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Title THE EFFECTIVENESS OF CONTROLLED READING-RATE PRACTICE TECHNIQUES IN THE DEVELOPMENT OF SPEED AND ACCURACY IN SECOND-QUARTER COLLEGE TYPEWRITING

Abstract approved (Major professor)

The purposes of this study were to determine: (1) the effectiveness of Skill-Builder Controlled Reader training in the development of speed and accuracy on straight-copy and production-copy timed writings in second-quarter college typewriting, (2) the effect of controlled reading-instrument training on the students' rate and level of reading comprehension, and (3) the validity of the Gregg production word-count system.

This experiment was conducted in the second-quarter typewriting classes at Oregon State University during the winter and spring quarters of 1960-1961. Participating in the experiment were 77 students from the major schools and classes on the campus. Students enrolling in second-quarter typewriting were assigned during registration to either a control or an experimental class by the coin-selection method of random sampling.

Both the control and the experimental classes used the same textbooks, materials, electric typewriters, and classroom facilities. The only difference between the teaching procedures used in the control and experimental classes was the presentation of approximately ten minutes of Skill-Builder Controlled Reader materials in the experimental classes three days a week for seven weeks. On instrument-training days, the control classes typed for ten minutes from duplicated sheets containing the identical filmstrip copy used in the experimental classes. The experimental classes were divided into three ability groups and instrument-training drills were projected for each ability group at gradually increasing speeds commensurate with the group's key-stroking ability. Ability grouping was not used in the control classes.

Periodic measurements were made of the students' ability to reproduce straight-copy and production-copy material under timing. Thirteen different measurements, including a reading test, were used to evaluate the students' performance.

On the final letter, enumeration, and five-minute straight-copy tests, F-test calculations showed that there were no statistically significant differences between the means of the control and experimental classes in speed and/or accuracy performance. On the final five-minute tabulation test, there

was a statistically significant difference at the 5 per cent level between the means of the two groups in speed performance. In terms of accuracy performance on the final tabulation test, the difference between the means of the two groups was not statistically significant.

Pre-training and post-training scores on reading rate and comprehension were obtained from the control and experimental groups by using two equivalent forms of the Cooperative English Test, Test C2. The control groups showed a slight improvement in their reading rate and level of comprehension while the experimental groups showed a slight loss in both factors. The F-test was used to measure the significance of the difference between the means of the two groups. The results were significant at the 5 per cent level.

The mean gross-words-per-minute score on the final five-minute straight-copy test was correlated with the mean production-words-a-minute scores on the final five-minute letter, tabulation, and enumeration tests. The values of rho for all variables correlated were significant at the 1 per cent level.

The conclusions reached in this study were: (1) controlled reading-instrument training does not significantly affect the students' skill development in key-stroking speed

and/or accuracy performance on straight-copy and production-copy timed writings in second-quarter college typewriting, (2) controlled reading-instrument training tends to impede, at least temporarily, the students' rate and level of reading comprehension, and (3) production words a minute is a valid word-count system for equating straight-copy and production-copy timed writings.

THE EFFECTIVENESS OF CONTROLLED READING-RATE PRACTICE TECHNIQUES IN THE DEVELOPMENT OF SPEED AND ACCURACY IN SECOND-QUARTER COLLEGE TYPEWRITING

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EDWARD A PERKINS

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Head of Departments of Business Education and Secretarial Science

In Charge of Major

Redacted for privacy

Chairman of School Graduate Committee

Redacted for privacy

Dean of Graduate School

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CHAPTER I

INTRODUCTION

An exploding population leading to mounting school enrollments, as well as an advancing technology in the aerospace age, has placed considerable stress on today's American educational system. As a result of these accelerating forces, a number of colleges, universities, and public school systems have begun to examine critically some of their long-held assumptions as to the nature and organization of the teaching-learning process. Inquiries ranging from one-shot doctoral research studies to research conducted at the local level with small staffs and limited budgets to massive long-range programs supported jointly by the Cooperative Research Program of the U. S. Office of Education and colleges, universities, and state educational agencies are mushrooming as never before in all our previous history.

The curriculum, naturally enough, was the first target of widespread concern for the excellence of education. For

a decade or more, the spotlight of criticism has been focused on the life-adjustment activities of the curriculum, a system which, in the main, attempted to meet the current needs and interests of children. A number of vocal and articulate critics--newspaper and magazine editors, politicians, industrialists, military men, and others--argued that the curriculum was outdated and failed to meet the needs of a technological civilization. Silberman provides a good summary of this point of view in his statement:

> For fifty years this system helped the U. S. to make more smoothly than any other nation the difficult transition from a farming to an industrial society, at the same time absorbing and Americanizing the children of millions of immigrants. "Adjustment" was what the American school child needed--and the schools of yesterday supplied it. (33, p. 126)

Against this background of restless discontent with the educational ideas of the recent past, a new curriculum aimed at quality education is being forged in several thousand schools throughout the country. Stimulated by the recommendations of the Conant Report (9, p. 41-76), by the findings of experimental studies conducted by the Commission on the Experimental Study of the Utilization of the Staff in the Secondary School (41, p. 4-14), and by other studies, the most dramatic changes are taking place in the American

secondary education program. One discernible trend is an increased emphasis in the intellectual disciplines, particularly in science, mathematics, and modern foreign language. Another important trend is that toward shorter programs in vocational education, which includes bookkeeping, shorthand, and typewriting.

Business educators, then, are faced with the challenge of searching for answers to problems brought about by sweeping changes in the curriculum. Can the teaching-learning process of business subjects be accelerated? Can the length of business skill-subject programs be shortened without resulting in a loss of vocational competency? Will Skill-Builder Controlled Reader training accelerate the learning process and result in greater speed and accuracy gains in typewriting?

Need for the Study

In considering the need for the study, the following reasons were apparent:

1. A need exists to modernize the business education curriculum. Cook expressed this need when he said:

> Unfortunately, we are not experiencing the revitalization that is so evident in most of the other high school subjects. This, at a time when

> courses are being eliminated from the business curriculum, when enrollments are dropping in the vocational courses, when we have a country of economic illiterates, and when there is a greater demand than ever before for skilled office workers. (10, p. 22)

2. Statements of accomplishment in the area of typewriting have disclosed that vocational skill is reached in a majority of schools by the average high school student after four semesters of instruction. (26, p. 17) In view of an indicated trend toward two- and three-semester programs in high school typewriting, there seems to be a need to improve teaching practices in order to reach vocational objectives in a shorter period of time.

3. A need also seems to exist for further, more scientific and more extensive research to determine the place of audio-visual aids in the teaching of skills in business subjects. Audio-visual aids, appropriately selected and properly utilized, can contribute to teaching and can improve learning, the goal of teaching. Today many American schools own or have easy access to such audio-visual equipment as the motion-picture projector, the filmstrip projector, the overhead transparency projector, the opaque projector, the tape recorder, and various others. Despite such a variety of audio-visual materials that are available, there remains

one simple fact: Most teachers already have access to more technological aids to instruction than they are using. In writing about the use of audio-visual aids by business education teachers of skill subjects, Winger stated:

> There are those who are skeptical of the entire audio-visual program and reluctant to attempt to adapt any phase of the program to their teaching procedures. Others have adopted certain preferred aids to learning and use them almost exclusively without attempting to try out any of the new devices. (43, p. 1)

4. Studies in controlled reader training for developmental reading instruction on all levels have been conducted. (38, p. 1-5) In the field of business education, a number of training programs in beginning typewriting, shorthand, and other business education subjects have been conducted with the assistance of the reading instrument. (31, p. 17-20) A need exists, then, to determine the effectiveness of this type of training in beginning, intermediate, and advanced typewriting at both the secondary and college levels.

Statement of the Problem

The primary purpose of this study was to determine by experimental means the effectiveness of the Skill-Builder Controlled Reader as a learning aid in the teaching of

second-quarter college typewriting. The study was performed to determine whether students receiving Skill-Builder Controlled Reader training in intermediate college typewriting would attain higher rates of speed and/or better accuracy on straight-copy timings and production-type problems than students not receiving reading-instrument training. A secondary purpose of this study was to determine the effect of Skill-Builder Controlled Reader training on the students' speed and level of reading comprehension based on a standardized reading test. Another purpose of this study was to determine the significance of the relationship between the following word-count scoring systems: gross-words-per-minute scores obtained on the final five-minute straight-copy writing and production-words-a-minute scores obtained on the final five-minute letter test, the final five-minute tabulation test, and the final five-minute enumeration test.

Hypotheses

The following hypotheses were proposed:

Hypothesis I: That practice on typewritten copy automatically projected at a continuous, left-to-right motion and preset pace will be conducive to the development of

rapid stroking on straight-copy material and production-type activities in second-quarter college typewriting.

Hypothesis II: That practice on typewritten copy automatically projected at a continuous, left-to-right motion and preset pace will be conducive to the development of accuracy on straight-copy material and production-type activities in second-quarter college typewriting.

Hypothesis III: That practice on typewritten copy automatically projected at a continuous, left-to-right motion and preset pace will improve the students' rate and level of reading comprehension on ordinary reading copy.

Limitations of the Study

The limitations of this study were as follows:

1. The filmstrip copy used in this study was not correlated with the typewriting textbooks and supplementary materials used for daily practice and skill-building purposes.

2. It was not possible to conduct a follow-up study to determine if the reading-instrument training had any long-term effect. Approximately four out of every five students in this study were nonbusiness education majors who did not

continue their typewriting instruction into the third-quarter course.

3. There was no way of controlling individual determination and other motivating factors.

4. There was no way of controlling the amount of practice time the students spent outside the classroom.

Definition of Terms

Throughout this study certain technical and mechanical terms are used. Stated below are definitions of these terms.

Basic rate: Refers to a scoring method devised by Dr. Fred Winger, of Oregon State University, and used in all second-quarter typewriting classes at that school for the purpose of determining a student's beginning-of-the-quarter achievement rate on straight-copy material. The net-words-per-minute score for each student, based upon the average of three or more straight-copy five-minute writings administered within the first ten days of the course, was computed and then adjusted around an arbitrary limit of three errors. This adjustment computation was designed to equate the error factor, which tends to be unusually high for many students at the beginning of the course.

Errors: Refers to the total number of errors made on the entire timed writing rather than the number of errors per minute of writing. The determination as to what constituted an error was based upon the International Typewriting Contest Rules that are available in most typewriting textbooks.

Filmstrip: The filmstrip is a continuous length of 35mm film upon which words, phrases, sentences, and other typewriting exercises to be projected are imprinted. All filmstrip exercises used in this study were selected from the Educational Developmental Laboratories' Typing-Skill Development Course, a twenty-five filmstrip, seventy-five lesson course designed to be used from the day students complete their keyboard introduction to the termination of typewriting instruction.

Fixations: The length of time required for the eyes to fix on a given part of a line in reading.

Gross words per minute (GWPM): Refers to a method of determining the rate of speed in typewriting without taking accuracy into consideration. The gross-words-per-minute figure was obtained by dividing the total number of strokes typed by five and then by the number of minutes in the

timing. In typewriting five strokes, letters, and spaces are considered a word in all computations.

Net words per minute (NWPM): Refers to a method of determining the rate of speed in typewriting taking accuracy into consideration. The net-words-per-minute scores were obtained by dividing the total number of strokes typed by five and from this number ten words were deducted for each error in the timed writing, then this figure was divided by the number of minutes in the timing. The ten-word penalty was designed to represent the length of time it would take to make an acceptable correction of the mistake.

Perception: In typewriting perception refers to copying from printed material without regard to meaning or comprehension.

Production-type exercises: Refers to one-page personal and business letters arranged in block or semiblock style; one-column to four-column tabulation problems, with or without column headings; and various manuscript exercises, including the enumeration, outline, and bibliography. These textbook exercises were designed to build basic typewriting skill in problem-solving situations.

Production words a minute (PWAM): Refers to a new production word-count system that attempts to equate the

complexity of production typing with the simplicity of straight-copy typing, thus facilitating the establishment of a single set of standards for all kinds of typewritten copy. In addition to the usual one-word credit for each five strokes, letters, and spaces, the counting system allows the following credits for all necessary machine operations:

1. Underscored words: Triple count is given for each underscored stroke.

2. Centered words: Triple count is given for each centered stroke.

3. Extra carriage returns: Five strokes are given for each extra carriage return.

4. Tabulation: Five strokes are given for each use of the tabulator.

5. Changing paper: Forty strokes are given for change of paper.

6. Special operations: Five strokes are given for each special machine operation, like using the margin release, the variable spacer, the carriage release, and the ratchet release. (27, p. 31)

All these credits are based on having the margins, tab stops, and spacing mechanism of the typewriter set in advance and paper inserted, so that the student is ready to

begin typing--just as he is for a straight-copy timing. In computing speed, the student uses the same method that he does in determining gross words per minute: total words typed, or the total number of strokes typed divided by five, divided by the number of minutes in the timing.

Recognition span: The number of letters, parts of words, or words that can be identified at one fixation pause.

Regressions: The number of times the eyes tend to retrace or review portions of the line being read.

Skill-Builder Controlled Reader: The Skill-Builder Controlled Reader, developed by the Educational Developmental Laboratories, Huntington, New York, is a 35mm filmstrip projector with an automatic speed variation from two to eighteen lines a minute, or about twelve to one hundred eight words a minute, with a speed increase of six words a minute with each turn of the speed control dial. It is a mechanical device which presents reading material in a continuous, smooth, left-to-right motion; it has a moving slot which covers and uncovers print as it moves across each line. Projection may also be set in an open slot motion which exposes an entire line of print at one time.

Straight-copy timings: Refers to sentence or paragraph timed writings, some with equal-length lines and others with varied-length lines. In this study, straight-copy timings were used in conjunction with a skill-building program that emphasized either the speed or the accuracy factor on specific days of the week.

Tachistoscope: The tachistoscope is a mechanical device which projects images of objects or reading material on a screen for a brief measured period, a full second or some fraction of a second. It is an effective instrument for improving the seeing process of the learner.

Summary

As schools are currently under pressure to compress nonacademic programs, the time required to develop basic typewriting skill needs to be reduced; and the instructional practices and procedures need to be improved. It is felt that audio-visual aids, appropriately selected and properly utilized, can help accelerate the learning process. A need exists for further, more scientific and more extensive research to determine the place of audio-visual aids in the teaching of skill subjects in business education. Specifically, research data are needed to determine the value of

Skill-Builder Controlled Reader training in all phases and levels of typewriting instruction.

The primary purpose of this study, then, was to determine by experimental means whether students receiving Skill-Builder Controlled Reader training in second-quarter college typewriting would attain higher rates of speed and/or better accuracy on straight-copy timings and production-type problems than students not receiving reading-instrument training.

Chapter II will review the related research in controlled reading-instrument training in the field of education.

CHAPTER II

REVIEW OF RELATED RESEARCH IN CONTROLLED READING-INSTRUMENT TRAINING IN THE FIELD OF EDUCATION

Introduction

Inventive Americans have long turned their attention to the production of special tools, instruments, and devices for aiding various instructional programs. The list of machines and gadgets which have been sold to schools during the last thirty years in reading instructional programs, for example, constitutes a formidable exercise in spelling and pronunciation: tachistoscope, metronoscope, ophthalmograph, reading rate accelerator. In the field of business education, however, the use of reading instruments is still in its infancy.

This investigation has been restricted to the early background and development of controlled reading-instrument training in education. An examination of some of the significant studies in the fields of reading improvement and business education provides a vivid picture of the development of controlled reading instrumentation in this country.

Pertinent research studies of the reading factors in typewriting will also be examined.

The Development of Controlled Reading Devices

Early Concept of Reading

The early concept of reading, from the middle of the nineteenth century until 1910 or thereabouts, emphasized a mechanistic interpretation of reading. Reading was considered basically a perceptual act--a matter of quick recognition of words. Diagnoses of reading difficulties took the form of examination of the physical and particularly the eye-movement characteristics of the problem reader. Success in reading was considered largely a reflection of physical traits which could best be modified by physical or medical means. Some of the basic psychological facts derived from the studies of this period have been summarized by Spache. They are:

1. Reading is performed in a series of short, quick movements and fixation pauses rather than one continuous sweep across the page.

2. The number of words, phrases, or letters recognized during the fixation pause reflects the reader's familiarity with the reading matter, the difficulties which he encounters in word recognition or assimilation of ideas, as well as the physical characteristics of the material read.

> 3. These eye-movements do not occur line after line in a fixed pattern because of the influence of the factors mentioned above. There is, however, a tendency for the individual to form ocular-motor habits which tend to persist in many reading situations. (34, p. 10)

Remedial training intended to increase both the speed and span of word recognition, then, consisted largely of rote memorization supplemented by flash cards and laboratory quick-exposure devices.

The Tachistoscope

The tachistoscope, which flashes or projects objects, words, and numbers at fast speeds, was developed to work directly on span and time of fixation. Early tachistoscopic experiments designed to measure the span of apprehension were conducted in the laboratory by Sir William Hamilton in 1859; by Jevons in 1871; by Cattell in 1895; and by Dodge, Kutzner, Fernberger, Freeman, Glanville, Dallenbach, and others in the period up to 1914. (19, p. 314-315)

Prominent among contemporary psychologists interested in the field of recognition training is Dr. Samuel Renshaw of Ohio State University. A program of tachistoscopic training in aircraft and ship recognition was established by Renshaw during World War II for the Navy Department. This

training proved to be successful and was continued by the Navy throughout the war.

Since 1938 the Keystone View Company has spearheaded the development of equipment, materials, and methods for use on the tachistoscope in education. Keystone's progress in the field of tachistoscopic techniques is summarized by Hamilton as follows:

> The first great advance in this project came with the development of the Keystone Overhead Projector. This made possible the use of multiple exposure slides instead of using an entire slide for one word, phrase, or number as was necessary in the conventional type of slide projector, whether for standard or for two-inch lantern slides. It now became possible to print from sixteen to eighteen and later forty exposures on one slide, each exposure appearing on the screen at exactly the same spot when flashed. Up to the time of this development, the use of the tachistoscope dragged. The expense of hand-making and buying 1,000 or more slides, which seemed to be a minimum necessity, seemed prohibitive to buyers; and where such a collection of slides might be secured, its filing and use were cumbersome and forbidding. (19, p. 315-316)

A comprehensive report of tachistoscopic principles, techniques, and application to school problems is contained in Gaspar C. Barnette's Learning Through Seeing. (4, p. iii-145)

Importance of Eye Movements in Reading

Beginning approximately in the second decade of this century, the concept of reading gradually shifted to one emphasizing comprehension. This change in the concept of the act of reading was largely responsible for much vigorous debate among reading authorities regarding the importance and value of training in the mechanics of eye movements and its relationship to reading skill. Traxler summarized the nature of this controversy as follows:

> Some authorities regard the complex of psychological factors involved in reading comprehension as the all-important thing and hold that eye-movements are only symptoms of the effectiveness of comprehension. They insist that if pupils are instructed in such a way that they learn to understand what they read, their eye-movements will as a rule be satisfactorily mature. Others believe that faulty eye-movements are frequently a cause of reading inefficiency and that noteworthy improvement in reading skill may be brought about by direct training of eye-movements. (40, p. 280)

Whatever the nature of eye-movement behavior in reading, photographic records of eye movements reveal that good readers at any age or grade level make fewer fixations per line, fewer regressions, and take less time per fixation than poor readers. The fact that there are these differences between the eye movements of good and poor readers suggests the possibility of improving reading by training

the poor reader to emulate the eye movements of the good reader. A number of controlled reading devices, including the Metronoscope, the Harvard Reading Films, and the Controlled Reader, have been developed to that end. These instruments have been used extensively in schools and clinics throughout the country to develop a rhythmic, left-to-right movement of the eyes, broaden the span of recognition, and decrease the number of fixations and regressions.

Controlled Reading Devices

In 1922 Guy T. Buswell began experiments with a device to aid in the presentation of specific remedial exercises in a reading program. His apparatus consisted of a simple stereoptican device which used a kinetoscope film. By moving the film upward through the stereoptican apparatus, Buswell was able to project single units on a screen with one following another in regular position across the line. Buswell stated:

> In reading the words, the pupil would not only be securing exercise in grasping a short word at a single eye-fixation, but he would also be getting the habit of moving his eyes regularly across the line as in ordinary reading. (6, p. 141)

Buswell was acutely aware of the limitations of his device, and he cautioned it should be used for a specific type of

remedial exercise for a specific reading deficiency. (6, p. 138-147)

One of the first practical devices for reading instruction was the Metronoscope which was developed by James Y. Taylor, Earl A. Taylor, and Carl C. Taylor and released by the American Optical Company in 1931. The Metronoscope was a triple-door device for exposing segments of lines of print in a left-to-right fashion. In essence it was a tachistoscopic device for the controlled time exposure of words and phrases for continuous reading. An adaptation of the Metronoscope principle, 16mm silent motion-picture films for the college level known as the Harvard Reading Films, was released by Harvard University in 1938. Films of a similar nature were released by the State University of Iowa in 1951 for high school readers. (38, p. 1)

A number of individual acceleration devices, though not left-to-right control devices, were released after 1950. Among these were the Reading-Rate Controller, Stero Optical Company; the Reading Accelerator, Science Research Associates; the Reading Pacer, Keystone View Company; the Rateometer, Audio-Visual Research; the Shadowscope, Lafayette Instrument Company. These devices are used to develop rapid

reading and skimming skills after a sound fundamental reading skill has been established. (38, p. 1)

The Controlled Reader, the latest development in the reading-instrument field, was designed by Stanford E. Taylor beginning in 1947. The first pre-release models of the device were tested for effectiveness at the Washington Square Reading Center in New York City and in its public and private school branches during 1952 and 1953. This device, a 35mm filmstrip projector equipped with a left-to-right scanning mechanism, has a speed range from 60 to 1,000 words per minute allowing speeds appropriate to any level of instruction, from pre-reading through the adult level. At present the Controlled Reader is being used in thousands of classrooms as well as in hundreds of reading clinics. (38, p. 1-5)

A slow-speed Controlled Reader, known as the Skill-Builder Controlled Reader, was recently developed by the Educational Developmental Laboratories, Inc., Huntington, New York, especially for use in business education classrooms. The Skill-Builder Controlled Reader operates automatically at speeds from 12 to 108 words per minute, which gives the business teacher an opportunity to pace skill-building materials at speeds which allow time for student

reaction to the reading stimulus. Filmstrip programs have been developed and released for instruction in the areas of typewriting, shorthand, and business mathematics as well as for instruction in the use of the ten-key adding machine.

The Controlled Reader seems to satisfy the pedagogical requirements for an effective reading instrument and skill-building device and fulfill the physical requirements for use in the classroom. While a great deal of experimentation should and will be undertaken before the total scope can be appreciated and applied to classroom procedures, a number of significant studies with controlled reading devices have already been conducted in the fields of reading improvement and business education.

Experimentation with Controlled Reading Devices in the Field of Reading Improvement

The Metronoscope

One of the first experiments with the Metronoscope was reported by Taylor (37, p. 214-233), the inventor of the machine. In a study designed to determine whether controlled reading with the Metronoscope is more effective in establishing efficient reading habits than a corrective method which depends principally on verbal instruction and

whether the improvement brought about by training is permanent, Taylor set up experimental and control groups, each group consisting of twenty-five high school students selected from the tenth and eleventh grades. Each group was given practice in rapid reading during thirty-minute practice periods on ten consecutive school days. The control group read short stories from mimeographed sheets while the experimental group read the same material from the Metronoscope. Eye-movement photographs of 148 words administered before and after training showed that the reduction in number of fixations and in regressive movements was greater for the experimental group than for the control group, that these improvements were relatively permanent, and that both groups showed a slight loss in comprehension. In Taylor's own words:

> The experimental group averaged fewer fixations and regressions per 148 words than the control group, presumably as a result of controlled reading. The increase of speed in silent reading is also greater for the experimental group, and the loss in comprehension--shown for both groups and apparently due to reading too rapidly--is smaller. (37, p. 219)

Taylor also observed:

> The findings in this study also indicate that the willingness of the pupil to follow verbal instructions is not effective in breaking down old habits and establishing new ones. The

> response of the subjects in the experimental group, however, to a reading situation in which they were compelled to practice new habits of attack on print is evidence that corrective training of this type tends to condition rapid, effective reading. (37, p. 233)

Witty and Kopel (45, p. 138-139) took exception to the implications and conclusions contained in Taylor's study. In a critical analysis of the findings of the study, they pointed out:

> Changes in eye movements, as in all other mechanics of reading, are significant to the extent that they modify comprehension and speed. At this point the study must have proved a tremendous disappointment to the investigator, for the experimental group did not show significant gains in these respects. The average of the comprehension scores of the experimental group was 83.33 before training; after training, it was 82. For the control group the initial and final comprehension scores averaged 86.33 and 84.66. Thus the losses for the two groups were 1.33 and 1.67 points. The difference in these losses is clearly not great or significant. At the end of the experiment the differences in scores for time in reading are similarly insignificant. On the initial test the experimental groups required an average time of 31.65 seconds for reading 148 words, while 22.16 seconds were used in the final test. The control group averaged 33.84 and 24.24 seconds in the initial and final tests. The gains computed from these averages are 9.49 and 9.6 seconds, respectively. Significance could scarcely be attributed to this small difference. One must conclude that controlled (metronoscope) reading may effect

> changes in the mechanical process which are not co-ordinated with and apparently do not influence the process of meaningful reading. (45, p. 139)

Center and Persons (8, p. 118-123) also began experimenting with the Metronoscope soon after this instrument became available. Eight pupils having the lowest comprehension scores and approximately the same speed of reading were selected from a group of the very poorest readers in the Reading School of the Theodore Roosevelt High School in New York City to test the effectiveness of the diagnosis with the Ophthalmograph and corrective work with the Metronoscope. These pupils were given eight metronoscopic training periods of twenty-five minutes duration each, or two sessions per week for a month. The aim of the remedial work was to increase the pupils' comprehension, develop rhythmical reading, reduce the number of regressions, and increase speed by reducing the number as well as the duration of fixations. The rate of reading was gradually increased from 180 words per minute during the first period to 280 words per minute during the final periods. Comprehension tests were given after each period of silent reading, and the pupils were informed of their progress. Eye-movement photographs taken with the Ophthalmograph before and after

training showed a reduction in the number of regressions and fixations and a consequent increase in the span of recognition. Comprehension test scores showed definite gains at the end of the training period. There was no control group in this study.

In their Dartmouth College Study of visual factors in reading, Imus, Rothney, and Bear (20, p. 1-144) reported the use of the Metronoscope in an attempt to correct the reading habits of selected numbers of the class of 1940 who regressed frequently and to help some types of plodding readers. They stated that the Metronoscope proved to be an interesting and stimulating variation in procedure, but they reported no specific results based on this kind of training alone.

Reading Films

In an experiment designed to determine the relative effect of three methods of training upon eye movements and reading rate, Glock (18, p. 93-106) selected at random six groups of remedial readers from the State University of Iowa during the first semester of 1947-1948. One group of subjects utilized controlled reading practice techniques that employed the Harvard Films for Reading Improvement; another

group used a reading film developed by the experimenter; the third group relied on mechanically uncontrolled reading from the printed page under a verbal set to strive always to read as fast as was consistent with comprehension. Glock found that all groups improved eye movements substantially, including a reduction in the number of fixations and regressions and an increase in the span of recognition. There was also a significant over-all reduction in the average duration of fixations. Rate of comprehension, as measured by various reading tests, showed significant over-all improvement for all three methods of training. Glock contends:

> Large gains in rate have usually resulted whenever subjects have been given an instructional set to improve their speed. Motivation appears to have been a prime factor. Perhaps the various mechanical devices have proved to be effective, in part, because of their novelty and because of the subject's confidence in their use. The controlling aids tend to point up the problem for the subject and to set up specific goals. (18, p. 93)

Dearborn and Wilking (11, p. 668-678) also experimented with the Harvard Reading Films, one of several techniques used to improve the reading of college freshmen. Gains were measured by means of a number of reading tests. The results indicated that the remedial groups profited significantly from the remedial sessions.

The Reading-Rate Controller

In a study conducted in 1953 to determine the effects of the Reading-Rate Controller on the students' reading ability, Wedeen (42, p. 121-123) separated 150 Brooklyn College freshmen into three equivalent groups. Group A was given training in reading by means of the Reading-Rate Controller. Group B was given training without any mechanical device. Motivation was induced by means of a stop watch. Group C was the control group and received no training. Groups A and B used the same reading materials and trained in the same room for two 50-minute periods a week for five weeks. The results showed that both the mechanistic group and the non-mechanistic group produced genuine gains in reading rate and comprehension and general reading ability; both groups were superior to the control group. The Reading-Rate Controller group, however, produced greater improvement only in rate.

Wooster (46, p. 421-426) reported in 1954 an investigation designed to determine the possible value of supplementary training on the Reading-Rate Controller in conjunction with a college course in effective study. Two groups of six students each were selected from an upper-division psychology course; the remaining 48 students in the course

comprised the control group. Experimental Group A received 345 minutes of training on the Reading-Rate Controller in 11 one-half hour sessions and one 15-minute session. Experimental Group B received 315 minutes of training in 10 one-half hour sessions and one 15-minute session. The control group took the effective study course, but it had no supplementary training on the Reading-Rate Controller. Comparable pre-training and post-training scores on rate and comprehension were obtained by using two parallel reading tests. The results showed no statistical significance among the three groups with regard to rate and comprehension. Wooster concluded:

> In this case, no extra benefits seemed to accrue from additional training on the reading-rate controller, as used. The study sheds some light on the possible value of using such a device in connection with a course where reading is treated as only one of several topics. Further investigation is needed, however, concerning the practical usefulness of these machines and the comparative effectiveness of different approaches to the problem of improving reading skills. (46, p. 425-426)

The Controlled Reader

Several public schools have used the Controlled Reader as part of the regular reading program and have tried to evaluate the results in a somewhat informal way using techniques that are not highly statistical. For example,

in 1954, Kilthau (22, p. 60-62) described a fourth-grade reading program at the Powell Avenue School, Bethpage, New York. In that program, forty-five minutes a day were allotted to controlled reading; the time was divided equally among three reading groups. Kilthau reported that, at the end of the training period, the children were reading more rapidly and that, by their general understanding of stories and their answers to questions, they showed they had better comprehension of what they were reading. In 1957, Anderson (2, p. 172-177) reported the use of the Controlled Reader in a reading program initiated at the seventh-grade level at the Lufkin Junior High School, Lufkin, Texas, designed to be helpful to the poor reader, the average reader, and the accelerated reader. All students received Controlled Reader training three times weekly for a period of forty minutes for the entire school year. The results of the study showed that, at the end of the program, most of the students had increased their reading speed and rate of comprehension. Anderson summarized the findings of the study as follows:

> Because of the unparalleled motivation of this type of instrument instruction, the students develop: (a) confidence in their ability to succeed; (b) longer span of attention; (c) ability to concentrate for longer periods of time;

(d) capacity for working under pressure; and
(e) more positive attitude toward reading.
(2, p. 176)

The Centinela Valley (California) Union High School District reported the use of a Controlled Reader, one of several devices used in the school system's reading improvement program initiated in 1959. The Controlled Reader was used daily as a way of increasing rate and comprehension as well as improving concentration and attention. Pre-training and post-training scores obtained from a standardized reading test showed an appreciable improvement in rate, comprehension, and other reading factors. (14, p. 1-3)

In 1959, Kemp (21, p. 474-475) reported a private school experiment the purpose of which was to determine the effects of Controlled Reader training when used as an integral part of a remedial and a speed improvement program. Twenty-four teen-age students were placed in two groups. Group A was made up of students deficient in both rate and comprehension. Group B was comprised of students who definitely needed to increase their reading speed and who showed little or no deficiency in comprehension. Each group received thirty-two hours of Controlled Reader training over a period of six weeks. In Group A, the remedial group, the rate of presentation was strictly adjusted to the average

comprehension of the group, and small increases in rate were made only when comprehension was considerably above average. In Group B, the speed-reading group, the rate of presentation of the Controlled Reader was increased as rapidly as the level of comprehension permitted; and, during the last few sessions, the rate was adjusted to exceed the capabilities of the group. Data were obtained on standardized reading tests before and after training. Kemp found that marked increases in both rate and comprehension were achieved in both groups and that, proportionately, the remedial group made a greater increase in comprehension than in rate. There was no control group in this study.

Opinions of Reading Specialists

Against this background of experimentation with controlled reading devices in the field of reading improvement, a number of reading specialists voice a cautious estimate concerning the usefulness of mechanical devices in increasing the rate of reading comprehension. In a summarization of opinion and research regarding the value of controlled reading techniques, Traxler stated:

> The results of the research studies that have been conducted thus far do not provide clear-cut evidence either favorable or unfavorable to controlled reading. The experimental

> procedure and the conclusions of a considerable proportion of the limited number of available studies would not meet the criteria of an acceptable statistical study. Notwithstanding the limitations in the data as a whole, however, it appears that the findings are somewhat more favorable to the value of controlled reading techniques than is the sum total of the opinion of experts in the field of reading. Most of the studies do suggest that considerable improvement is made under teaching procedures employing controlled reading. There are, however, two limitations which greatly interfere with definite conclusions in this regard. One limitation is that information concerning the permanence of the gains in test scores brought about by the controlled reading is almost non-existent. The other limitation is that . . . controlled reading has usually been only one of a number of techniques employed and it is almost impossible to say just what procedures have been responsible for the improvement shown by the subject. (40, p. 288-289)

The situation with respect to the evaluation of the relative effectiveness of different methods and mechanical devices in teaching reading has been characterized by Strang in the following words:

> In most of the experiments a combination of methods has been used so that the improvement resulting cannot be attributed to any one mechanical device. When mechanical devices are used with high-school and college students there may be some danger of disorganization of the effective habits which they already have built. There is also the tendency to direct attention from the thought to the mechanics and to decrease rather than increase those most important characteristics of good readers--flexibility and adaptability. The

> conceptual as well as the perceptual factors involved in increasing one's span of recognition must be recognized. (36, p. 184-185)

Anderson and Dearborn point out that the evidence that eye-movement training devices accomplish their purpose is far from reassuring. They stated:

> These and similar devices have been used extensively in schools and clinics throughout the country. According to one report, over three hundred colleges and universities employ these methods in remedial work with their own students. Unfortunately, research has not conclusively demonstrated that any lasting benefit is derived from eye-movement training as such. The whole approach requires re-examination. (1, p. 131)

Sheldon maintains that the value of mechanical devices in a reading improvement program appears to reside in the novel effects they present. He explained his stand as follows:

> Teachers have been concerned about the usefulness of mechanical devices in increasing the rate of reading comprehension. The research now available indicates that only slight if any improvement is brought about by use of various instruments . . . . The question of why mechanical devices do not facilitate reading comprehension is related to the reader's thought processes and purpose for reading. The most elementary of reading texts emphasizes the need to develop concepts and background in order for students to understand fully what they read. It is not yet within the scope of various mechanical devices we have examined to meet these needs. At

> present the reading rate controller, tachistoscopes, metronoscopes, and similar instruments are unable to achieve this end. (32, p. 52-53)

During the last two decades, then, many experiments have been carried out to determine the relative efficiency of different techniques of teaching reading with a variety of controlled reading devices. Unfortunately, the evidence available does not show conclusively which of the controlled reading techniques in current use is the best. The data in the foregoing studies, as well as the opinions of various reading specialists, suggest that controlled reading techniques designed to improve reading rate and comprehension should have the benefit of a more extensive, detailed, and rigidly controlled experimental study than has been made in this area.

Experimentation with Controlled Reading Devices in the Field of Business Education

Although controlled reading-instrument training of one type or another has been used for a number of years, the average business educator has little or no idea of its adaptability to specific teaching situations. This situation is due primarily to the fact that, until recently, the use of such mechanical devices was confined largely to the

area of reading improvement. After World War II, controlled reading techniques expanded rapidly into other educational areas. It was not until 1949, however, that the first experimental study with a reading instrument was conducted in the field of business education.

Tachistoscopic Studies in Typewriting

In 1949, Winger (43, p. 1-166) set up an experiment for beginning typewriting students at Oregon State College. Forty students comprised the experimental group and a like number, the control group. Each group used the same material in the textbook each day during the experiment. The only difference in procedure between the two groups was the presentation of tachistoscopic drill materials in the experimental group for about ten minutes a day, five days a week, for ten weeks. The results of the experiment as determined by the last five-minute writing showed a statistically significant difference of the experimental group over the control group in stroking rate and accuracy. Winger also observed that tachistoscopic training was conducive to relaxed stroking, developed pronounced pattern stroking, increased student motivation, and developed certain desirable techniques of operation.

Two years after Winger's study was conducted on the college level, Palmer (30, p. 1-94) undertook a similar experiment on the secondary level utilizing the beginning typewriting classes of Klamath Union High School, Klamath Falls, Oregon. From a population of 280 students, 61 students were selected at random for the experimental group, and 63 students were selected for the control group. Tachistoscopic training was started one month after the beginning of school and was used for ten minutes each day in the experimental group. At the end of the experiment, the tachistoscopically trained students showed a superiority in rapid and accurate stroking on straight-copy timings, letters, and number exercises. Follow-up measurements on straight-copy and letter timings two months after tachistoscopic training was concluded indicated that the gains in speed and accuracy of the experimental group were of a permanent nature.

Tachistoscopic Study in Shorthand

In a study to determine the effectiveness of tachistoscopic training in elementary shorthand, Barber (3, p. 1-103) set up experimental and control groups selected from the classes at Oregon State College during the fall,

winter, and spring quarters of 1957-1958, 1958-1959, and 1959-1960. The only difference in the teaching procedures between the experimental and control classes was that the experimental groups received tachistoscopic training each day while the control groups were given chalkboard drills on the same material. The results of the study showed that, on all measures involving reading and transcription rates of shorthand outlines, the experimental groups far surpassed the control groups. On all measures involving accuracy of transcription, however, the control groups were far more accurate than the experimental groups.

The Skill-Builder Controlled Reader in the Classroom

Several efforts have been made to determine the value of reading-instrument training in typewriting and shorthand in a somewhat informal way using techniques that were not highly statistical. For example, Bell and Batchelor (5, p. 3) reported the use of the Timex tachistoscope and the Skill-Builder Controlled Reader in five classes in elementary shorthand and typewriting in the School of Commerce at New York University. Special drills correlated with the shorthand and typewriting textbooks were prepared for use with the Timex and the Skill-Builder Controlled Reader and

were used each day to supplement the usual class instruction. The instructors found that their students profited greatly from the use of these mechanical devices. Fedorczyk (15, p. 82-85) reported the use of the Skill-Builder Controlled Reader in a beginning typewriting class at the Edwin O. Smith School, teacher-training secondary school of the University of Connecticut, during the summer of 1960. Thirty-two students, ranging from thirteen to fifty-six years of age, were grouped in the classroom according to their skill levels as determined by teacher observation of student techniques, the results of one-minute timed writings, and the results of graded instrument runs. Because of the heterogeneity of the class, it was necessary to have four groups. All groups had daily practice with the Skill-Builder Controlled Reader which was paced at speeds equal to and slightly above their level of ability. At the end of six weeks of instruction, the pupils' speeds ranged from 17 to 63 gross words per minute, with three or fewer stroke errors on one-minute timed writings. Fedorczyk observed that instrument training in beginning typewriting helps the student develop speed, as well as correct eye movements, and allows the teacher to observe techniques and analyze student difficulties. Denny (12, p. 1-3) described an intensive

program of shorthand instruction using the Skill-Builder Controlled Reader at Chico State College, Chico, California, during the 1961 spring semester. Much of the success of this program was attributed to increased motivation developed by regular instrument-training sessions. The Skill-Builder Controlled Reader has also received enthusiastic support from the typewriting and shorthand instructors at Newton High School, Newtonville, Massachusetts (35, p. 1-7); it is also being successfully employed in a business education team-teaching program at Cupertino High School in Sunnyville, California (39, p. 1-6).

Kline's Study

The only controlled statistical study thus far made in determining the effectiveness of the Skill-Builder Controlled Reader as an instructional device in a business education subject was conducted by Kline (23, p. 1-193) during 1960-1961 in beginning typewriting. The experimental group consisted of 35 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. All subjects in the experiment were selected from

secondary schools located in Springfield City (Ohio) and Clark County (Ohio). Beginning with the twenty-first regular class session, the experimental classes worked with the Skill-Builder Controlled Reader for about ten minutes each class period. At the end of the first semester, one experimental class discontinued training with the Skill-Builder Controlled Reader, and the other experimental class continued training to the end of the second semester. The results showed that at the end of the first and second semesters, the differences in speed and accuracy between the experimental and the control groups, as measured by a three-minute straight-copy test at the end of the first semester and a five-minute straight-copy test at the end of the second semester, were found to be significant at the 1 per cent level. The differences between the experimental class which continued with the instrument training and the one which dropped it were found to be insignificant. On the basis of the data in this study, Kline concluded that the Skill-Builder Controlled Reader is an effective speed-forcing and control-building device and that it can be used effectively in conjunction with regular textbook materials and classroom procedures in the teaching of elementary typewriting.

The data in the foregoing studies suggest that controlled reading devices can be used most effectively in developing and solidifying basic skills in the field of business education. The evidence seems to justify further investigation and experimentation with controlled reading devices in typewriting and other skill-building areas.

Reading for Typewriting

Very little research has been conducted in the area of reading and its significance as a factor in one's ability to reproduce copy on the typewriter. However, it has been discovered that different types of eye movements may be required in typewriting from those used in reading history or literature.

In 1932, Butsch (7, p. 104-121) conducted an experiment in the educational laboratory at the University of Chicago the purpose of which was to determine the way in which the eye follows the copy while one is typewriting and, especially, to measure the distance which the eye keeps ahead of the hands in writing at various speeds. Butsch referred to this interval as the "eye-hand span." Use was made of an apparatus for photographing eye movements with an attachment for synchronizing the action of the typewriter with the film

record. His procedure was the same as in the experiments in which eye movements in reading were photographed, except that, instead of merely reading silently or orally, the 19 subjects reproduced the material in the copy on the typewriter.

From the film-record plottings made for each subject, Butsch noted that, in general, rapid writers require fewer fixations per line than do slower writers and that the eye-hand span for rapid writers was longer. He reported that, when reading copy for typewriting, the subjects made many more fixations per line, and longer fixations, than they did in ordinary reading. Moreover, the average length of eye-hand span varies for individual writers from 3.24 spaces to 7.60 spaces. On the average the eye keeps about one second ahead of the hand regardless of the speed of writing. In general, among all but the most rapid writers, the tendency is to keep one word ahead of the hand; when the eye was found to be more than one word ahead of the hand, it was usually on words making a phrase conveying a unit of thought. The results indicated that, while most typists are capable of a longer eye-hand span, the tendency was for the eye to keep just far enough ahead to provide copy for the hand as it is needed.

Dvorak, Merrick, Dealey, and Ford (13, p. 181-182) reported in 1936, after several years of extensive research of typewriting behavior, that certain determining letters contribute essential signals, especially the first letter of a word and any consonants rising above the main line of print, such as l, t, f, and d, and the ones extending below the line, such as p, y, and g. They pointed out that a few such signs from the first half of the word and the upper halves of the letters should be sufficient signals to enable the typist to type the word. A word is apparently caught from such cues in its familiar outline, and the typist fills in from his own personal visual or speech patterns. The investigators also reported that the hard spot is at the center of a word or immediately at the right of the center. They attributed practically all reading errors in typewriting--such as omissions, additions, and substitutions of words--to lack of proper attention to copy.

In 1943, Fuller (16, p. 19-21) conducted one of the most complete studies yet made of the general nature of the reading process as applied to typewriting. In this study, 100 subjects were photographed with an eye-movement camera while typewriting ten lines of copy and while reading seven lines of ordinary reading material. In addition to

photographing the subjects' eye movements, they were given a fifteen-minute typewriting test and the Traxler Reading Test. Fuller found that the rate for ordinary reading was about 5.7 times the reading rate for typewriting, that an average of 1.1 words are absorbed in a glance in ordinary reading but only .32 words in reading for typewriting, and that the mean time spent on each pause in typewriting was .47 of a second as compared to .30 of a second for ordinary reading. Since the data indicate that reading for typewriting requires only a very small span of recognition and slow rate of reading, Fuller suggested that even the poorest reader has a sufficiently large span of recognition to meet the demands of reading for typewriting.

Fuller stated that the term "perception" seems to be a more inclusive word than "reading" to describe the process of absorbing characters in print or writing for the purpose of reproducing these characters on the typewriter. Reproduction of symbols, rather than the comprehension required in ordinary reading, relegates the comprehension factor to a minor role in reading for typewriting. While ordinary silent reading seems to take place by word-wholes and fragmentary signals at a comparatively fast rate of speed, it

would appear that detailed word-recognition patterns are the basic reading patterns for typewriting.

As a result of his study, Fuller was able to make the following recommendation relative to effective reading for typewriting:

> The pupil must be able to move his eyes effectively across the copy. Close attention should be given to the details of the copy. Sufficient attention should be given to meanings or word-wholes so that the proper word is typed, and the words that belong together are in correct order. Slow and careful reading is possible because of the generous time element in reading for typewriting, and should be required. Mind wandering is the worst enemy of proper reading for typewriting. Careful and systematic observation and study of words in a consistent left-to-right direction will defeat any tendency to reading errors in typewriting. (17, p. 11)

Summary

Eye-camera records have revealed that good readers on normal reading copy, at any age or grade level, make fewer fixations and regressions per line and take less time per fixation than poor readers. These differences between the eye movements of good and poor readers suggest the possibility of improving the functional efficiency of the individual in reaction to print by training the poor reader to emulate the eye movements of the good reader. To this end, a number

of mechanically controlled devices have been developed, including the Metronoscope, the Harvard Reading Films, and the Controlled Reader.

Many experiments have been carried out to determine the relative efficiency of different techniques of teaching reading with a variety of controlled reading devices. The results of these experiments have indicated, in general, that mechanically controlled forms of training are effective in increasing speed of reading without decreasing comprehension if training is undertaken with determination and persistence. A number of reading specialists, however, have questioned the usefulness of mechanical devices in increasing the rate of reading comprehension.

Although controlled reading-instrument training is still in its infancy in the field of business education, there is some evidence available that suggests that mechanically controlled forms of training will improve basic skills in the initial stages of typewriting.

Studies of the reading factors in typewriting have indicated that the signals or stimuli in the copy are perceived but possibly not comprehended. It has been suggested that reading errors in typewriting can be attributed to mind wandering and lack of proper attention to copy.

Chapter III will deal with the procedures used in conducting this study.

CHAPTER III

PERSONNEL, MATERIALS, AND PROCEDURES

Introduction

The personnel, materials, and procedures of the study will be described in the following sections of this chapter: (1) formation of the classes, (2) materials and equipment, (3) controlled reading-rate practice techniques, and (4) evaluation procedures.

Formation of the Classes

Setting

This experiment was conducted in the writer's second-quarter typewriting classes in the Secretarial Science Department of Oregon State University during the winter quarter and repeated during the spring quarter of the school year 1960-1961. These classes met five times each week for a fifty-minute period each day and represented a training period of approximately ten weeks. The writer was in charge of all the classes used in this experiment.

Personnel

Any student on the Oregon State University campus who had completed the first-quarter typewriting course, or who had a working knowledge of the typewriter with skill development to approximate one semester of typewriting or more, was eligible to enroll for one of these second-quarter typewriting classes. The students who usually enroll in these classes during the winter and spring quarters are majors in departments other than Secretarial Science. Students majoring in this department are usually incoming freshmen with prior typewriting instruction at the secondary level who enroll in the second-quarter typewriting course during the fall quarter of each school year. The majority of persons enrolled in the second-quarter courses during the winter and spring quarters, then, are there to secure additional typewriting instruction to enable them to use the typewriter in the preparation of materials for other classes or for future personal-use values.

Table I on page 52 illustrates the wide distribution by schools of the students participating in the experiment. These enrollment totals make evident the fact that the second-quarter typewriting course during the winter and spring quarters should attempt to develop the student's

TABLE I

DISTRIBUTION BY SCHOOLS OF STUDENTS PARTICIPATING IN CONTROLLED READING TYPEWRITING EXPERIMENT

	Exp. I (Winter Q. 60-61)			Exp. II (Spring Q. 60-61)			
SCHOOL	CON.	EXP.	TOT.	CON.	EXP.	TOT.	COMB. TOT.
Agriculture	2	0	2	0	0	0	2
Business and Technology							
Non S.S.*	3	4	7	0	1	1	8
S.S.	4	3	7	2	2	4	11
Education	3	6	9	5	2	7	16
Graduate	2	0	2	0	0	0	2
Home Economics	1	2	3	2	4	6	9
Lower Division	9	7	16	2	6	8	24
Science	2	2	4	1	0	1	5
TOTALS	26	24	50	12	15	27	77

*S.S. represents Secretarial Science majors.

maximum potential in speed and accuracy on straight-copy and production-copy material in order to fulfill the objectives of the majority of the students.

Table II on page 54 shows the breakdown by classes of the students participating in the experiment. Seventy-one of the seventy-seven students participating in the experiment, or 92.2 per cent of the total enrollment during the winter and spring quarters of the school year 1960-1961, were either freshmen or sophomore students. These totals seem to indicate that the majority of students enrolled in second-quarter typewriting during the winter and spring quarters are there to secure a higher degree of operating skill which can be transferred to immediate or future personal-use tasks.

Random Sample Procedure

All students participating in the experiment were selected at random. For each quarter, students enrolling in second-quarter typewriting were assigned during registration to one of two classes by the coin-selection method; viz., a coin was flipped for each case upon a predetermined code, such as all "heads" being placed in an experimental class, and all "tails" being placed in a control class. Thus, each

TABLE II

DISTRIBUTION BY CLASSES OF STUDENTS PARTICIPATING IN CONTROLLED READING TYPEWRITING EXPERIMENT

	Exp. I (Winter Q. 60-61)			Exp. II (Spring Q. 60-61)			
	CON.	EXP.	TOT.	CON.	EXP.	TOT.	COMB. TOT.
Freshman	17	17	34	10	11	21	55
Sophomore	7	5	12	1	3	4	16
Junior	0	0	0	1	1	2	2
Senior	0	2	2	0	0	0	2
Graduate	2	0	2	0	0	0	2
TOTALS	26	24	50	12	15	27	77

student registering for second-quarter typewriting during the winter and spring quarters of the school year 1960-1961 had an equal chance with every other student of being included in an experimental or a control class. Students registering in an experimental or a control class did so without any previous knowledge as to which section would be the experimental class or which would be the control class. In the event a student was unable to arrange his schedule to fit this pattern, he was placed in the class he desired and was not counted as part of the experiment.

Assignment of Experimental and Control Classes

For the winter-quarter experiment, a flip of a coin determined which class was to be the experimental class and which was to be the control class. The nine o'clock class was declared the control group and the two o'clock class, the experimental group. This assignment of classes was just reversed during the second experiment, spring quarter, in order to avoid any advantage that one group might have over the other group due to the hour of the day. Hence, during the spring-quarter experiment, the ten o'clock class was declared the experimental group and the three o'clock class, the control group.

Materials and Equipment

Textbooks

The basic textbook used in both the control and experimental classes was Gregg Typewriting for Colleges by Lloyd, Rowe, and Winger (28, p. i-218). Supplementary texts used by each group during the experiment were Workbook I for Gregg Typewriting for Colleges by Lloyd, Rowe, and Winger (29, p. 1-96), and Tailored Timings by Winger (44, p. 1-48). Each group used the same textbook and supplementary material from day to day.

Skill-Builder Controlled Reader

The Skill-Builder Controlled Reader is a 35mm filmstrip projector with an automatic speed variation from 2 to 18 lines per minute, or 12 to 108 typewriting words per minute, with a speed increase of 6 words per minute with each turn of the speed control dial. The Skill-Builder Controlled Reader presents typewriting copy in a continuous, smooth, left-to-right motion; it has a moving slot which covers and uncovers print as it moves across each line. Projection may also be set in an open slot motion which exposes an entire line of print at one time. This instrument was developed by the Educational Developmental Laboratories.

Filmstrip Set

All filmstrip copy used in the experiment was selected from Educational Developmental Laboratories' Typing-Skill Development Course, a 25-filmstrip, 75-lesson course. Every line of copy on a filmstrip has an equal number of letters and spaces--30 strokes per frame--to allow for accurate speed control. The filmstrips of the set were packaged in transparent plastic containers for accurate selection and were organized in an album for convenient use and storage. Filmstrip selections used in the experiment are shown in Appendix A.

The Screen

A matte-white or flat, smooth-surfaced screen ten feet square was used as a projection surface. This type of screen makes it possible to have nearly equal light distribution and no distortion regardless of the angle or section of the room from which viewed.

The Classroom

The same classroom was used by both the control and the experimental classes during the experiment. This room contained sufficient desks and typewriters to accommodate

36 students. Due to a small amount of glare on the projection surface under normal classroom lighting conditions, window shades near the screen were pulled during instrument-training sessions and classroom lights near the projection surface were turned off. These precautionary steps insured enough darkness to make the print clearly visible at all points in the classroom; at no time, however, was the classroom completely darkened. The Skill-Builder Controlled Reader was placed in the middle of the room approximately 15 to 20 feet from the projection surface--this positioning of the instrument provided for easy readability of projected material.

Typewriters

All students participating in the experiment used electric typewriters of the following makes: IBM, Underwood, Remington Rand, Royal, and Smith-Corona.

Controlled Reading-Rate Practice Techniques

Experimental Factor

Both the control and the experimental classes used the same textbooks and supplementary materials as well as the same typewriters and classroom facilities from day to day.

The writer administered identical assignments in all classes in the same way. The only difference in the conventional teaching procedure was the presentation of approximately ten minutes of controlled reader materials to the experimental group on Mondays, Wednesdays, and Fridays from the third week through the ninth week of each quarter. On instrument-training days, the control group was provided with duplicated sheets containing the same filmstrip copy used by the experimental group. The control group typed from this copy for ten minutes under a verbal set to strive always to type as fast as was consistent with accuracy. A conscious effort was made to avoid any show of bias in the method of handling the control and experimental classes. At no time during the experiment was any reference made to the superiority of one group over the other on any phase of skill development being measured.

Grouping

Since individual abilities in second-quarter typewriting may range from 30 gross words per minute, or lower, to 70 gross words per minute, or higher, it was not considered feasible to provide all experimental students with a single instrument presentation during any given training

session. Therefore, three groups were established in each experimental class based upon the results of five-minute timed writings obtained and evaluated during the second week of each quarter.

Group I, the fast group, included students with a beginning straight-copy stroking rate of 50 gross words per minute or higher. Eight students in the experimental group were placed in Group I during the winter-quarter experiment and seven students during the spring-quarter experiment, for a combined total of fifteen students. Group II, the middle group, included students with a beginning straight-copy stroking rate ranging from 35 gross words per minute to 49 gross words per minute. Ten students in the experimental group were placed in Group II during the winter-quarter experiment and six students during the spring-quarter experiment, for a combined total of sixteen students. Group III, the slow group, included students with a beginning straight-copy stroking rate of below 35 gross words per minute. Six students in the experimental group were placed in Group III during the winter-quarter experiment and two students during the spring-quarter experiment, for a combined total of eight students.

Because this original grouping arrangement was based upon arbitrary criteria, it was found necessary to change a few students from one group to another during the experiment. All such changes were based upon these individuals' weekly progress in instrument-training lessons and in conventional classroom activities.

On days when instrument training was conducted, two groups worked from textbook material in the usual manner while a third group responded to controlled reader training. During a thirty-minute session, therefore, each group received about ten minutes of instrument training on the same filmstrip material at projection speeds commensurate with the group's ability. Thus, each student in the experimental classes received about one-half hour of instrument training per week and about three and one-half hours of instrument training for the entire quarter.

Due to visual, auditory, and other physical considerations, it was decided not to place student groups in a separate section of the classroom for instrument-training sessions. Each student in the experimental group, then, remained at his original typing station throughout the experiment and was kept informed of his group assignment.

Projection Speeds

Selected filmstrip exercises from the Typing-Skill Development Course were projected for each group in the experimental classes at speeds as shown in Appendix B. A projection-speed cycle similar to the speed-forcing plan employed in shorthand dictation was used throughout the experiment. (24, p. 174-177) The cycle for each group began at a speed just below or comparable to the students' skill level; the second and third steps of the cycle represented jumps in speed of six words per minute and twelve words per minute, respectively; the last projection of the cycle was returned to a slower speed, six words per minute above the starting rate of the cycle, to achieve accuracy. During any given instrument-training session, the same filmstrip exercise was projected as many times as possible during a ten-minute period for each of the three groups; a difference of twelve words per minute separated the three groups on all filmstrip exercises.

The markings on the speed control dial on the Skill-Builder Controlled Reader indicate lines per minute. Since all filmstrip exercises contained six typing words per frame, the exact speed control dial setting was determined by dividing the proposed projection speed by six. For

example, the speed control dial would be set at four for twenty-four words per minute (twenty-four words per minute divided by six typing words per frame equals four).

Instrument-Training Procedures

On instrument-training days--every Monday, Wednesday, and Friday beginning with the third week of the quarter and extending through the ninth week of the quarter--the first twenty minutes of the period was generally devoted to keyboard-review drills, checking workbook assignments, introducing new units of production work, and conducting various types of skill-building drills. During the remaining thirty minutes of the period, each group used the Skill-Builder Controlled Reader for ten minutes.

While Group I typed from drill copy projected by the Skill-Builder Controlled Reader, Group II and Group III worked on the same textbook assignment. At the end of a ten-minute period, Group II became the instrument-training group, Group I began its textbook assignment, and Group III continued its textbook assignment. Ten minutes later, Group III used the instrument, Group II returned to its textbook assignment, and Group I continued its textbook assignment.

This same order of presentation of instrument exercises to each group was continued for three training sessions. At the end of one week, or three training sessions, the order of presentation was changed as follows: Group III received instrument training first; Group I, second; and Group II, last. At the end of two weeks, or six training sessions, the order of presentation was changed once again: Group II received instrument training first; Group III, second; and Group I, last. At the beginning of the seventh training session, all groups were returned to their original order of presentation. Hence, it was assumed that by periodically rotating the order of presentation of instrument exercises to each group, any favoritism that may have been associated with the time of instrument presentation during training-session periods would thereby be avoided.

The students set their typewriter margins for a 60-space line during each Skill-Builder Controlled Reader training session. All filmstrips had been written so that the students would type two projected frames of copy for each line of copy on the typing paper. In order to insure a carriage return at the end of each line of copy on the typing paper, all filmstrips contained a triangle signal at the end of every other line of filmstrip copy.

As previously stated, the same filmstrip exercises were projected as many times as possible to each group during a ten-minute training session. It was necessary, therefore, for the operator to turn the filmstrip in reverse quickly at the end of a given exercise by pressing the advancing-reversing knob on the Skill-Builder Controlled Reader and rotating it in a clockwise motion to the beginning of the exercise.

Student instrument-training papers were collected at the end of each training session. These papers were checked by the writer in order to keep an accurate record of student progress. While these papers were not used for the purpose of determining a course grade, they were nevertheless carefully evaluated for possible grouping adjustments. It seemed advisable not to evaluate instrument-training papers for grading purposes as such but rather to have any skill which might be developed by the training demonstrate itself indirectly in the output of the students on the typewriter.

Evaluation Procedures

The measurement of the results of Skill-Builder Controlled Reader training in intermediate typewriting instruction as applied to this experiment was pointed toward an

emphasis upon the skill development of each individual student. Periodic measurements were made of the students' ability to reproduce straight-copy and production-copy material under timing. As pointed out earlier, the majority of students enrolled in these classes were interested primarily in the development of a high degree of operating skill which could be transferred to immediate or future personal-use tasks.

Each student participating in the experiment was evaluated by means of thirteen different variations: six straight-copy variations, six production-copy variations, and one rate of reading comprehension improvement variation. For each variation the analysis of variance was used to test the significance of the difference between the means of the control and experimental groups. The requirement that the groups used be random samples is basic to the method of analysis of variance. (25, p. 54) The condition of randomization was met in this experimental study.

Straight-Copy Variations

Commencing with the third week of instruction and extending through the tenth or last week of instruction, fifteen five-minute straight-copy writings were scored on

the basis of gross words per minute, net words per minute, and total errors for each student participating in the experiment. The materials used for the five-minute timings were taken from selected copies of the Gregg Publishing Division's Competent Typing Test series and F. B. Winger's Tailored Timings (44, p. 33-44). No opportunity was provided for practice on these timed writings in advance. The last five-minute writing of the quarter was the only one of the fifteen writings used for the purpose of statistical analysis. This final timed writing was scored for gross words per minute and total errors--these results constituted the first two straight-copy variations used in this study.

The third straight-copy variation consisted of the difference between the students' basic rate as determined at the beginning of the quarter and the average net-words-per-minute score on the best three five-minute writings during the quarter. This variation is referred to as "Speed Improvement A."

The fourth straight-copy measurement used in this study consisted of the difference between the students' gross-words-per-minute score on the first five-minute writing administered at the beginning of the experiment and the gross-words-per-minute score obtained from the last

five-minute writing at the end of the experiment. This particular variation is referred to as "Speed Improvement B."

The fifth straight-copy variation consisted of the students' total number of five-minute writings administered throughout the entire quarter that contained two or fewer typewriting errors. This measurement is referred to as "Consistency."

The final straight-copy measurement used in this study consisted of the average point total obtained from the students' four seven-minute writings administered during the last five weeks of the quarter. Each of these timed writings was scored as follows: (1) three points for each line of copy completed, (2) two additional points for each errorless line of copy completed, (3) two additional points per line for ten or more consecutive errorless lines of copy, (4) one additional point per line for five to nine consecutive errorless lines of copy, and (5) five points deducted for each typing error. This unique scoring formula, as well as the materials used for the timed writings, was developed by Fred E. Winger, of Oregon State University. This measurement is referred to as the "Average Production Drill."

Production-Copy Variations

End-of-the-quarter measurements were made on three different types of production copy: business letter, tabulation problem, and a one-page enumeration. These production-copy tests were timed for five minutes and were scored on the basis of production words per minute and total number of errors. Materials used for these measurements were taken from the textbook and supplementary drill sources.

Reading Comprehension Variation

Pre-training and post-training reading comprehension scores were obtained from all students participating in this experiment to determine the effect of Skill-Builder Controlled Reader training on the students' ordinary rate of reading comprehension. Equivalent forms of the Cooperative English Test C2: Reading Comprehension (Higher Level), published by the Educational Testing Service, Los Angeles, California, were used for this measurement. Form T was administered to both the control and experimental groups during the second week of each quarter; Form R, during the last week of each quarter. The difference between the total scaled scores on the two forms was used for the purpose of statistical analysis.

Summary

This experiment was conducted in the writer's second-quarter typewriting classes at Oregon State University during the winter quarter and repeated during the spring quarter of the 1960-1961 school year. Participating in the experiment were 77 students representing all the major schools and classes on the campus. The students were selected at random.

From day to day, both the control and experimental classes used the same textbooks and supplementary materials as well as the same electric typewriters and classroom facilities. The writer administered identical assignments in all classes in the same way. The only difference in the conventional teaching procedure was the presentation of approximately ten minutes of Skill-Builder Controlled Reader materials to each student in the experimental classes three days a week for seven weeks. On instrument-training days, the control classes typed for a period of ten minutes from duplicated sheets containing the same filmstrip copy used in the experimental classes. The experimental classes were divided into three ability groups in order to provide for the range of individual abilities that existed in the

second-quarter typewriting classes, and instrument-training drills were projected at gradually increasing speeds commensurate with each group's ability.

Periodic measurements were made of the students' ability to reproduce straight-copy and production-copy material under timing. Each student participating in the experiment was evaluated by thirteen different variations. For each variation the analysis of variance was used to test the significance of the difference between the means of the control and experimental groups.

Chapter IV presents the findings of this experimental study.

CHAPTER IV

FINDINGS AND INTERPRETATIONS

Introduction

The statistical treatment of the students' scores on typewriting tests under timing was handled in two different ways. The F-test, or variance ratio, was used to measure the significance of the difference between the means of the control and experimental groups on thirteen different measurements, including a reading comprehension test. To measure the significance of the difference between the speed and accuracy means of the two groups on initial and final five-minute straight-copy writings, the t-test was employed. Tables were constructed to present statistical evidence of group performance, and figures were prepared to portray the performance of these groups on five-minute straight-copy writings.

In addition to the basic statistical methods of analysis described above, correlation coefficients were computed in order to determine the significance of the relationship between selected word-count systems used in this study.

The findings of the study are described in the following sections of this chapter: (1) speed and accuracy performance on straight-copy tests, (2) speed and accuracy performance on production-copy tests, (3) reading rate and comprehension development, and (4) validity of the Gregg production word-count system.

Speed and Accuracy Performance on Straight-Copy Tests

Initial and Final Status

Gross Stroking Rate. Table III, page 74, shows the difference between the mean gross words per minute of the control and experimental groups on initial and final five-minute straight-copy tests.

On initial test performance, the experimental groups had higher stroking-rate means than the control groups. In Experiment I, the control group had a mean stroking rate of 45.65 gross words per minute and the experimental group, 51.13 gross words per minute; in Experiment II, the control group had a mean stroking rate of 51.83 gross words per minute and the experimental group, 53.20 gross words per minute. The differences for the two experiments--5.48 and 1.37, respectively--were not statistically significant.

TABLE III

t-TEST FOR DIFFERENCES BETWEEN THE MEAN GROSS WORDS PER MINUTE OF CONTROL AND EXPERIMENTAL GROUPS ON INITIAL AND FINAL FIVE-MINUTE STRAIGHT-COPY TESTS

EXP.	GROUP	N	INITIAL TEST			FINAL TEST		
			MEAN GWPM	S. D.	t TEST*	MEAN GWPM	S. D.	t TEST*
I	Control	26	45.65	12.21	1.54	55.46	13.49	1.30
	Exper.	24	51.13	12.44		60.25	11.91	
II	Control	12	51.83	12.12	0.32	57.50	11.50	1.23
	Exper.	15	53.20	9.22		62.80	10.09	

*For Experiment I a t-value of 2.01 is required for significance at the .05 level of confidence and 2.68 for the .01 level. For Experiment II a t-value of 2.06 is required for significance at the .05 level of confidence and 2.79 for the .01 level.

At the end of Experiments I and II, experimental-group testees demonstrated greater terminal stroking-rate ability than control-group testees. In Experiment I, the control group had a mean stroking rate of 55.46 gross words per minute and the experimental group, 60.25 gross words per minute; in Experiment II, the control group had a mean stroking rate of 57.50 gross words per minute and the experimental group, 62.80 gross words per minute. Once again the differences for the two experiments--4.79 and 5.30, respectively--were not statistically significant.

Accuracy. Table IV, page 76, shows the differences between the mean errors of the control and experimental groups on initial and final five-minute straight-copy tests.

At the outset of the study in Experiment I, the experimental-group testees demonstrated an ability to type more accurately than the control-group testees. While the control group had 11.46 mean total errors on initial test performance, the experimental group had 8.29 mean total errors. The difference of 3.17 favoring the experimental group, however, was not statistically significant. In Experiment II, the opposite condition existed. The control-group testees had 9.25 mean total errors as compared to 9.53 mean total errors for the experimental-group testees.

TABLE IV

t-TEST FOR DIFFERENCES BETWEEN THE MEAN ERRORS OF CONTROL AND EXPERIMENTAL GROUPS ON INITIAL AND FINAL FIVE-MINUTE STRAIGHT-COPY TESTS

EXP.	GROUP	N	INITIAL TEST			FINAL TEST		
			MEAN ERRORS	S. D.	t TEST*	MEAN ERRORS	S. D.	t TEST*
I	Control	26	11.46	8.54	1.55	4.85	3.17	0.93
	Exper.	24	8.29	5.11		3.63	3.24	
II	Control	12	9.25	4.69	0.15	3.50	2.22	0.38
	Exper.	15	9.53	4.40		3.80	1.76	

*For Experiment I a t-value of 2.01 is required for significance at the .05 level of confidence and 2.68 for the .01 level. For Experiment II a t-value of 2.06 is required for significance at the .05 level of confidence and 2.79 for the .01 level.

The mere difference of 0.28 errors favoring the control group was not statistically significant.

The initial accuracy advantage held by the groups at the beginning of Experiments I and II was retained at the end of the investigation. In Experiment I, the control group had 4.85 mean total errors on the final test; and the experimental group had 3.63 mean total errors. The difference of 1.22 errors favoring the experimental group was not statistically significant. In Experiment II, the control-group testees had 3.50 mean total errors on the final test as compared with 3.80 mean total errors for the experimental group. The difference of 0.30 errors favoring the control group was not statistically significant.

Interpretation. The initial and final performance results on five-minute straight-copy tests did not show a statistically significant superiority of one group over the other on either stroking-rate ability or accuracy ability. It would appear, then, from the data presented in Tables III and IV, that typists receiving reading-instrument training in second-quarter college typewriting do not develop significantly greater stroking-rate abilities and/or accuracy abilities on straight-copy timings than typists not receiving such training.

Growth Patterns

Introduction. Tables V, VI, and VII, and Figures 1 through 9, pages 79 through 90, show the growth patterns of the control and experimental groups on five-minute straight-copy writings as expressed in terms of group means. This developmental period covered approximately the last eight weeks of each ten-week quarter. Measurements of gross stroking rate, accuracy of copy reproduction, and net words per minute were obtained on fifteen different five-minute straight-copy writings or about two writings per week commencing with the third week of instruction.

Gross Stroking Rate. The growth pattern of the control and experimental groups in Experiment I was characterized by gradual increases with marked fluctuations in progress. Worthy of note is the fact that both groups showed only moderate stroking-rate gains from the third week through the seventh week of the quarter. During this period the experimental group increased its stroking rate 3.5 gross words per minute while the control group gained 3.6 gross words per minute. During the last three weeks of the quarter, both groups demonstrated sharp increases in their gross stroking rate. During this period the experimental group gained 5.3 gross words per minute while the control group gained

TABLE V

MEAN SCORES ON GROSS WORDS PER MINUTE, NET WORDS PER MINUTE, AND TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY WRITINGS (Experiment I)

	GWPM		ERRORS		NWPM	
TEST NO.	CON.	EXP.	CON.	EXP.	CON.	EXP.
1	45.7	51.5	14.6	7.9	25.1	35.9
2	46.8	49.9	10.3	7.4	27.5	35.5
3	46.2	51.2	8.8	6.6	30.1	38.8
4	48.9	51.7	10.1	8.2	31.4	36.6
5	47.7	54.7	6.3	7.6	35.9	40.2
6	49.0	53.8	4.6	4.9	39.8	44.0
7	48.1	56.3	8.4	7.1	31.4	42.0
8	47.0	52.6	6.0	5.0	35.6	42.6
9	50.9	55.5	5.9	6.0	39.2	43.6
10	49.3	55.0	5.6	4.8	38.2	45.3
11	54.0	59.4	5.0	4.8	44.0	49.8
12	55.2	59.6	7.3	5.6	40.7	48.4
13	57.2	58.7	5.8	5.2	45.7	48.3
14	56.5	59.7	5.3	4.9	45.9	49.9
15	55.5	60.3	4.8	3.6	45.8	53.0

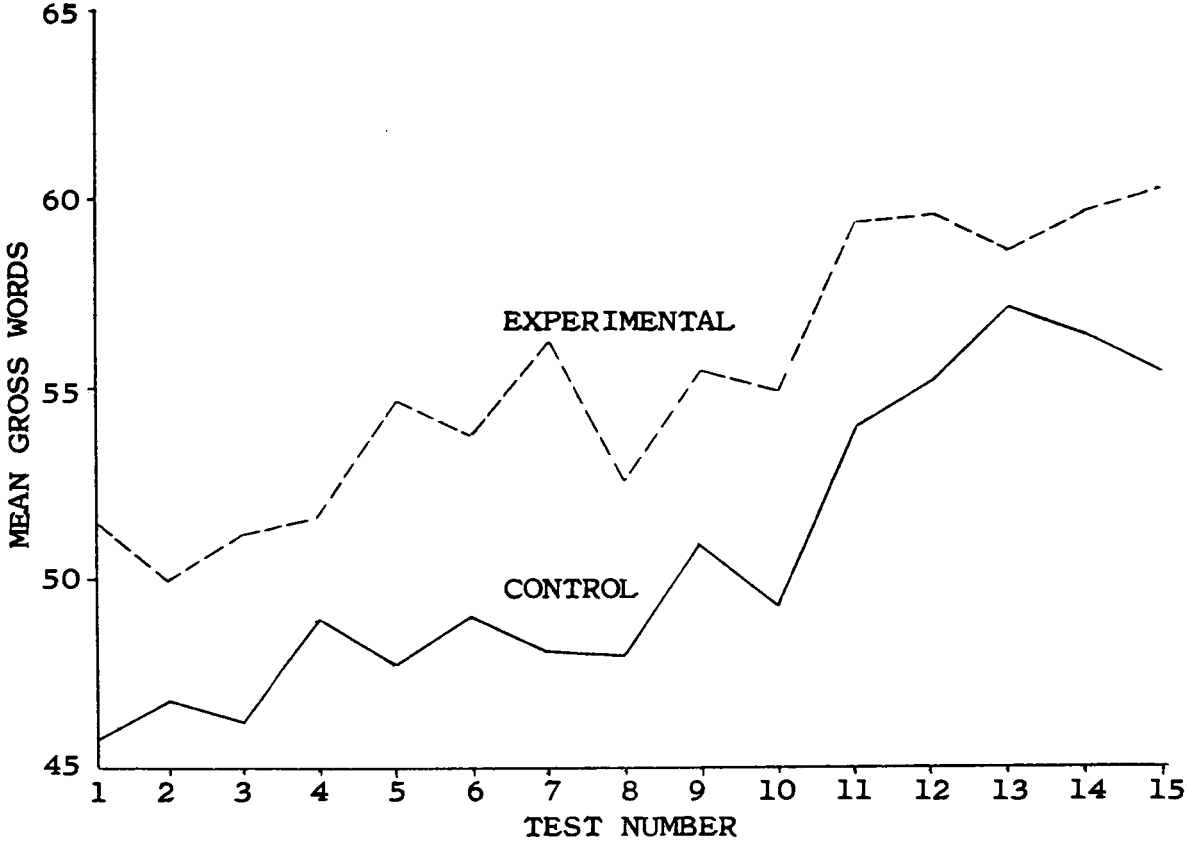

FIGURE 1. MEAN GROSS WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment I)

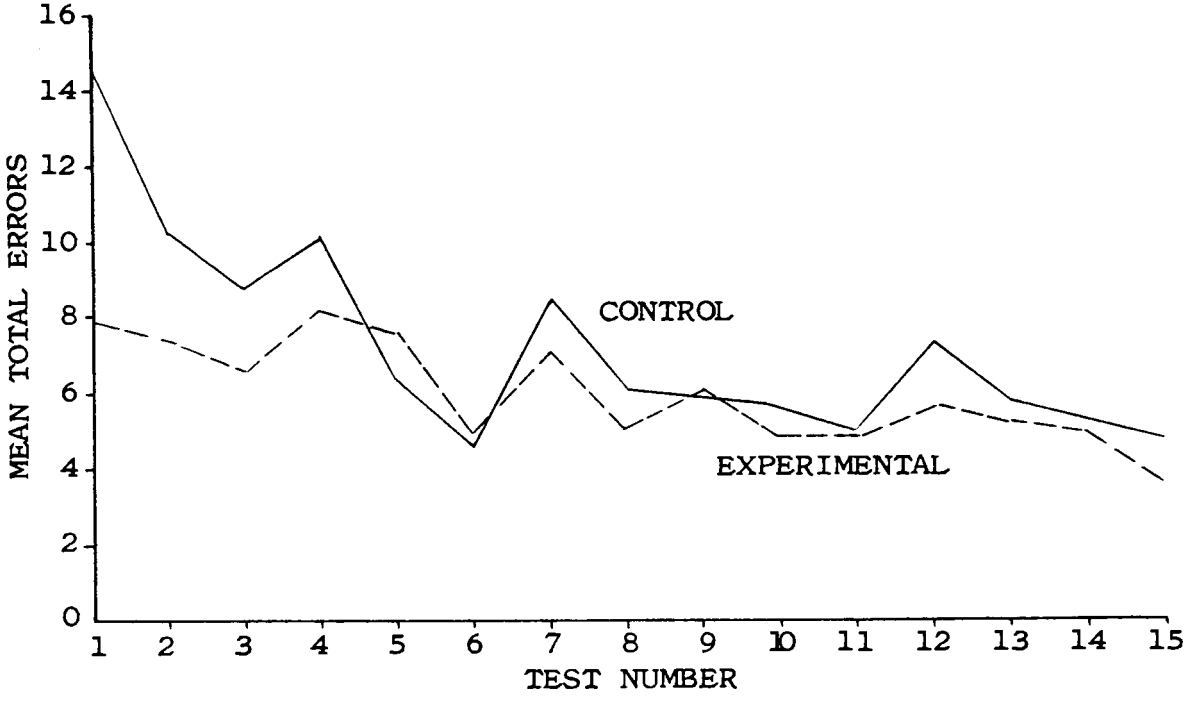

FIGURE 2. MEAN TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment I)

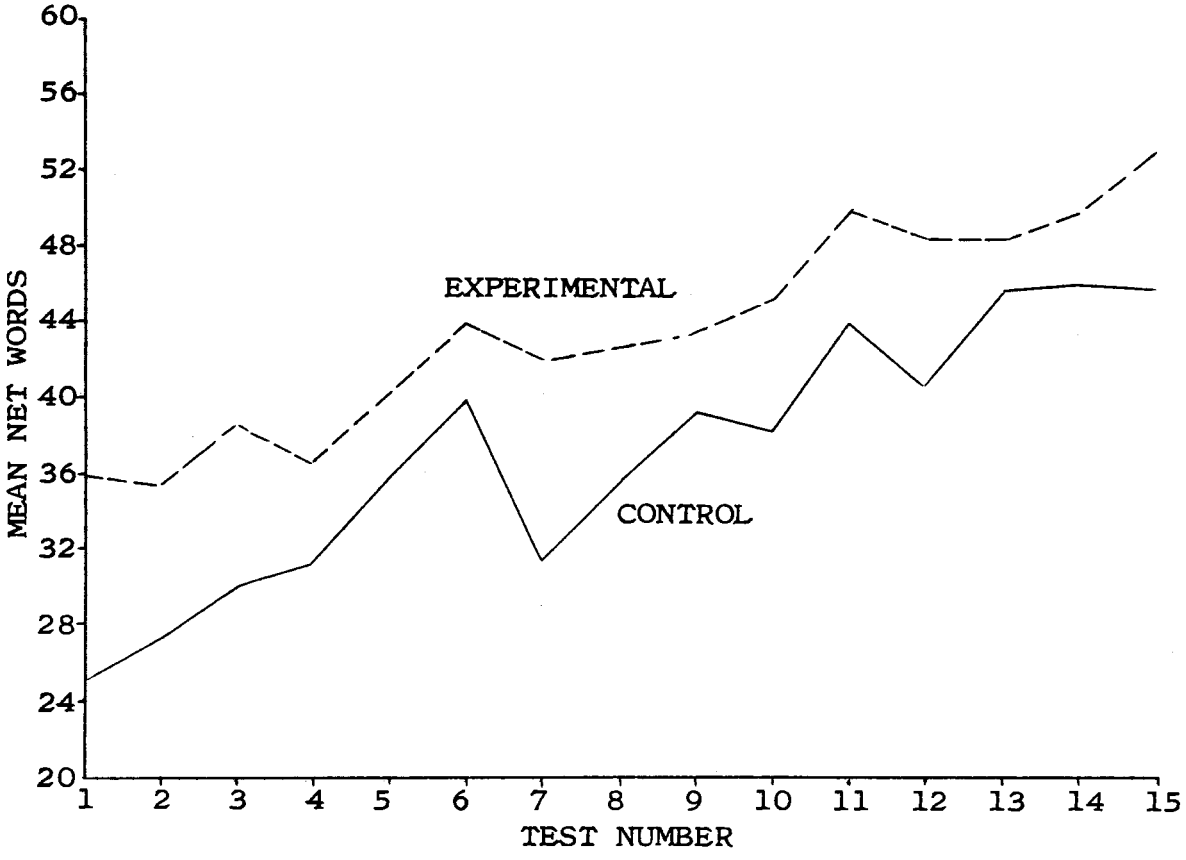

FIGURE 3. MEAN NET WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment I)

TABLE VI

MEAN SCORES ON GROSS WORDS PER MINUTE, NET WORDS PER MINUTE, AND TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY WRITINGS (Experiment II)

	GWPM		ERRORS		NWPM	
TEST NO.	CON.	EXP.	CON.	EXP.	CON.	EXP.
1	51.8	52.2	9.3	9.7	33.3	33.5
2	49.2	52.3	9.6	7.8	30.1	36.8
3	50.2	54.3	10.1	10.3	31.2	35.9
4	54.2	55.9	10.3	9.3	32.9	37.9
5	51.8	55.0	6.3	5.9	39.1	43.1
6	51.0	54.6	5.8	4.1	39.4	46.5
7	53.0	54.5	8.4	6.9	36.1	41.3
8	52.7	55.4	6.9	6.5	38.3	45.5
9	54.8	56.0	5.7	4.4	43.5	47.2
10	55.4	57.5	6.7	5.3	42.1	46.8
11	57.9	61.4	6.1	4.6	45.8	51.6
12	58.5	63.6	4.8	4.6	48.9	54.4
13	56.6	61.6	4.2	4.6	48.3	52.4
14	58.4	63.7	5.5	4.5	47.4	54.7
15	57.5	62.1	3.5	3.9	50.5	54.4

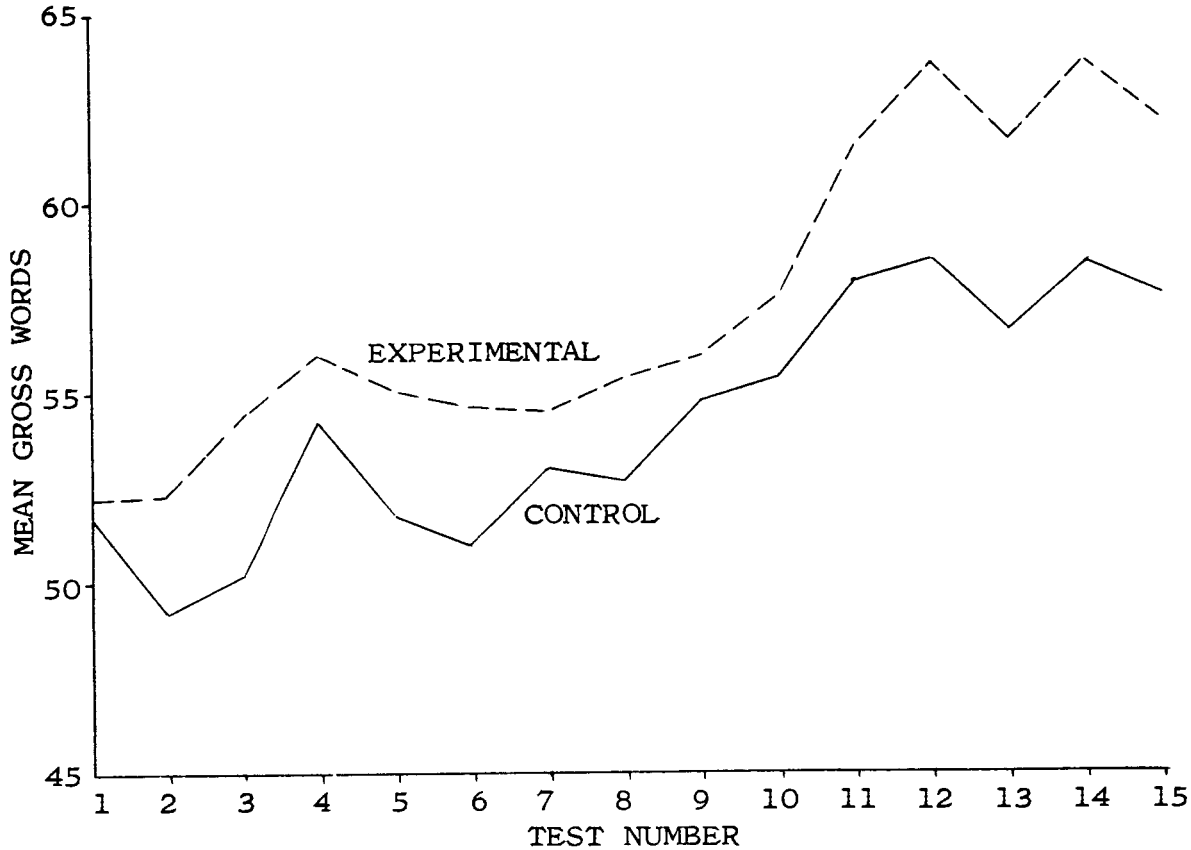

FIGURE 4. MEAN GROSS WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment II)

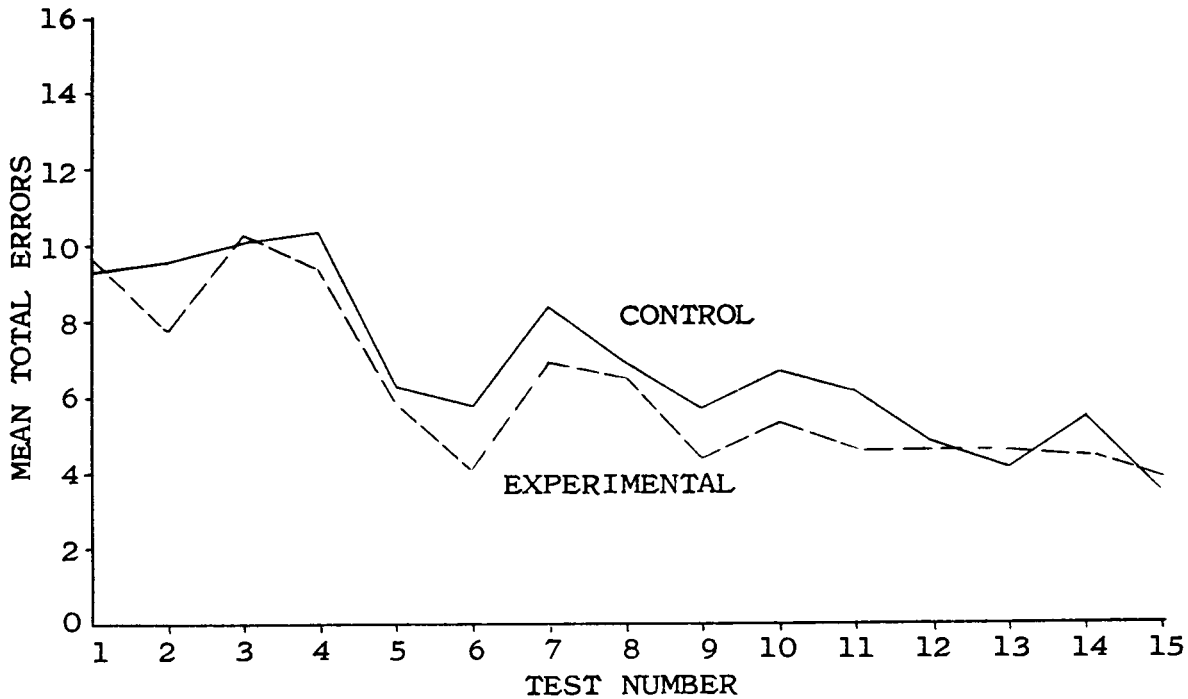

FIGURE 5. MEAN TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment II)

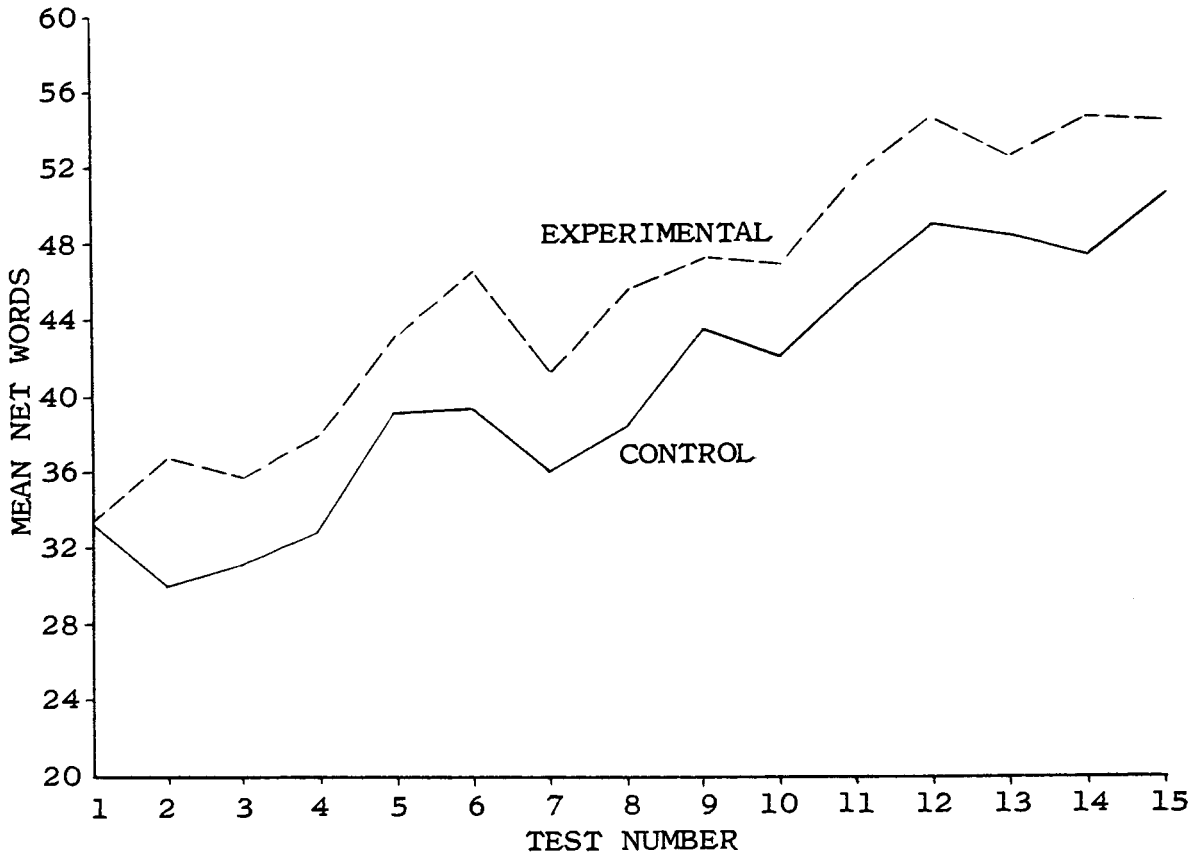

FIGURE 6. MEAN NET WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Experiment II)

TABLE VII

MEAN SCORES ON GROSS WORDS PER MINUTE, NET WORDS PER MINUTE, AND TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY WRITINGS (Combined Experiments)

	GWPM		ERRORS		NWPM	
TEST NO.	CON.	EXP.	CON.	EXP.	CON.	EXP.
1	47.6	51.8	10.8	8.6	27.7	35.0
2	47.5	50.8	10.1	7.5	28.3	36.0
3	47.4	52.4	9.2	8.1	30.4	37.7
4	50.6	53.4	10.5	8.6	31.9	37.1
5	49.0	54.8	6.3	6.9	36.9	41.4
6	49.6	54.1	4.9	4.6	39.7	44.9
7	49.7	55.5	8.4	7.1	32.9	41.7
8	48.9	53.7	6.3	5.6	36.5	43.8
9	52.2	55.7	5.8	5.4	40.6	44.9
10	51.3	55.9	5.9	5.0	39.5	45.9
11	55.2	60.2	5.3	4.8	44.6	50.5
12	56.1	61.0	6.6	5.3	42.9	50.5
13	57.0	59.8	5.3	5.0	46.5	49.9
14	57.1	61.3	5.4	4.7	46.4	51.8
15	56.1	60.9	4.4	3.7	47.3	53.5

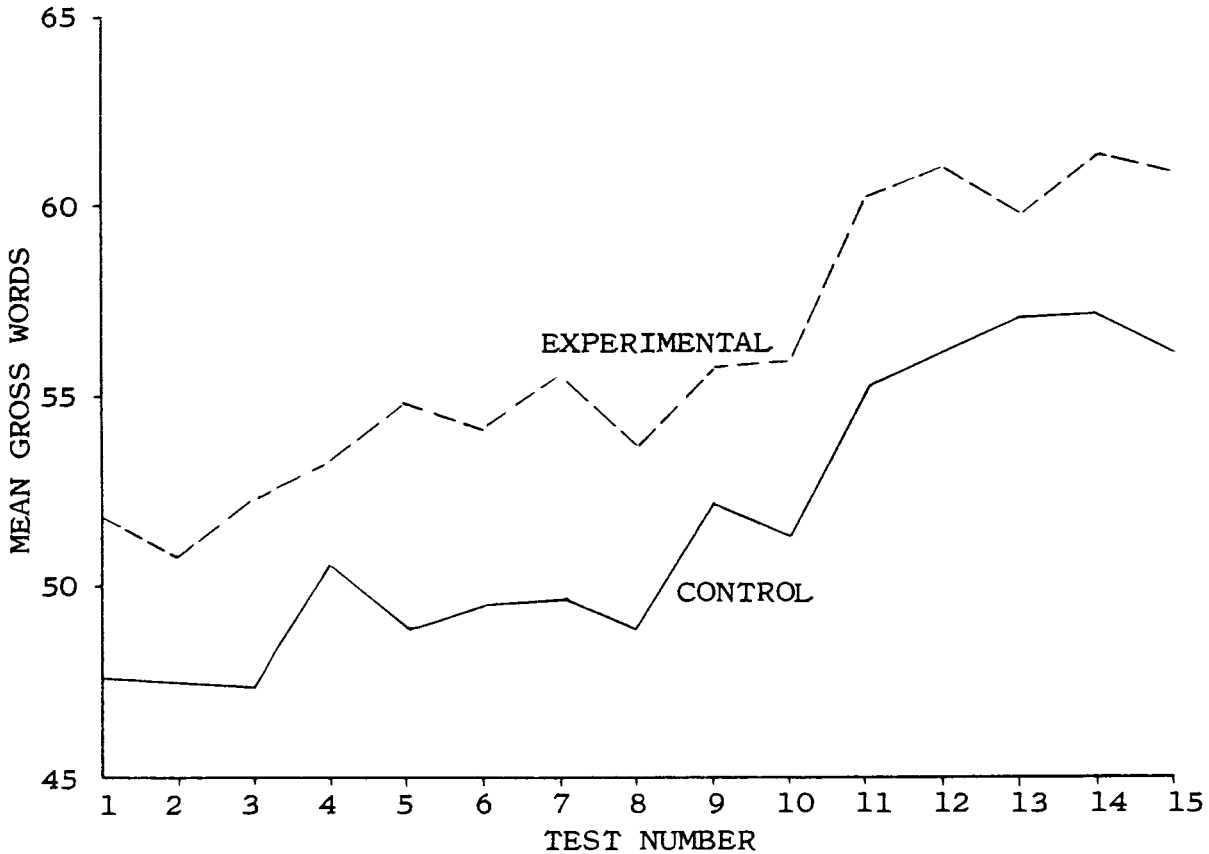

FIGURE 7. MEAN GROSS WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Combined Experiments)

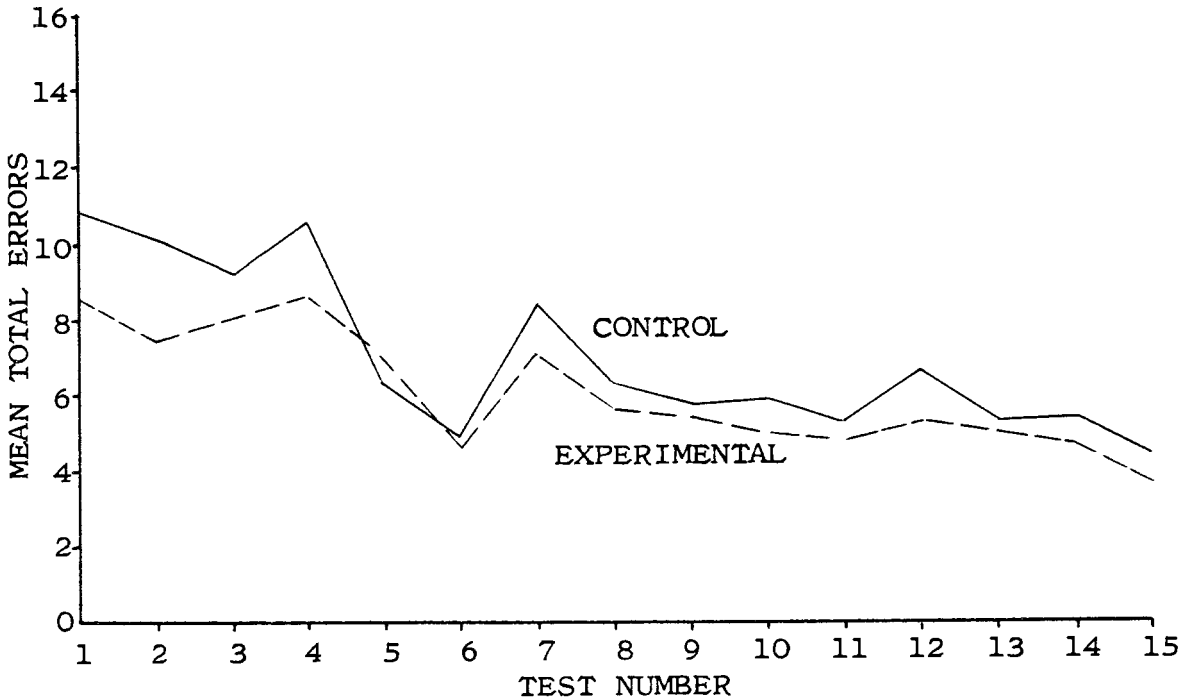

FIGURE 8. MEAN TOTAL ERRORS ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Combined Experiments)

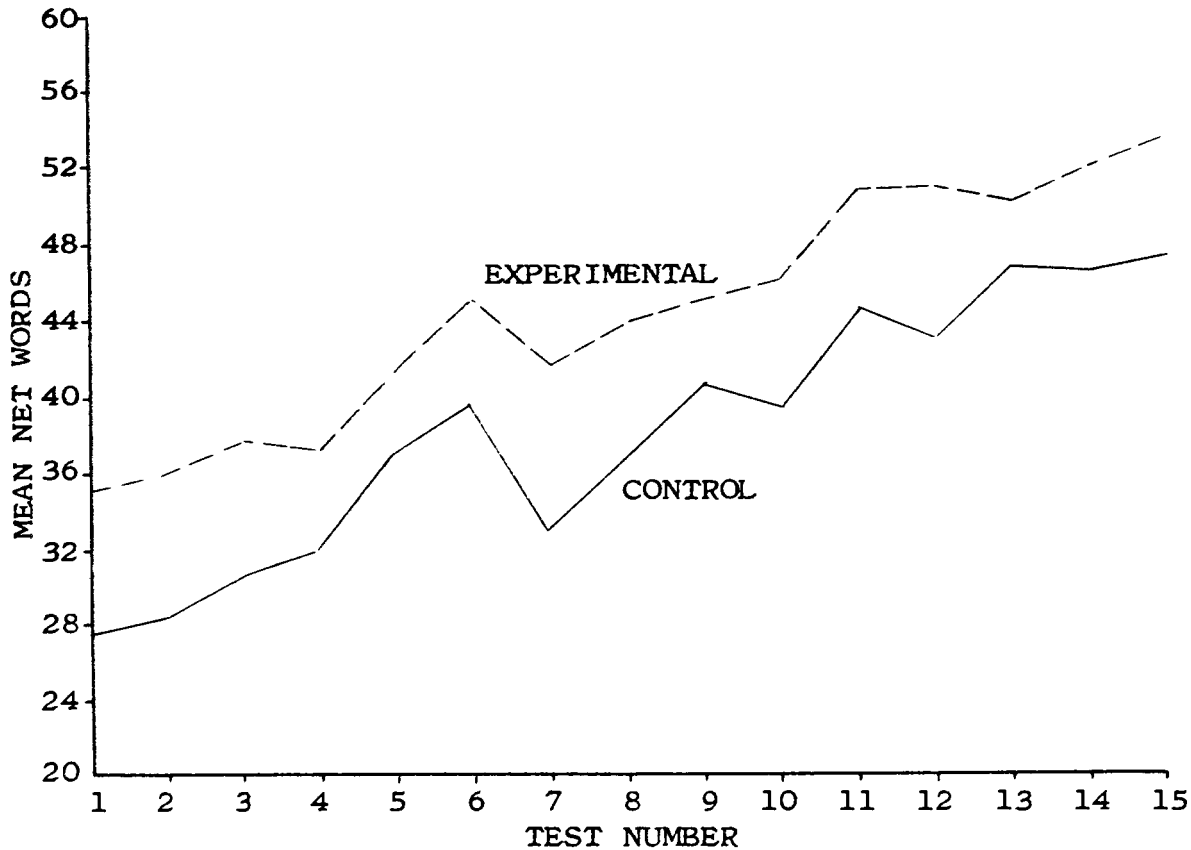

FIGURE 9. MEAN NET WORDS PER MINUTE ON THE FIVE-MINUTE STRAIGHT-COPY TESTS
(Combined Experiments)

6.2 gross words per minute. In terms of over-all improvement during the quarter, then, the experimental group increased its stroking rate 8.8 gross words per minute and the control group gained 9.8 gross words per minute.

In Experiment II, the growth pattern of the control and experimental groups showed more uniform development than was the case in Experiment I. The total increase for the experimental group was 9.9 gross words per minute, and the total gain for the control group was 5.7 gross words per minute.

An inspection of the comparative performances of the control and experimental groups, when both experiments were combined, disclosed a marked similarity of improvement on gross stroking rate. The experimental group showed a slight superiority over the control group of 4.2 gross words per minute at the beginning of the training period and 4.8 gross words per minute at the end of the training period. In general, the learning curves for the two groups showed a highly consistent pattern of variations or changes in the same direction.

Interpretation. The group learning curves fluctuated to a rather large extent; however, they do have a clear upward trend that shows the influence of preceding practice.

When one considers the initial and terminal stages of the gross stroking-rate abilities of the control and experimental groups, as well as the generally similar pattern of growth throughout the training period, one does not find any evidence which would suggest that reading-instrument training results in superior stroking-rate performance.

Accuracy of Copy Reproduction. The accuracy patterns of the experimental and control groups in Experiment I were both characterized by a steady improvement, or reduction in total errors, although the control group showed more erratic performance at various points in the measurement series. The mean error scores for the control group for the first, second, fourteenth, and fifteenth tests were 14.6, 10.3, 5.3, and 4.8, respectively. For these same tests, the experimental group had mean error scores of 7.9, 7.4, 4.9, and 3.6. Thus, while the experimental group showed a slight superiority in accuracy of copy reproduction on all measurements except three (Tests 5, 6, and 9), the control group showed the greatest amount of improvement. The control group had an error reduction of 9.8 total errors during the training period while the experimental group reduced its errors by 4.3 total errors.

In Experiment II, the control group held a slight advantage on the first, third, thirteenth, and fifteenth tests. In terms of consistent performance, however, the experimental group again demonstrated an ability to type more accurately than the control group. Both groups reduced their errors during the training period by 5.8 total errors.

For the combined experiments, a pronounced pattern of parallelism of improvement was noted. The mean error scores for the control group for the first, second, fourteenth, and fifteenth tests were 10.8, 10.1, 5.4, and 4.4, respectively. For these same tests, the experimental group had mean error scores of 8.6, 7.5, 4.7, and 3.7. Hence, the control group had an error reduction of 6.4 total errors during the training period while the experimental group decreased its total errors by 4.9.

Interpretation. From about the middle of the training period on, the accuracy pattern for each group became less erratic than the performance in the early stages of each experiment; and a general trend of gradual error reduction was established. The generally similar growth patterns of the control and experimental groups seem to indicate that reading-instrument training does not contribute to superior accuracy performance.

Net Words Per Minute. The results on this particular factor in the measurement process represented a combination of the gross stroking rates and the accuracy patterns of each group. Based on the International Typewriting Rules' ten-word penalty for each typewriting error, one error decreases the gross stroking rate by two words per minute on a five-minute writing.

In Experiment I, the growth pattern of the control group was characterized by more and sharper fluctuations on the various measurements than was true for the experimental group. The superiority of the experimental group ranged from 2.6 to 10.8 net words per minute. The total increase in net words per minute for the experimental group, based on the difference between the first and fifteenth tests, was 17.1 net words per minute while the control group gained 20.7 net words per minute.

In Experiment II, the growth patterns of the control and experimental groups were generally similar with both groups showing a steady increase in the net stroking rate. The superiority of the experimental group ranged from 0.2 to 7.3 net words per minute. The total increase in net words per minute for the experimental group, based on the difference between the first and fifteenth tests, was 20.9 net

words per minute while the control group gained 17.2 net words per minute.

Generally similar patterns of development for the two groups were portrayed when the results of Experiment I and II were combined. On the first test, the superiority of the experimental group was 7.3 net words per minute; and, on the fifteenth test, the experimental group showed a superiority of 6.2 net words per minute. The total increase in net words per minute for the experimental group, based on the difference between the first and last tests, was 19.6 net words per minute while the control group gained 18.5 net words per minute--a difference of only 1.1 net words per minute favoring the experimental group.

Interpretation. The growth patterns on net stroking rates for the control and experimental groups showed a steady increase with almost parallel variations from one measurement to the next. In general, the experimental group started with a slight superiority in net stroking-rate ability and retained a similar advantage throughout the training period. The data do not seem to reveal, however, a superior pattern of development favoring the group receiving reading-instrument training.

Significance of Selected Straight-Copy Measurements

Analysis of Variance. The analysis of variance was applied to the results on each of the selected straight-copy measurements in order to test the significance of the difference between the means of the experimental and the control groups. To increase the value of the findings, the data of the two experiments were combined to make a total of 38 students in the control group and 39 students in the experimental group.

The 5 per cent and 1 per cent points of the F-distribution with 1 and 73 degrees of freedom were 3.98 and 7.01, respectively. An F-value which exceeds these values indicates that the difference between the means of the control and experimental groups was statistically significant.

Method. This first item on the analysis of variance tables is actually the most important one so far as this experiment was concerned. It represents the results of the tests of significance of the difference between the means of the control and means of the experimental groups for each measurement used in the study.

Term. This item represents a comparison of the means of Experiment I with those of Experiment II and has no actual bearing on the main objective of this study.

Interaction. This item represents those variations attributable not to either the method variance or to the term variance acting alone but to joint effects of the two variations acting together. A lack of statistical significance in interaction means that consistent results were obtained in Experiments I and II. None of the interactions of the variations measured in this study were statistically significant.

Error. The error mean square represents the pooled variations of all four groups of students who participated in the experiment. It measures the variation among the students within the groups.

Total. This last item on each table is merely a checking device used for computation and has no actual bearing on the findings.

Gross Words Per Minute. Tables VIII and IX, page 98, show the mean scores and analysis of variance calculations, respectively, for gross words per minute for the last five-minute straight-copy test of the quarter for the control and experimental groups.

TABLE VIII

TABLE OF MEANS OF GROSS WORDS PER MINUTE FOR LAST FIVE-MINUTE STRAIGHT-COPY TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	55.46	60.25	57.85
II	57.50	62.80	60.15
Combined	56.11	61.23	58.67

TABLE IX

ANALYSIS OF VARIANCE FOR GROSS WORDS PER MINUTE ON LAST FIVE-MINUTE STRAIGHT-COPY TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	442.27	1	442.27	2.87	Not Sig.
Term	91.49	1	91.49	0.59	Not Sig.
Interaction	1.14	1	1.14	0.01	Not Sig.
Error	11244.36	73	154.03		
Total	11779.26	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table VIII shows that, in both Experiments I and II, the experimental groups had higher stroking-rate means than the control groups; the differences between the two groups were 4.79 gross words per minute in Experiment I and 5.30 gross words per minute in Experiment II. The combined experiments favored the experimental groups by 5.12 gross words per minute.

Table IX shows that the F-value of 2.87 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 0.59 and 0.01 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Errors. Tables X and XI, page 100, show the mean scores and analysis of variance calculations, respectively, for total errors for the last five-minute straight-copy test of the quarter for the control and experimental groups.

Table X shows that, in Experiment I, the experimental group demonstrated an ability to type more accurately than the control group by a difference of 1.22 total errors. In Experiment II, the control group held a slight advantage over the experimental group by 0.30 total errors.

TABLE X

TABLE OF MEANS OF TOTAL ERRORS
FOR LAST FIVE-MINUTE STRAIGHT-COPY TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	4.85	3.63	4.24
II	3.50	3.80	3.65
Combined	4.42	3.69	4.05

TABLE XI

ANALYSIS OF VARIANCE FOR TOTAL ERRORS
ON LAST FIVE-MINUTE STRAIGHT-COPY TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	3.69	1	3.69	0.44	Not Sig.
Term	5.96	1	5.96	0.70	Not Sig.
Interaction	10.06	1	10.06	1.19	Not Sig.
Error	618.41	73	8.47		
Total	638.12	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table XI shows that the F-value of 0.44 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 0.70 and 1.19 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Speed Improvement A. Tables XII and XIII, page 102, show the mean scores and analysis of variance calculations, respectively, for speed improvement A, a course grading plan based on the difference between the adjusted basic rate as determined at the beginning of the quarter and the average net score on the best three five-minute straight-copy tests at the end of the quarter.

Table XII shows that, in both Experiments I and II, the experimental groups maintained a speed-improvement superiority over the control groups; the differences between the two groups were 1.81 net words per minute in Experiment I and 2.50 net words per minute in Experiment II. The combined experiments favored the experimental groups by 1.96 net words per minute.

Table XIII shows that the F-value of 3.12 representing the difference between the means of the experimental and

TABLE XII

TABLE OF MEANS FOR SPEED IMPROVEMENT A

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	10.15	11.96	11.05
II	8.50	11.00	9.75
Combined	9.63	11.59	10.61

TABLE XIII

ANALYSIS OF VARIANCE FOR SPEED IMPROVEMENT A

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	80.51	1	80.51	3.12	Not Sig.
Term	29.65	1	29.65	1.15	Not Sig.
Interaction	2.10	1	2.10	0.08	Not Sig.
Error	1885.34	73	25.83		
Total	1997.60	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

control groups was not statistically significant. The F-values of 1.15 and 0.08 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Speed Improvement B. Tables XIV and XV, page 104, show the mean scores and analysis of variance calculations, respectively, for speed improvement B. This measurement was based on the difference between the average gross stroking rates at the beginning and at the end of the quarter; it represents the difference between the actual initial and terminal gross stroking-rate performances on five-minute straight-copy tests. In other words, no mathematical adjustment was made to the initial performance scores to account for individual differences in accuracy, as was the case in the preceding measurement.

Table XIV shows that, in Experiment I, the control group showed an improvement of 12.23 gross words per minute as compared with 11.83 gross words per minute for the experimental group. In Experiment II, the experimental group gained 11.33 gross words per minute while the control group gained 9.67 gross words per minute. The combined

TABLE XIV

TABLE OF MEANS FOR SPEED IMPROVEMENT B

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	12.23	11.83	12.03
II	9.67	11.33	10.50
Combined	11.42	11.64	11.53

TABLE XV

ANALYSIS OF VARIANCE FOR SPEED IMPROVEMENT B

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	7.00	1	7.00	0.39	Not Sig.
Term	40.80	1	40.80	2.30	Not Sig.
Interaction	18.51	1	18.51	1.04	Not Sig.
Error	1293.95	73	17.73		
Total	1360.26	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

experiments favored the experimental groups by a mere 0.22 gross words per minute.

Table XV shows that the F-value of 0.39 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 2.30 and 1.04 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Consistency. Tables XVI and XVII, page 106, show the mean scores and analysis of variance calculations, respectively, for consistency. This measurement provides additional data on the accuracy performances of the control and experimental groups during the training period and is based on the total number of five-minute straight-copy writings containing two or fewer typewriting errors.

Table XVI shows that, in both Experiments I and II, the experimental groups demonstrated an ability to consistently type more accurately than the control groups; the differences between the two groups were 1.73 in Experiment I and 0.66 in Experiment II. The combined experiments favored the experimental groups by 1.38.

TABLE XVI

TABLE OF MEANS FOR CONSISTENCY

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	1.85	3.58	2.71
II	2.67	3.33	3.00
Combined	2.11	3.49	2.80

TABLE XVII

ANALYSIS OF VARIANCE FOR CONSISTENCY

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	25.11	1	25.11	3.15	Not Sig.
Term	1.41	1	1.41	0.18	Not Sig.
Interaction	4.98	1	4.98	0.63	Not Sig.
Error	581.22	73	7.96		
Total	612.72	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table XVII shows that the F-value of 3.15 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 0.18 and 0.63 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Production Drills. Tables XVIII and XIX, page 108, show the mean scores and analysis of variance calculations, respectively, for the average production drill performances for the control and experimental groups. This measurement combines stroking-rate ability and consistent accuracy performance and is based on the average score on four seven-minute straight-copy tests given throughout the quarter. The scoring procedure is outlined on page 68 of this thesis.

Table XVIII shows that, in both Experiments I and II, the experimental groups had higher mean scores than the control groups on these performance tests. The differences between the two groups were 23.68 mean points in Experiment I and 25.37 mean points in Experiment II. The combined experiments favored the experimental groups by 25.13 mean points.

TABLE XVIII

TABLE OF MEANS FOR AVERAGE PRODUCTION DRILL

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	81.87	105.55	93.71
II	93.52	118.89	106.20
Combined	85.55	110.68	98.11

TABLE XIX

ANALYSIS OF VARIANCE FOR AVERAGE PRODUCTION DRILL

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	10454.88	1	10454.88	3.66	Not Sig.
Term	2712.42	1	2712.42	0.95	Not Sig.
Interaction	12.40	1	12.40	0.00	Not Sig.
Error	208423.59	73	2855.12		
Total	211603.29	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table XIX shows that the F-value of 3.66 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 0.95 and 0.00 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Interpretation. An attempt was made to provide a variety of data on quantity (speed) and quality (accuracy) of performance on straight-copy material for the control and experimental groups. In general, the mean performance scores on six different straight-copy measurements favored the experimental groups over the control groups in both Experiments I and II. The differences between the mean scores on all straight-copy measurements for the two groups, however, were not statistically significant.

From all the evidence available, therefore, it may be asserted that typists receiving controlled reading-instrument training do not seem to develop significantly greater key-stroking and accuracy skills on straight-copy timings than typists not receiving such training.

Speed and Accuracy Performance on Production-Copy Tests

To determine the students' speed and accuracy performance on production-type activities, six different production-copy measurements were employed. Measurements of production words a minute and total errors were obtained on the last five-minute business letter, tabulation, and enumeration tests for the control and experimental groups.

Letter Writing

Production Words a Minute. Tables XX and XXI, page 111, show the mean scores and analysis of variance calculations, respectively, for production words a minute on the last five-minute letter test for the control and experimental groups.

Table XX shows that the experimental group, in Experiment I, had a mean score of 54.21 production words a minute compared with a mean score of 50.00 production words a minute for the control group. In Experiment II, the experimental-group mean was 56.27 production words a minute and the mean for the control group, 54.58 production words a minute. The mean scores for the combined experiments showed a difference of 3.55 production words a minute favoring the experimental groups over the control groups.

TABLE XX

TABLE OF MEANS OF PRODUCTION WORDS A MINUTE FOR LAST FIVE-MINUTE LETTER TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	50.00	54.21	52.10
II	54.58	56.27	55.42
Combined	51.45	55.00	53.22

TABLE XXI

ANALYSIS OF VARIANCE FOR PRODUCTION WORDS A MINUTE ON LAST FIVE-MINUTE LETTER TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	150.85	1	150.85	1.20	Not Sig.
Term	191.70	1	191.70	1.52	Not Sig.
Interaction	27.70	1	27.70	0.22	Not Sig.
Error	9197.81	73	126.00		
Total	9568.06	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table XXI shows that the F-value of 1.20 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 1.52 and 0.22 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Total Errors. Tables XXII and XXIII, page 113, show the mean scores and analysis of variance calculations, respectively, for the total errors on the last five-minute letter test for the control and experimental groups.

Table XXII shows that, in both Experiments I and II, the experimental groups demonstrated an ability to type letter copy more accurately than the control groups. The differences between the two groups were 0.06 total mean errors in Experiment I and 0.97 total mean errors in Experiment II. For the combined experiments, the experimental groups had 0.47 fewer mean errors than the control groups.

Table XXIII shows that the F-value of 0.73 representing the difference between the means of the experimental and control groups was not statistically significant. The F-value of 4.12 representing the difference between the means of Experiments I and II was statistically significant

TABLE XXII

TABLE OF MEANS OF TOTAL ERRORS
FOR LAST FIVE-MINUTE LETTER TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	4.27	4.21	4.24
II	3.50	2.53	3.01
Combined	4.03	3.56	3.79

TABLE XXIII

ANALYSIS OF VARIANCE FOR TOTAL ERRORS
ON LAST FIVE-MINUTE LETTER TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	4.59	1	4.59	0.73	Not Sig.
Term	25.96	1	25.96	4.12	Sig.
Interaction	3.57	1	3.57	0.57	Not Sig.
Error	459.81	73	6.30		
Total	493.93	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

at the 5 per cent level of confidence. The F-value of 0.57 representing the interaction variance was not statistically significant.

Tabulation Writing

Production Words a Minute. Tables XXIV and XXV, page 115, show the mean scores and analysis of variance calculations, respectively, for production words a minute on the last five-minute tabulation test for the control and experimental groups.

Table XXIV shows that, in both Experiments I and II, the experimental groups had higher mean scores than the control groups on this performance test. The differences between the two groups were 7.62 mean production words a minute in Experiment I and 3.50 mean production words a minute in Experiment II. The combined experiments favored the experimental groups by 6.42 mean production words a minute.

Table XXV shows that the F-value of 4.07 representing the difference between the means of the experimental and control groups was statistically significant at the 5 per cent level of confidence. The F-values of 1.63 and 0.56 representing the difference between the means of Experiments I and II and the interaction variance, respectively,

TABLE XXIV

TABLE OF MEANS OF PRODUCTION WORDS A MINUTE FOR LAST FIVE-MINUTE TABULATION TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	48.92	56.54	52.73
II	54.50	58.00	56.25
Combined	50.68	57.10	53.89

TABLE XXV

ANALYSIS OF VARIANCE FOR PRODUCTION WORDS A MINUTE ON LAST FIVE-MINUTE TABULATION TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	537.24	1	537.24	4.07	Sig.
Term	215.09	1	215.09	1.63	Not Sig.
Interaction	73.72	1	73.72	0.56	Not Sig.
Error	9634.80	73	131.98		
Total	10460.85	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

were not statistically significant.

Total Errors. Tables XXVI and XXVII, page 117, show the mean scores and analysis of variance calculations, respectively, for the total errors on the last five-minute tabulation test for the control and experimental groups.

Table XXVI shows that, in both Experiments I and II, the experimental groups demonstrated an ability to type tabulation copy more accurately than the control groups. The differences between the two groups were 0.10 total mean errors in Experiment I and 0.86 total mean errors in Experiment II. For the combined experiments, the experimental groups had 0.46 fewer mean errors than the control groups.

Table XXVII shows that the F-value of 0.45 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 3.34 and 0.28 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Enumeration Writing

Production Words a Minute. Tables XXVIII and XXIX, page 118, show the mean scores and analysis of variance

TABLE XXVI

TABLE OF MEANS OF TOTAL ERRORS
FOR LAST FIVE-MINUTE TABULATION TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	5.27	5.17	5.22
II	4.33	3.47	3.90
Combined	4.97	4.51	4.74

TABLE XXVII

ANALYSIS OF VARIANCE FOR TOTAL ERRORS
ON LAST FIVE-MINUTE TABULATION TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	4.08	1	4.08	0.45	Not Sig.
Term	30.19	1	30.19	3.34	Not Sig.
Interaction	2.54	1	2.54	0.28	Not Sig.
Error	660.85	73	9.05		
Total	697.66	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

TABLE XXVIII

TABLE OF MEANS OF PRODUCTION WORDS A MINUTE FOR LAST FIVE-MINUTE ENUMERATION TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	49.81	53.04	51.42
II	54.58	57.93	56.25
Combined	51.32	54.92	53.12

TABLE XXIX

ANALYSIS OF VARIANCE FOR PRODUCTION WORDS A MINUTE FOR LAST FIVE-MINUTE ENUMERATION TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	188.38	1	188.38	1.37	Not Sig.
Term	406.13	1	406.13	2.95	Not Sig.
Interaction	0.06	1	0.06	0.00	Not Sig.
Error	10056.85	73	137.77		
Total	10651.42	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

calculations, respectively, for production words a minute on the last five-minute enumeration test for the control and experimental groups.

Table XXVIII shows that, in both Experiments I and II, the experimental groups had higher stroking-rate mean scores on enumeration copy than the control groups. The differences between the two groups were 3.23 mean production words a minute in Experiment I and 3.35 mean production words a minute in Experiment II. The combined experiments favored the experimental groups by 3.60 mean production words a minute.

Table XXIX shows that the F-value of 1.37 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 2.95 and 0.00 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Total Errors. Tables XXX and XXXI, page 120, show the mean scores and analysis of variance calculations, respectively, for the total errors on the last five-minute enumeration test for the control and experimental groups.

TABLE XXX

TABLE OF MEANS OF TOTAL ERRORS
FOR LAST FIVE-MINUTE ENUMERATION TEST

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	3.81	3.42	3.61
II	3.42	2.33	2.87
Combined	3.68	3.00	3.34

TABLE XXXI

ANALYSIS OF VARIANCE FOR TOTAL ERRORS
ON LAST FIVE-MINUTE ENUMERATION TEST

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	9.45	1	9.45	2.43	Not Sig.
Term	9.45	1	9.45	2.43	Not Sig.
Interaction	2.08	1	2.08	0.54	Not Sig.
Error	284.12	73	3.89		
Total	305.10	76			

*For 1 and 73 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Table XXX shows that, in both Experiments I and II, the experimental groups had fewer mean total errors than the control groups on the last five-minute enumeration test. The differences between the two groups were 0.39 mean total errors in Experiment I and 1.09 mean total errors in Experiment II. For the combined experiments, the experimental groups had 0.68 fewer mean errors than the control groups.

Table XXXI shows that the F-value of 2.43 representing the difference between the means of the experimental and control groups was not statistically significant. The F-values of 2.43 and 0.54 representing the difference between the means of Experiments I and II and the interaction variance, respectively, were not statistically significant.

Interpretation. The mean scores on six different production-copy measurements favored the experimental groups over the control groups. When these scores were subjected to statistical analysis, however, only one measurement showed a statistically significant difference between the means of the control and experimental groups on production-copy performance.

From all the data presented, therefore, it may be asserted that typists receiving reading-instrument training

do not seem to develop significantly superior speed and/or accuracy performance on production-copy tests when compared with typists not receiving such training.

Reading Rate and Comprehension Development

To determine the effect of controlled reading-instrument training on the students' reading rate and comprehension, pre-training and post-training scores were obtained from the experimental-group testees and from the control-group testees by using two equivalent forms of the Cooperative English Test, Test C2: Reading Comprehension (Higher Level), published by the Cooperative Test Division of the Educational Testing Service, Los Angeles, California. Form T was administered to both groups during the second week of each quarter, and Form R was given to both groups during the last week of each quarter. Scaled scores were obtained on each of three parts of the test: vocabulary, speed of comprehension, and level of comprehension.

Reading Growth. Table XXXII, page 123, shows the mean gains for the control and experimental groups for vocabulary, speed of comprehension, and level of comprehension. In Experiment I, the control group had slight but positive gains on all factors measured while the experimental group

TABLE XXXII

MEAN GAINS FOR CONTROL AND EXPERIMENTAL GROUPS
FOR VOCABULARY, RATE AND LEVEL OF READING COMPREHENSION
ON COOPERATIVE ENGLISH TEST, TEST C2

EXPERIMENT NO.	GROUP	VOCABULARY	RATE OF COMPREHENSION	LEVEL OF COMPREHENSION	TOTAL GAIN
I	Control	1.2	1.5	0.3	0.8
	Exper.	0.4	-1.9	-1.6	-1.2
II	Control	2.0	2.0	2.6	2.3
	Exper.	-0.4	0.9	-1.9	-0.8

had decreases on all factors but vocabulary; in Experiment II, the control group gained on all factors measured while the experimental group had slight losses on vocabulary and level of reading comprehension.

Tables XXXIII and XXXIV, page 125, show the mean scores and analysis of variance calculations, respectively, for total reading comprehension development for the control and experimental groups. This measurement was based upon the mean total scaled scores of the various parts of the reading test.

Table XXXIII shows the mean total improvement in reading comprehension for the control and experimental groups. In both Experiments I and II, the control groups improved their total reading comprehension while the experimental groups had a slight loss in total reading comprehension. For the combined experiments, the control groups gained 1.32 mean points while the experimental groups had a loss of 1.03 mean points.

Table XXXIV shows that the F-value of 5.54 representing the difference between the means of the experimental and control groups was statistically significant at the 5 per cent level of confidence. The F-values of 0.72 and 0.26 representing the difference between the means of

TABLE XXXIII

TABLE OF MEANS
FOR TOTAL READING COMPREHENSION IMPROVEMENT

EXPERIMENT NO.	CONTROL CLASS	EXP. CLASS	MEAN OF MEANS
I	0.85	-1.17	-0.32
II	2.33	-0.80	1.53
Combined	1.32	-1.03	0.29

TABLE XXXIV

ANALYSIS OF VARIANCE
FOR TOTAL READING COMPREHENSION IMPROVEMENT

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F*	CONCLUSION
Method	114.51	1	114.51	5.54	Sig.
Term	14.93	1	14.93	0.72	Not Sig.
Interaction	5.34	1	5.34	0.26	Not Sig.
Error	1569.76	72	20.65		
Total	1704.54	75			

*For 1 and 72 degrees of freedom an F-value of 3.98 is required for significance at the .05 level of confidence and 7.01 for the .01 level.

Experiments I and II and the interaction variance, respectively, were not statistically significant.

Interpretation. In terms of reading improvement during the training period, the control groups had significantly greater gains in total reading comprehension than the experimental groups. In fact, the terminal reading scores for the experimental groups were actually lower than those obtained at the beginning of the study. Careful study of the data provides no defensible explanations for the gains made by the control groups. The data suggest, however, that controlled reading-instrument training in second-quarter college typewriting may be a slight handicap to efficient reading rate and comprehension as measured by a standardized reading test. No evidence was obtained to determine if the decreases noted for the experimental groups were of a temporary or of a permanent nature.

Validity of the Gregg Production Word-Count System

Correlation coefficients were calculated in order to determine the significance of the relationship between the Gregg production word-count system and the gross-words-per-minute word-count system. Table XXXV, page 127, shows the correlation coefficient values between production-words-a-

TABLE XXXV

COEFFICIENTS OF CORRELATION BETWEEN GROSS WORDS PER MINUTE ON LAST FIVE-MINUTE STRAIGHT-COPY TEST AND PRODUCTION WORDS A MINUTE ON FINAL FIVE-MINUTE LETTER, TABULATION, AND ENUMERATION TESTS (Combined Experiments)

LAST 5-MINUTE STRAIGHT-COPY TEST, GWPM CORRELATED WITH:	r	
	CONTROL	EXP.
Final 5-Minute Letter Test, PWAM	0.94*	0.92*
Final 5-Minute Tabulation Test, PWAM	0.81*	0.92*
Final 5-Minute Enumeration Test, PWAM	0.92*	0.92*

*Significant at the .01 level of confidence

minute scores obtained on the final five-minute production-copy tests of each quarter and gross-words-per-minute scores obtained on the last five-minute straight-copy test of each quarter. For both the control and the experimental groups, all variables correlated were highly significant as the r-values were beyond the 1 per cent level of confidence.

Interpretation. The data tend to suggest that production words a minute is a valid word-count system for equating straight-copy timed writings and production-copy tests. It would appear that the Gregg production word-count system can be used most effectively in establishing identical achievement goals, or grading standards, for all kinds of typewritten copy.

Summary

The t-test was used to measure the significance of the difference between the means of the control and experimental groups on initial and final speed and accuracy performance on five-minute straight-copy tests. The t-test calculations do not show a statistically significant pre-training or post-training superiority of one group over the other on either stroking-rate ability or accuracy ability.

The F-test, or variance ratio, was used to measure the significance of the difference between the means of the control and experimental groups on thirteen different measurements. Table XXXVI, page 130, contains a summary of the means, F-values, and degrees of freedom for the control and experimental groups for these various measurements. Among the thirteen variables, only two show a statistically significant difference between the means of the two groups.

Correlation coefficients were computed in order to determine the significance of the relationship between the Gregg production word-count system and the gross-words-per-minute word-count system. Since all relationships correlated were significant at the 1 per cent level of confidence, it was suggested that production words a minute is a valid word-count system for equating straight-copy timed writings and production-copy tests.

Chapter V presents a general summary of the study, the conclusions, and the recommendations for further research.

TABLE XXXVI

SUMMARY OF MEANS, F-VALUES, AND DEGREES OF FREEDOM FOR THE CONTROL AND EXPERIMENTAL GROUPS ON THIRTEEN DIFFERENT VARIATIONS

VARIABLE	CON.	EXP.	F	DF
Last 5-Min. Timing--GWPM	56.11	61.23	2.8713	1 & 73
Last 5-Min. Timing--Errors	4.42	3.69	0.4353	1 & 73
Speed Improvement A	9.63	11.59	3.1175	1 & 73
Speed Improvement B	11.42	11.64	0.3948	1 & 73
Consistency	2.11	3.49	3.1536	1 & 73
Avg. Production Drill	85.55	110.68	3.6618	1 & 73
Final Letter--PWAM	51.45	55.00	1.1972	1 & 73
Final Letter--Errors	4.03	3.56	0.7285	1 & 73
Final Tabulation--PWAM	50.68	57.10	4.0704*	1 & 73
Final Tabulation--Errors	4.97	4.51	0.4508	1 & 73
Final Enumeration--PWAM	51.32	54.92	1.3674	1 & 73
Final Enumeration--Errors	3.68	3.00	2.4272	1 & 73
Total Reading Comprehension Improvement	1.32	-1.03	5.5439	1 & 72

*Significant at the .05 level of confidence

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

As schools are under pressure to compress nonacademic programs, the time required to learn basic typewriting skill needs to be reduced; and the instructional practices and procedures need to be improved. Studies in reading improvement have indicated that techniques designed to train eye movements are effective, by certain criteria, in accelerating the learning process. A need exists, then, to determine the effectiveness of controlled reading-rate practice techniques in the learning of typewriting and related skill subjects.

The Problem

The primary purpose of this study was to determine the effectiveness of the Skill-Builder Controlled Reader as a learning aid in the teaching of second-quarter college typewriting. The study was performed to determine whether students receiving Skill-Builder Controlled Reader training in intermediate college typewriting would attain higher rates

of speed and/or better accuracy on straight-copy timings and production-type problems than students not receiving controlled reading-instrument training. A secondary purpose of this study was to determine the effect of Skill-Builder Controlled Reader training on the students' rate and level of reading comprehension based on a standardized reading test. Another purpose of this study was to determine the significance of the relationship between the Gregg production word-count system and the gross-words-per-minute word-count system.

Review of Related Research

Many experiments have been carried out in the field of reading improvement to determine the relative efficiency of different techniques of teaching reading with a variety of controlled reading devices. In general, the results of these experiments have indicated that mechanically controlled forms of training are effective in increasing speed of reading without decreasing comprehension if training is undertaken with determination and persistence. A number of reading specialists, however, have questioned the usefulness of mechanical devices in increasing rate of reading comprehension.

Although controlled reading-instrument training is still in its infancy in the field of business education, there is some evidence available that suggests that mechanically controlled forms of training will improve basic skills in the initial stages of learning to typewrite.

Procedures

This experiment was conducted in the second-quarter typewriting classes at Oregon State University during the winter quarter and repeated during the spring quarter of the 1960-1961 school year. Participating in the experiment were 77 students from the major schools and classes on the campus. For each quarter, students enrolling in second-quarter typewriting were assigned during registration to either a control or an experimental class by the coin-selection method of random sampling.

From day to day, both the control and experimental classes used the same textbooks and supplementary materials and the same electric typewriters and classroom facilities. The writer administered identical assignments in all classes. The only difference between the teaching procedures used in the control and experimental classes was the presentation of approximately ten minutes of Skill-Builder

Controlled Reader materials to the students in the experimental classes three days a week for seven weeks. On instrument-training days, the control classes typed for a period of ten minutes from duplicated sheets containing the same filmstrip copy used in the experimental classes. The experimental classes were divided into three ability groups and instrument-training drills were projected for each ability group at gradually increasing speeds commensurate with the group's key-stroking ability. Ability grouping was not used in the control classes.

Periodic measurements were made of the students' ability to reproduce straight-copy and production-copy material under timing. Thirteen different measurements, including a reading test, were used to evaluate the students' performance.

Findings

Initial and Final Speed Status. In both Experiments I and II, the experimental groups had higher initial stroking-rate means on five-minute straight-copy material than the control groups. The differences between the means of the two groups for Experiments I and II were 5.48 and 1.37 gross words per minute, respectively. The t-test values showed

that these differences were not statistically significant.

At the end of the experiment, in both quarters, the experimental groups retained their stroking-rate superiority on five-minute straight-copy material. The differences between the means of the control and experimental groups for Experiments I and II were 4.79 and 5.30 gross words per minute, respectively. The t-test values showed that these differences were not statistically significant.

Initial and Final Accuracy Status. In Experiment I, the experimental group demonstrated an ability to type more accurately than the control group on initial and final five-minute straight-copy writings. The difference between the means of the two groups on the initial test was 3.17 total errors; on the final test, 1.22 total errors. The t-test values showed that these differences were not statistically significant.

In Experiment II, the control group held an initial and final accuracy advantage of 0.28 and 0.30 total errors, respectively. These differences favoring the control group were not statistically significant.

Speed and Accuracy Performance on Straight Copy. Six different measurements were employed to determine the speed and accuracy performances of the control and experimental

groups on straight-copy material. These measurements were:

1. Gross words per minute on the last five-minute straight-copy test.

2. Total errors on the last five-minute straight-copy test.

3. Speed Improvement A -- This measurement represented the difference between a student's adjusted basic rate, based upon five-minute straight-copy writings given at the beginning of the quarter, and his average net score on the three best five-minute straight-copy writings administered throughout the quarter.

4. Speed Improvement B -- This measurement represented the difference between a student's average initial and average terminal gross stroking-rate performance on five-minute straight-copy writings.

5. Consistency -- This measurement was based upon the total number of five-minute straight-copy writings given throughout the quarter that contained two or fewer typewriting errors.

6. Production Drills -- This measurement combined stroking-rate ability and consistent accuracy performance and was based upon the average score on four seven-minute straight-copy writings given throughout the quarter.

The F-test, or variance ratio, was used to measure the significance of the difference between the means of the control and experimental groups on each of the six straight-copy measurements. In general, the mean performance scores on the straight-copy measurements favored the experimental groups over the control groups. The analysis of variance calculations, however, showed that the differences between the mean scores for the two groups on all straight-copy measurements were not statistically significant.

Speed and Accuracy Performance on Production Copy. Six different measurements were employed to determine the speed and accuracy performances of the control and experimental groups on production-type activities. These measurements were:

1. Production words a minute on the last five-minute letter test.

2. Total errors on the last five-minute letter test.

3. Production words a minute on the last five-minute tabulation test.

4. Total errors on the last five-minute tabulation test.

5. Production words a minute on the last five-minute enumeration test.

6. Total errors on the last five-minute enumeration test.

The mean scores on all production-copy measurements favored the experimental groups over the control groups. The F-test value for the difference between the means of the two groups on the final tabulation test was significant at the 5 per cent level of confidence. The analysis of variance calculations for the other production-copy variations, however, showed no significant difference between the mean scores of the control and experimental groups.

Reading Rate and Comprehension Development. To determine the effect of controlled reading-instrument training on the students' rate and level of reading comprehension, pre-training and post-training scores were obtained from the control and experimental groups by using two equivalent forms of the Cooperative English Test, Test C2: Reading Comprehension (Higher Level). In both Experiments I and II, the control groups improved their rate and level of reading comprehension while the experimental groups showed a slight loss in both reading factors. For the combined experiments, the control groups gained 1.32 mean points while the

experimental groups had a loss of 1.03 mean points. The F-test was used to measure the significance of the difference between the means of the two groups. The results were significant at the 5 per cent level of confidence.

Validity of the Gregg Production Word-Count System. To determine the significance of the relationship between gross words per minute and production words a minute, the mean gross-words-per-minute scores on the final five-minute straight-copy test were compared with the mean production-words-a-minute scores on the final five-minute letter test, the final five-minute tabulation test, and the final five-minute enumeration test for both the control and experimental groups. The values of rho for all variables correlated were statistically significant at the 1 per cent level of confidence.

Conclusions

The prime purpose of this study was to determine the effectiveness of controlled reading-instrument training in the development of speed and accuracy skills in second-quarter college typewriting. The curiosity underlying this concern about the relative efficiency of reading-instrument training in intermediate typewriting resulted from a careful

study of earlier investigations in the field of business education which indicated that significant speed and accuracy skills were obtained in beginning typewriting classes through the use of controlled reading devices. As a result of this study, therefore, new evidence has been assembled for use in pointing the way to a better understanding and appreciation of the application of controlled reading-rate practice techniques to the total scope of typewriting instruction.

A secondary purpose of this study was to measure the effect of controlled reading-instrument training on the typists' rate and level of reading comprehension. A third purpose was to measure the relationship between selected word-count scoring systems used in this study.

This study, then, has resulted in the compilation of data dealing with many facets of second-quarter college typewriting. The conclusions that seem probable in the light of the evidence gathered are as follows:

1. Controlled reading-instrument training does not significantly affect the students' skill development in key-stroking speed on straight-copy writings and on production-copy problems in second-quarter college typewriting. It was hypothesized that Skill-Builder Controlled Reader training

would result in significantly greater gross speed gains when compared with training procedures not utilizing the reading instrument as a supplement to the teacher's instruction. Since only one of six different straight-copy and production-copy measurements showed a statistically significant difference between the mean stroking-rate scores of the control and experimental groups, Hypothesis I was rejected.

2. Controlled reading-instrument training does not significantly affect the students' skill development in accuracy of copy reproduction on straight-copy writings and production-copy problems in second-quarter college typewriting. It was hypothesized that Skill-Builder Controlled Reader training would result in significant accuracy improvement when compared with training procedures not utilizing the reading instrument as a supplement to the teacher's instruction. Since none of the six different straight-copy and production-copy measurements showed a statistically significant difference between the mean accuracy scores of the control and experimental groups, Hypothesis II was rejected.

3. Controlled reading-instrument training tends to impede, at least temporarily, the typists' rate and level of reading comprehension. It was hypothesized that

Skill-Builder Controlled Reader training would improve the students' rate and level of reading comprehension. Since the control groups had a slight gain in rate and level of reading comprehension and the experimental groups, a slight decrease, Hypothesis III was rejected.

4. Production words a minute appears to be a valid word-count method for equating straight-copy writings and production-copy writings. Gross-words-a-minute scores were computed for three different types of end-of-quarter, five-minute production-copy tests, using the Gregg production word-count system; the production-test scores were then correlated with the gross-words-per-minute scores obtained on end-of-quarter, five-minute straight-copy writings. All correlation coefficients were significant at the 1 per cent level of confidence. These statistical results tend to suggest that production words a minute can be used effectively in establishing a single set of achievement goals, or standards, for all kinds of typewritten copy.

Recommendations

While this study revealed that controlled reading-rate practice techniques are no more effective in the development of speed and accuracy on straight-copy writings and

production-copy problems in second-quarter college typewriting than training procedures not utilizing the reading instrument as a supplement to the teacher's instruction, the reader must be ever mindful of the limitations under which the study was conducted. The value of the findings is limited to some extent by the fact that the filmstrip copy used in this study was not correlated with the typewriting textbooks and supplementary materials used for daily practice and skill-building purposes. A further limitation of this study resulted from a lack of follow-up data to determine if reading-instrument training had any long-term effect. Furthermore, this study was confined to a specific phase and level of skill development; namely, second-quarter, or intermediate, college typewriting.

The results of this study, therefore, must be considered as applicable only to the population with which the writer worked, and any generalizations made for other groups must be changed to the extent that the other populations vary from the characteristics of the writer's groups. The reader is not likely to be seriously in error, however, if he interprets the results of this study as being generally applicable to intermediate typewriting at both the secondary and college levels of instruction.

The writer was aware that the procedures used in the solution of the specific problems investigated did not cover all aspects of instrument training and that further research was needed to fill the gaps. The following recommendations for the kinds of needed research on the use of controlled reading-rate practice techniques in typewriting and related skill subjects, then, have grown out of this experiment:

1. The reading-instrument training program should be extended from the keyboard-introduction phase of learning typewriting through the intermediate and more advanced stages of skill development. Such an investigation should attempt to determine the relative effectiveness of controlled reading-instrument training at all levels and stages of typewriting instruction.

2. There seems to be a need for additional experiments to determine the most effective procedures and techniques of reading-instrument training in the typewriting instructional program. Some of the considerations that seem to merit investigation at this time are: types of filmstrip materials best adapted to typewriting skill development, number and length of training sessions to be employed, most effective projection speeds for the different stages of skill development, and most effective room arrangement.

3. A study should be conducted to determine the optimum number of ability groups that can be effectively employed in all phases of a reading-instrument training program. Such an investigation should also attempt to determine the effect of mechanical forms of training on the various ability groups. It was observed in the present study, for example, that the speed and accuracy gains for the three ability groups showed a highly similar pattern of growth development throughout the training period. Further information along these lines should help place the concept of ability grouping in its proper perspective as related to controlled reading-rate practice techniques in typewriting.

4. In view of the negative evidence presented in this study regarding the effect of reading-instrument training on the students' reading rate and comprehension scores, there is a definite need for further research data in this area at all levels of typewriting instruction. Pre-training and post-training reading test scores would provide reliable data on the immediate effects of such training procedures; follow-up measurements, after cessation of training, would provide much needed evidence regarding the permanency of the reading rate and comprehension changes found in this study. Such an investigation might also be expanded to include

photographic records of eye movements, assuming that the eye-movement camera actually produces a true picture of the reading habits of the subject. This instrument provides a record of the number of fixations and the number of regressions for the subject as well as a record of his speed of reading. These eye-movement-camera scores should then be compared statistically with the reading comprehension test scores and the typewriting performance scores in order to evaluate objectively reading-instrument training as related to significant factors in reading improvement.

5. There seems to be a need for additional experiments to determine the relative combined effectiveness of controlled reading-instrument training and tachistoscopic training at all levels and stages of typewriting instruction. As pointed out in Chapter II of this study, investigations by Winger and Palmer have indicated that the use of tachistoscopic training in beginning typewriting resulted in significantly superior speed and accuracy performance when compared with training procedures not using the tachistoscope; and Kline found that the Skill-Builder Controlled Reader was an effective speed-forcing and control-building device in beginning typewriting. What would be the results, then, if <u>combined</u> tachistoscopic and reading-instrument

procedures were employed throughout the typewriting instructional program? Investigators might consider setting up one group of subjects using both types of reading devices, a second group using only the tachistoscope, a third group using only the Skill-Builder Controlled Reader, and a fourth group that would receive typewriting instruction without any mechanical device. A statistical comparison of the differences between the means of the groups on various types of straight-copy and production-copy measurements would provide much needed information regarding the value of mechanical forms of training in typewriting.

6. It is also recommended that controlled reading-instrument training be adapted to formal experimentation in shorthand, transcription, business machines, bookkeeping, and other areas in the business education program at both the secondary and college levels of instruction. Some informal research studies by classroom business teachers have been made in these areas, but nothing basic has resulted from these beginnings at the present time.

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APPENDICES

APPENDIX A

SKILL-BUILDER CONTROLLED READER FILMSTRIP MATERIALS

Training Session No. 1

there is for them on a by any can do on time with each at a
who is will be on time as the to work is a to one it is not
as a 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 who is at a

Training Session No. 2

to make there is on each in a for the when a to send in the
on the will move in a on each there were to be on the it is
you are to read as an to send of the in the for the and the
to make to have there is to a to send out has been there is

Training Session No. 3

can be when their have become when the is now for all of it
of the it is that all must be as well as will not to a in a
with a must be is now for the for many for a who is on them
it is not and the to do in it for many who is to go to each

Training Session No. 4

when the of the of one in the day-by-day must learn from it
loss of out of would be to it on the to the to go many more
in the are on the in it go at take a on the for the from it
is a of every to go for their when the go us in it after it

Training Session No. 5

be sure to send us to go in a for the will send at a in the
so that there is for a on the once was here is for a on the
about the it would be sure to to write in order you can get
you have had it is best get a you may want you can you have

The clowns just took over and fixed up my boring quiz shows.
Please be sure to send us all the newest parts for the boat.
A mechanic will send your car out for repair early tomorrow.
All seniors must take a final examination before graduation.

Training Session No. 6

we plan to take are now in it after the during the can take
with a when a he should has a the above when the it is on a
to get into he is sure at all are in a of time up in to the
as they as soon as all of the to see whether it is for them
Extra crews jumped in quickly to blast their freezing river.
We plan to take a trip abroad after the program is finished.
Many league games were rained out during the playing season.
Many busy people decide to go away for a rest in the winter.

Training Session No. 7

a few on a were very to use a is to at the in a of the as a
they will is quite and have a which are by the if the to be
there are is to have she will she may about the it is never
this is of the to talk to the in making during the if there
She played quite a few moving jazz recordings on a juke box.
The new photographs were very difficult to use at that time.
The new roof insulation is to be installed in a week or two.
They will build a new wall in back of the barn before March.

Training Session No. 8

all of the will be as soon as you may send you have it will
of a in many of the so many a of the now that want a to the
after having it is to be in a in the about very much for it
in their it can be must be in up in may be of each for them
We seized the quick boxer pup for scaring my very jolly cat.
Proofread all of the copy the moment you complete the paper.
Your orders will be filled as soon as we receive your check.
You may send back the damaged merchandise you have received.

Training Session No. 9

b bag bed cab fib hub job box pub bark boom bell best above
Bo Bob Bill Betty Blake Bonny Blaze Butler Browns Briquette
ba bad bag ban bar ball basic be bed beg bet bell beat bear
bi bid bib bit big bin bitter ob job lob mob nob cob robber
saw pull dart jump were up as you free kill cart lump great
minimum badge million fat pin fever onion vast jump dare in
it sow make social handle out is lake antic mantle corn map
rush handy title their am got cork then world land busy pal

Training Session No. 10

g jag lag king drag cage brag tug wig grip gaze grow oxygen
Gift Gave Grief Grants Gather Good George Gregory Grotesque
go got good goal gouge govern ga gas gap gab game gate gave
gi give gift girl given giddy ing sing string making taking
at my sat hop rat mop bat hip rest milk best pony daze junk
traced opinion street million cast poly safe pump star noun
to rut rub lap pale halt than of nap bus dog lens name maid
the pays body male malt quake sleuth rocks social their man

Training Session No. 11

l lad lab help jail sail left lax mail real line live quail
Law Legs Lazy Load Lack Light Lady Luck Lewis Louis Lucille
la lab lad lag lap law lawyer le led leg let letter leisure
lo lob log lot low lost loose li lip lie lid live life line
was pun was him red nil seats gas lip see hum fee lion test
start onion brave million get feast polo fewer minimum sets
am so or is do to the hay may go them melt slap wick handle
men and pay but sit tub works duck clap tuck some city malt

Training Session No. 12

q quiz squaw boquet technique jonquils equipment equivalent
Quack Query Quixote Qualified Quote Quebec Quality Quagmire
qua quake quart quail quality qui quick quiet quilt quinine
qui quit quiz quirk quintuple que quey quest queer question
sad nip we no gaze limp be in pull save milk star million a
fact kill fewer minimum brave pink brag puny save yolk dare

it is to for the men bit with melt down with pale male hand
title handy quake social work height handle antic mantle do

Training Session No. 13

c cab cave excel quick advice cow cast came buck arch eject
Cap Czar Cafe Cage City Cathy Can Carl Could Course Capitol
ca can cat cad care call came cu cub cup cut cube cuff cure
co cog cot cod core come coal ack tack back lack pack track
abbey accept agreed apple all annual applaud assort applied
book brood banner battle bill baffle business button buzzer
cook carry cheer collect call careen carriage carry cartoon
affix attract call bell afoot address alley butter admitted

Training Session No. 14

h him how josh hangar exhibit hay habit authorize technique
Hot Half Have Holland Houston Hog Hock Howard Hopper Heaven
ha had ham has hat have halve hi him hid his hit high hinge
ho hob hod hog hop hole horse he hen hep her hex heed hedge
droll depress dazzle darkness error essay express effective
fall free ferret fluffy flood good glass gross greed giggle
hill hood happy hurrah huddle huffy discuss encompass doors
deep glossy flitter difficult gloom engross feeble embossed

Training Session No. 15

m mob mow come modern muffler mix moth jump some move amaze
Might Monkey Montana Mosquito Mast Mary Mildred Mississippi
ma mad map mat may made marsh me men meet mean mess measure
mi mit milk mile minor middle mo mob mom mop mow most motor
inn illegal imminent immature jeep juggle justness jettison
kill keep knee knotty kittens lettuce lessee lesson looking
manner message mellow merrily misspell loopholes irregulars
moon less infallible keenness indeed lattice morass muffler

Training Session No. 16

r rag rib wire crux from rich run rid rip real query reject
Rose Rack Ride River Richards Reed Rhode Randolph Rochester

ra race rack rail rate ratify re red read rest real retreat
ri ride ring riot right rigid ru rug run rut rush rust rung
need noon nutty napper narrow occur office occupant opposed
proceed paddle puzzle pattern queer queen quarrel quizzical
roof ruddy referred repossess rubber nozzle necessity offer
quill pass root need occupied rattle pull press motto poppy

Training Session No. 17

d sad bad had dog made duplex fade jade quad void card dawn
Dan Day Dark Daze Date Donald Dennis Daniel Dorothy Dolores
ad cad had mad made bade fade de deal deaf deed deep decent
di die dig did dial diet dirt ed bed led red seed discarded
it at on of go by is no to be for the not all day had their
were with this them your they have time also what will very
They were for it all the way. On this day, she will not go.
They have had the best times. It is their way to the party.

Training Session No. 18

i in oil him fig bid aim fire pie via quiz jive wise excite
Ivy Ike Irvin Italy Induction I Iowa Idaho Indiana Illinois
in into inch incline increase id idea idle idol ideal idiom
im impart immediate important it fit pit sit bit hit permit
by to be of in as on go or it the you are now can for there
with take fine many will they is got girl home today should
Take the girl with you today. There are many fine counties.
By now, they will be at home. You and I should be in on it.

Training Session No. 19

n gun sun need junk lone mine run vine zany funny technique
Now Nab Nap New Nan Next Nora North Nevada Nucleus Nebraska
na nab nag nap nail name navy ne new net need never neither
ni nip nine nice nick nightly no not noon nose notch notary
to it do is we us of on if so the for the his the our their
show when will have take your help been best with help have
It is the way to do the show. When will we have the winner?
Take us to your best leaders. Have they been of help to us?

Training Session No. 20

s saw sob sad safe sack quest sap rest vest just slim exist
Sag Son She Sit Sun Say Seize Sam Suzy Smith Sunday Satisfy
sa say sad sap sat saw safety se sea see set sell seat send
sh she shop shall sheet shelf si sip sit side sixth sincere
we is in to on of no or if it can way not are the say where
will very good goal mail find take post they from date done
We cannot find a better goal. Our new picture is very good.
The women are not in the way. Take the mail to the postman.

Training Session No. 21

y bay may stay lazy very play yes jelly funny query anxiety
Yawn Yoke Yield Yacht Yardage You York Yank Young Yesterday
ya yaw yap yam yard yawn yarn ye yes yelp year yeast yellow
yo you your yours youth young ye yew yearn yeoman yesterday
be by if it in is to of on we are the not see her you later
show them will know fine same going after former onto three
It is in a chapter by itself. We are not going to the show.
You and I will see her later. If you know, it will be fine.

Note: The preceding filmstrip selections came from the Typing-Skill Development Course, a 25-filmstrip, 75-lesson course developed by the Educational Developmental Laboratories, Inc., Huntington, New York.

APPENDIX B

FILMSTRIP EXERCISES AND PROJECTION SPEEDS USED IN INSTRUMENT-TRAINING SESSIONS

TRAINING SESSION NO.	FILMSTRIP EXER. NO.*	PROJECTION SPEEDS IN WPM		
		GROUP 1 (FAST)	GROUP 2 (MIDDLE)	GROUP 3 (SLOW)
1	1 Ba	48	36	24
2	5 Ba	54	42	30
3	6 Ba	60	48	36
4	9 Ba	54	42	30
5	14 Ba, b	54	42	30
6	15 Ba, b	60	48	36
7	16 Ba, b	66	54	42
8	20 Ba, b	60	48	36
9	2 Aa, b	60	48	36
10	7 Aa, b	66	54	42
11	12 Aa, b	72	60	48
12	17 Aa, b	66	54	42
13	3 Aa, b	66	54	42
14	8 Aa, b	72	60	48
15	13 Aa, b	78	66	54
16	18 Aa, b	66	54	42
17	4 Aa, b	66	54	42
18	9 Aa, b	72	60	48
19	14 Aa, b	78	66	54
20	19 Aa, b	78	66	54
21	24 Aa, b	72	60	48

*From the Typing-Skill Development Course, a 25-filmstrip, 75-lesson course developed by the Educational Developmental Laboratories, Inc., Huntington, New York. See Appendix A.