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EVALUATING EFFECTIVENESS OF USING BUSINESS EDUCATION
DEPARTMENT PREPARED VIDEO TAPES IN THE TEACHING
OF INTERMEDIATE TYPEWRITING AT
UTAH STATE UNIVERSITY

by

William C. Lauer

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF EDUCATION

in

Curriculum Development and Supervision with a
Special Emphasis in Business Education

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1972

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DEDICATION

It is indeed my pleasure to dedicate this dissertation in the following manner:

To my wife, Nancy, and my children, Linda, Karen and Todd, for their patience and support in fulfilling this assignment;

To my advisor, Dr. Lloyd Bartholome, a truly great educator, for all his kind help, time, and guidance; and

To my parents for all their encouragement toward further education.

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To the following, I offer my sincere appreciation for their invaluable help and guidance in the preparation of this paper:

The Ocean City, New Jersey, School Board, Faculty, and Administration for granting me a sabbatical leave and providing encouragement to complete my degree requirements.

To the Business Education Faculty of Utah State University, under the direction of Dr. Ted Ivarie, for all their understanding, interest, and guidance in addition to making available the facilities for the completion of this study.

To the teachers involved in the study: Vernon Klemin, Elaine Christenson, and Larry Arp.

To Mrs. Carrie Parson, Secretary to the Utah State Business Education Department, Miss Jeri Sparks, student at Utah State University, and Mr. Dennis Jones, teacher at Ocean City, for all their invaluable help.

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Special thanks to my Committee for their time and interest in this experiment.

William C. Lauer

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ABSTRACT

Evaluating Effectiveness of Using Business Education

Department Prepared Video Tapes in the Teaching

of Intermediate Typewriting at

Utah State University

by

William C. Lauer, Doctor of Education

Utah State University, 1972

Major Professor: Dr. Lloyd W. Bartholome
Department: Business Education

The purpose of this study was to compare the relative effectiveness of teaching intermediate typewriting at Utah State University during the Spring and Fall Quarters, 1971, utilizing a system incorporating prepared video tapes with the conventional teacher presentation method.

There were 60 experimental and 60 control students used in the experiment. Those students in the experimental group received all their instruction via prepared video tapes while the control group received all their instruction in the conventional teacher presentation.

The final measure utilized for comparing learning programs in the two groups was student performance in the following areas: straight copy timed writings gross words per minute and rate of accuracy, manuscript typing total gross words and rate of accuracy, letter typing total gross words and rate of

accuracy, and statistical tabulation typing total gross words and rate of accuracy. Error measurement was based upon error rate rather than absolute errors. There were eight null hypotheses tested at the .05 level of significance.

Since the study employed two groups of students who did not have pre-experimental sampling equivalence, scores were obtained for every student on pre and posttesting in the four major areas. These test scores were then used in the analysis of covariance technique because the groups available were intact or administratively organized groups within the University.

The tests were developed by the author and were correlated with those commonly used to measure achievement in typewriting. A correlation coefficient using the Pearson "r" was used to determine test validity and reliability. The tests contained the same syllable intensity (1.5) and approximate word length. The pretests were administered at the beginning of each quarter while the post-tests were given during each quarter at the end of each unit of instruction.

The Experimental group achieved higher than the Control group during the Fall Quarter in letter typing total gross words and during the Combined Quarters in statistical tabulation total gross words. The Experimental group achieved a more significant amount of errors during the Fall and Combined Quarters in straight copy timed writings. However, as the result of confusion with the post-testing in this area, these results may not be a true measurement of the students. In all other areas of testing there was no significant difference. In analyzing

the accuracy data further, the error rate ranged from a low of .019 to a high of .036. The difficulty of the test copy had very little effect upon the rate of accuracy.

The students in the Experimental group answering an evaluation form pertaining to video instruction, gave high approval to the use of prepared video tapes as a medium of instruction.

(180 pages)

CHAPTER I
INTRODUCTION

Additional research toward the improvement of instruction in typewriting is of paramount importance.

Today more high school students are enrolled in typewriting than any other business subject. One of the major problems facing school administrators is that of finding some way to make typing instruction available to all those students who desire it.¹

The teaching of typewriting by the use of television media may be an answer to the perplexing problem of improving instruction and making typing available to more students. In a recent study, Sherrilyn Smith recommended that: "Typewriting teachers should consider the use of portable closed circuit television equipment as a teaching tool to improve typewriting techniques."²

Max Carrington recognized the need for further experimentation in typewriting when he stated:

Typewriting is the key to an effective business education program, and typewriting instruction should be changing

¹Lloyd V. Douglas, James T. Blanford, and Ruth I. Anderson, Teaching Business Subjects, second edition (Englewood Cliffs, N. J.: Prentice Hall, Inc., 1965), p. 111.

²Sherrilyn B. Smith, "An Experiment to Determine Whether Closed Circuit Television Can Improve Beginning Typewriting Performance," (Unpublished M. Ed. Study, University of Colorado, 1969), pp. 40-41.

to meet the new demands of sequence and scope... .
Experimentation is needed to determine new content and
methods of instruction.³

If the class size of typewriting can be expanded through the use of new media as an effective teaching procedure, more students will be able to avail themselves of this valuable vocational skill. In addition, school districts will be able to utilize team teaching to a larger degree. Greater provision for individual differences will be realized because teachers will be able to move about the room in order to provide personal attention to the student who may be experiencing difficulty.

Smith continued with: "Further study is needed involving larger numbers of students ... using production achievement as a method of evaluation."⁴ Only through continuous research and critical analysis in the area of typewriting teaching methods can the ultimate in instructional patterns be developed or achieved.

Statement of the Problem

The purpose of this study was to compare the relative effectiveness of teaching intermediate typewriting utilizing a system incorporating prepared video tapes with a conventional method of instruction. In general, the study was

³Max R. Carrington, "Focus on Typewriting," Business Education Forum, XXV (November, 1970), p. 7.

⁴Sherrilyn B. Smith, op. cit., pp. 40-41.

concerned with a comparison of the use of video tapes in the experimental group, and a conventional teacher presentation in the control group. Specifically, the comparison was evaluated in terms of typewriting speed and accuracy.

In order to facilitate the comparative analysis of the two groups, the following null hypotheses were tested:

1. There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.
2. There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minutes manuscript typewriting tests.
3. There is no difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.
4. There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.
5. There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

6. There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty-minute manuscript typewriting tests.

7. There is no difference in letter typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen-minute letter typewriting tests.

8. There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen-minute statistical tabulation tests.

Importance of Study

The primary objective of a course in intermediate typewriting is to increase speed and develop accuracy, because both speed and accuracy in typewriting are basic to the development of a vocational skill. The typist will not be successful if he is a fast but inaccurate typist; nor will he be successful if he is an accurate but slow typist. The typing teacher must teach his students both of these skills.⁵

Lloyd stated:

Typewriting is big. Typewriting is growing. Typewriting is changing. Typewriting is becoming a tool important in mastering our language. As more and more people

⁵Douglas, Blanford & Anderson, op. cit., p. 134.

want typing for more purposes, methods of increasing learning efficiency in typewriting must and will be found.⁶

The teaching of typewriting has to be undertaken with a spirit of discovery and a search for improved methods and procedures, yet it must always be undertaken within the framework of an understanding of the skill learning process.⁷

West restated, "Research findings that furnish potentially important correctives to instructional practices must surely be deemed useful to teachers. The need is for a larger proportion of useful research . . ."⁸

A need for a study in the use of television in typewriting instruction is indicated by Patterson when he wrote that:

The medium of television allows one to use many of the same techniques and devices that are used in the typical classroom, but it serves to re-emphasize their importance. From televised teaching, one is impressed with the value of saving time, the value of demonstrations, and the increased value of visual aids.⁹

⁶ Alan C. Lloyd, "Typewriting Futures," Business Education World, XLVIII (April, 1968), p. 27.

⁷ Lawrence W. Erickson, "Modes of Instruction and Their Meaning," Practices and Preferences in Teaching Typewriting (Monograph 117. Cincinnati, Ohio: Southwestern Publishing Company, March, 1967), p. 10.

⁸ Leonard J. West, "Teachers' Perceptions of Research," Business Education World, XLVIII (September, 1967), p. 26.

⁹ Herman F. Patterson, "Values of Televised Teaching Applicable to the Classroom," Business Education Forum, XX (October, 1965), p. 19.

Winger reinforced the importance of video tapes in his statement:

Typewriting teachers cannot help but become very excited, however, when they consider the application of video tapes and monitors for classroom instruction. There appears to be no limit to the possibilities for effective and interesting presentations of the many skill portions of the typewriting program.¹⁰

Robert F. Poland wrote that:

There are many implications which can be projected to the teaching of typewriting by television at all levels of instruction. Some of these implications are: (1) Teachers will be relieved of much of the routine and monotonous details of lesson planning. (2) Team teaching would become a reality in the teaching of typewriting. (3) Through the use of television, more students could be taught at one time. (4) Perhaps the most important aspect of television instruction might be the improved quality of instruction which might result. (5) Students are able to grasp the various aspects of typewriting by visual aids, by demonstrations which are in reality a 'bird's-eye view,' and by seeking help immediately from the classroom teacher without disrupting the classroom presentation.¹¹

Locke, however, warned that:

Television has become widely available in schools, but there has never been a scientific rationale for the introduction of television into the instructional process. There have been economic rationales, to be sure--the medium's capacity to reach large audiences, for instance--but none

¹⁰Fred E. Winger, "Emerging Typewriting Curriculum Patterns as Related to Contemporary Developments," Business Education Forum, XXII (November, 1967), p. 14.

¹¹Robert Poland, "Team Teaching by Closed Circuit TV," The Balance Sheet, XLVIII (September, 1966), p. 18.

that involves the processes by which youngsters learn. By and large, television does only what lecturers do, or what motion pictures do, and its relationship to the instructional process has been relatively superficial.¹²

Cook and Wiper showed their faith in the adoption of television by writing:

Probably more experimentation has been done with the teaching of typewriting by television than with any other business subject. Effective utilization of TV typewriting programs could revolutionize the teaching of this subject. We may someday have a set of video-tapes or kinescopes on the major skillbuilding and techniques procedures (taught by experts) or even a complete introductory typewriting course that could materially affect the need for a battery of typing teachers in a large school system.¹³

To lend impetus to television instruction Wood observed:

Television instruction has not run its course. Many districts, in fact, are using it successfully on an expanding basis. Districts need to consider the possibility of making available closed-circuit programs on a growing list of topics, both general and specific. This type of instructional medium will continue to dictate certain layout procedures within the classroom.¹⁴

¹²Robert W. Locke, "The Systems Approach for Preparing Students for Office and Distributive Occupations," "The Emerging Content and Standard of Business Education," National Business Education Yearbook, VIII (National Business Education Association, 1970), p. 280.

¹³Fred S. Cook and Robert E. Wiper, "New Media for Teaching Typewriting," "New Media in Teaching the Business Subjects," National Business Education Yearbook, III (National Business Education Association, 1965), p. 91.

¹⁴Merle W. Wood, "Facilities and Layout," "The Office Practice Program in Business Education," Eastern Business Teachers Association Yearbook, XLIII (Eastern Business Teachers Association, 1969), p. 131.

Swanson, however, cautioned that:

We still have a long way to go before we are in a position to spell out specific criteria based on assumed use of instructional television. One of the nation's experts in the field of educational television, Robert M. Diamond, gives an important caution when he says, 'Unfortunately, instructional television has been oversold, misused, and often the lessons themselves have left much to be desired. Television can help in the improvement of instruction; but to do this, it must be utilized properly and well.'¹⁵

Evelyn Deininger wrote further:

Although it has been slow to come of age, television is an interesting and challenging medium of instruction. Its primary goal is to provide better quality of instruction. Rather than abolish proven techniques of good teaching, television acts to emphasize them. Instructional television serves as a storage medium. By preserving sound and motion, the same lesson can be made available many times. In addition, it is possible to present quality learning situations to many people at the same time. This is most helpful if there is a shortage of qualified teachers and if immobility among learners exists--where students are unable to come to the classroom because of distance or other factors. Schools can share gifted typewriting teachers, thereby bringing expert instruction to many students. . . . The televised teaching of typewriting has much to offer as an integral part of business education. It must be judged fairly on its own merits and without bias.¹⁶

At the University of Miami, Robert M. Diamond wrote that:

Television is only one of a series of new instructional tools available to teachers and, like the others, is only as

¹⁵ Edwin A. Swanson, "Self-Instructional Equipment and Material: Criteria for Evaluating Business and Office Education," National Business Education Yearbook VII (National Business Education Association, 1969), p. 154.

¹⁶ Evelyn Deininger, "Televised Typewriting and Instruction," Type-writing News, (South-Western Publishing Company, Spring, 1971), p. 1.

effective as the care taken in planning and the skill of application Television should and must be considered as one of a series of instructional tools to be utilized for effective teaching. When properly used, instructional television, in its many forms and in its many applications can assist us in becoming more efficient and effective as teachers. Business teachers in many communities are aware of and are using the new media. Few business teachers, however, have written about their experiences. Furthermore, it is difficult to find research studies directly concerned with the teaching of typewriting via these new media. There is a definite need for business teachers not only to use, but also to do research about the advantage and limitations of new machines and materials in the teaching of typewriting.¹⁷

For the foregoing reasons, it seems appropriate to determine what improvements in typewriting instruction through the use of television media can be made to cope with the ever-increasing complexities of modern education. Hopefully teachers of typewriting will find in this study useful suggestions to improve their instruction in the development of both speed and accuracy by using a critical analysis of the recommendations and conclusions that are presented. A further desire is that certain principles may be adaptable to the needs of the different instructional patterns found in the variety of learning institutions.

Definition of Terms

To assist the reader in analyzing the structure and findings of this study, a definition of terms is provided to clarify the intent of the author.

¹⁷Robert M. Diamond, "Television is Business Education: Today and Tomorrow," "New Media in Teaching the Business Subjects," National Business Education Yearbook, III (National Business Education Association, 1965), pp. 67-74.

Speed. --The number of standard words of 1.5 syllable intensity used in five-minute straight copy timed tests and production typing timed tests.

Accuracy. --The number of standard words correctly typed in each five-minute straight copy test and production typing timed test.

Standard Word. --Five typewriter strokes represent one standard word including spacing after words.

Speed Test or Timed Writings. --Typing from straight copy for a five-minute interval.

Production Test. --Typing various letters, business forms, tabulations, etc., for periods of 30 to 50 minutes.

Drill Typing. --Practice and remedial typing materials.

Correct words a minute. --Involves the deduction of only a one word penalty for each error.¹⁸

Net words a minute. --Deduction of a ten-word penalty for each error made during the time before dividing the total standard five-stroke words typed by the time allowed.¹⁹

Gross words a minute. --No error penalty is deducted before total words are divided by the number of minutes typed.²⁰

¹⁸ Mathilde Hardaway, Testing and Evaluation in Business Education, third edition (Cincinnati, Ohio: South-Western Publishing Company, 1966), p. 268.

¹⁹ Ibid., p. 268.

²⁰ Ibid., p. 268.

Mailable words a minute.--This method penalizes a typist for an error by the time it takes him to make a correction--generally 26 seconds.²¹

Production rate a minute.--Production rate is the score obtained on various types of problems or office copy.²²

Five error limit.--The number of errors allowed for a qualifying timed writing.

Basic rate.--A student's word score per minute based on the first timed writing of the quarter.

Improvement Scale.--A scale of improvement based on basic rates assigned to the students.

Techniques.--Correct application by the student while in the process of typing.

Theory.--Correct application of typewriting principles that were discussed in class.

Intermediate Typing.--Assumes previous training in typewriting.

Video Tapes.--Tapes prepared by the Utah State University Business Education Department under the direction of Dr. Lloyd Bartholome correlated with the textbook instruction.

Monitors.--Eight closed-circuit television sets used with the experimental group.

²¹Ibid., p. 269.

²²Ibid., p. 270.

Criterion variable. --The timed writings and production tests used to evaluate the hypotheses.

Analysis of Covariance. --A statistical technique for comparing performance, which provides a measure of control on individual student differences within the comparison groups.

Tabulation. --Listing material in vertical and horizontal columns.

Statistical Typing. --Typing numbers and/or symbols in various problems.

Experimental Group. --The students who have received the majority of their instruction through the utilization of prepared audio-video tapes.

Control Group. --The students who have received instruction by the conventional teacher-directed methods.

Correlation Coefficient. --A measure of relationship between two variables.²³

Validity. --The extent to which the device is good for measuring a specific objective.²⁴

Reliability. --A test that measures consistently whatever it does measure.²⁵

²³N. N. Downie and R. W. Heath, Basic Statistical Methods, third edition (New York, N. Y.: Harper and Row, 1970), p. 101.

²⁴Mathilde Hardaway, op. cit., p. 23.

²⁵Ibid., p. 25.

Delimitations

To better assist the reader in understanding the scope and magnitude of the present study, the delimitations are presented for analysis.

This study was performed at Utah State University, Logan, Utah, during the Spring and Fall Quarters, 1971. Two classes of Intermediate Typewriting were evaluated each quarter. The study was confined to this course of typewriting instruction only.

Intact groups of students were used in the study.

Evaluation of speed and accuracy development was confined to the areas of: straight copy timed writings, tabulation problems, manuscript typing, letter typing, and statistical problem typing.

Limitations

In order to help the reader develop a better appreciation of the results of this study, the following significant limitations have been presented for his convenience:

1. The classes were taught at different hours of the day.
2. Four instructors were utilized in the study.
3. Class size was not equal.
4. Students entered the class with various backgrounds of instruction and experience in typewriting.

5. The experiment was conducted for two quarters only.
6. Evaluation was restricted to speed development and accuracy control.

Summary

The purpose of this study was to compare the relative effectiveness of teaching intermediate typewriting utilizing a system incorporating prepared video tapes with the conventional teacher method of instruction. This achievement was measured by student performance in recording speed and accuracy of typewriting in the areas of straight copy timed writings, manuscript typewriting, letter typewriting, and statistical tabulation problem typewriting.

One experimental group and one control group was used to evaluate speed development and accuracy control in Intermediate Typewriting during the Spring and Fall Quarters, 1971, at Utah State University. The experimental group received instruction through the utilization of prepared video tapes. The control group received instruction through the conventional teacher presentation. In order to eliminate the possibility of individual differences within the comparison groups from influencing the results of the study, the analysis of covariance was employed to statistically treat the data.

Four teachers were used in the study. Each quarter, the teacher alternated between the experimental and control groups in order to control teacher bias within the study. None of the groups involved in the study were informed that an experiment was being conducted as part of their typewriting course.

The organization of the study is as follows: Chapter I presents the Problem, Importance of the Study, Definition of Terms, Limitations, and the Delimitations. Chapter II provides a Review of the Literature and Research pertinent to this study. Chapter III explains the Design and Procedures used in the research. The Analysis and Interpretation of the Data is presented in Chapter IV. Chapter V presents the Summary, Conclusions, Findings, Implications, and the Recommendations of the study.

CHAPTER II
REVIEW OF RELATED LITERATURE

Introduction

The articles and research studies reported in this section are related to the utilization of audio-video aids used in general business education and typewriting instruction. This section presents some of the related research and literature.

There is definitely a concern toward improved use of audio-visual equipment in the teaching field. Bradshaw succinctly described this concern when he said:

A continual concern in an educational system is that teachers should strive to improve the classroom learning situation through the utilization of audio-visual hardware. Studies have been conducted showing that the learning situation is improved by teachers using audio-visual hardware.²⁶

To support this, Robert M. Vooge²⁷ in a Master's Thesis at the University of North Dakota wrote that as times change and conditions change the

²⁶ James Bradshaw, "Utilization of Audio-Visual Hardware by Utah Business Education Teachers," (Unpublished Master's Plan B Report, Utah State University, 1969).

²⁷ Robert Vooge, "A History of Changing Trends and Ideas of Selected Typewriting Equipment and Teaching Aids," (Unpublished Master's Thesis, University of North Dakota, 1966).

typewriting teacher should at least be familiar with new types of equipment and teaching ideas.

The review of literature is divided into two main sections: (1) Audio-Visual Aids in Business Education, and (2) Audio-Visual Aids in Typewriting Instruction.

Audio-Visual Aids in Business Education

Literature is cited in this section to fortify the desire and need for further experimentation and research in the field of audio-visual education. James S. Kinder supported this when he wrote:

Prospective teachers are aware that they must be better educated in the subject in which they plan to teach. They also know that if the older instructional materials are inadequate, and all of the new ones which have passed the test of research and development must be put to use.²⁸

Kathleen Roper reported the following survey in her study:

The purpose of this investigation was to discover what audio-visual aids are available and used in selected Kansas High Schools. This study also attempted to suggest some of the contributions the classroom teacher could make while using audio-visual instructional aids in teaching selected business subjects.²⁹

²⁸ James S. Kinder, Using Audio-Visual Materials in Education (New York: American Book Company, 1965), p. 16.

²⁹ Roper, Kathleen, "The Availability and Usage of Audio-Visual Aids in Selected Kansas High Schools," (Unpublished Master's thesis, Kansas State College, Pittsburg, 1967).

Questionnaires were sent to a selected group of high schools in Kansas for the school year 1966-67. The schools were divided into three categories-- large, small, and medium. Eighty-four schools were selected. Ninety-eight teachers representing 44 schools responded. The questionnaire consisted of a check sheet listing fifteen different audio-visual aids which might be used in high schools.

Roper recommended and concluded that:

1. A study should be made to discover why the available audio-visual aids are not being used too extensively in our schools.
2. Teacher training institutions should prepare teachers for use of audio-visual aids, especially the newer aids.
3. School districts should have in-service audio-visual training for teachers.
4. Prospective and experienced teachers should be made aware of existent legislation concerning federal funds available for the purchase of audio-visual aids and supplies.
5. Business teachers should alert their supervisors to the need for audio-visual aids in their departments.
6. Business teachers should use a wide variety of audio-visual aids to supplement instruction.
7. Business teachers should show creativity in preparation of materials to use with audio-visual aids in all the business subjects.

With more and more audio-visual aids being placed on the market every year, including commercially produced films, tapes, and other devices to use with these aids, it is important that teachers take the initiative and encourage schools to purchase those aids which would be beneficial to the business department.

Teachers must realize, however, that even though the aids are available through use of federal aid, that it is their responsibility to make use of these aids once they are purchased by the schools. In addition, these teachers should make every effort to produce their own audio-visual aids whenever possible and/or feasible.³⁰

McCormick in a study at the University of Iowa made the following conclusion: "The outstanding innovation in recent years in the field of instructional television is the increasing use of video-tape. Video-tape makes it possible to re-run telecasts for subsequent sections and for review and make-up."³¹

Thompson stated:

Teachers of business subjects are finding a need not only to keep pace with the technology of business equipment, but to keep pace with the aids to instruction that are being developed to make classroom instruction more effective... . As professional educators, it is increasingly important to succeed in designing messages which control learning in ways consistent with the objectives of the messages and media. The entire area of communication is unsolved, and the most recent development in audio-visual education points up the area of communication as an area of prime importance.³²

³⁰ Ibid.

³¹ Frank McCormick, "The New Media in Accounting Instruction: A Study of Current Thought and Practice in the University and the Public Junior College" (Unpublished Doctoral dissertation, University of Iowa, 1965).

³² Robert J. Thompson, "Recent Developments in Audio-Visual Education, Recent and Projected Developments Affecting Business Education," National Business Education Yearbook, III (National Business Education Association, 1964), p. 123.

The National Association for Business Teacher Education Bulletin No. 90 of the 1969 Convention Proceedings in a committee study under the title of "Innovative Means for Renewing Business Education: Modular Scheduling, Ungraded Classes, Audio-Instructional Techniques, Computer-Assisted Instruction," recognized the need for the use of television in the teaching of business education by issuing a statement to the effect that:

Education courses state that we must meet the needs of the individual students. How should we do this? We must identify problems related to accomplishing this. Professional educators are charged with the responsibility of maintaining the education that we have. We can solve some of these problems by using multimedia instruction. Media that can be used include audio instruction and video instruction.³³

Charles Duncan recognized the need for further research to improve instruction when he wrote:

Research needs to be studied too; for we must continue to look for better ways, knowing that very likely better ways do in fact exist and that we need to find them. Since each of us has time only for the important, self-guiding research we do in our classes, time must be found to read the formal research reports of what others have done, to study the recommendations and to reject or accept their conclusions.³⁴

³³National Association for Business Teacher Education Bulletin No. 90, "Innovative Means for Renewing Business Education: Modular Scheduling, Ungraded Classes, Audio-Instructional Techniques, Computer-Assisted Instruction," A Committee Report, p. 60.

³⁴Charles Duncan, "Focus on Typewriting--Critical Thinking: Key to Improved Instruction," Business Education Forum (November, 1969), p. 11.

Anna Mahaffey wrote:

With improvements in communication, transportation, manufacturing, and production the quality of instructional material and equipment will improve. The use of more realistic instructional material and equipment is a must. During the next decade, we will use an enormous amount of programmed instructional material, electronic equipment, video-taped material, television, overhead projectors, the project plan of instruction and computerized instruction, in addition to present teaching media.³⁵

Nolan, Hayden, and Malsbary concluded in their book that:

1. The use of audio-visual materials and media enables the teacher to extend his own and his students experience by bringing into the classroom opportunities for learning that students would not usually have.
2. The use of audio-visual materials and media makes possible experiences realistic and that are often taken for real life situations.
3. The use of audio-visual materials and media opens up new fields of interest to students and launches them into a great variety of learning activities.
4. The use of audio-visual materials and media enables the teacher to overcome physical difficulties in the presentation of certain subject matter.
5. The use of audio-visual materials and media enable the teacher to identify and to remedy difficulties and weaknesses in the students' educational experience.³⁶

³⁵ Anna Mahaffey, "Changing Technology Will Affect Business Curriculum," Business Education Forum (December, 1970), p. 61.

³⁶ C. A. Nolan, Carlos K. Hayden, and Dean R. Malsbary, Principles and Problems of Business Education (Cincinnati, Ohio: South-Western Publishing Co., Inc., 1967), p. 321.

Price gives the following advantages for using television in the classroom:

1. Each student has a front row seat.
2. According to recent studies, students learn as much as those taught in the conventional classroom.
3. Television brings the opportunity to use many sources of audio-visual materials to provide richer learning experiences.
4. Cameras can magnify and show more clearly objects or procedures that illustrate instruction.
5. Television brings the good teacher to more students. This is particularly important in some areas where college enrollments continue to grow, and where there are teacher shortages.
6. The teacher has an opportunity to view his own performance by means of video-tape records, thus making possible a self-evaluation which can result in better teaching.
7. Review and refresher courses can be offered in many areas.³⁷

In a research study at Indiana State University, Harrington and Knoblett³⁸ reported as follows:

Much has been said concerning the use of educational television. Some of the comments have been concerned primarily with open circuit television as

³⁷Carol Price, "Television, the 21-inch Classroom," Selected Readings in Business and Office Occupations, "National Business Education Yearbook, V (Washington, D.C.: National Business Education Association, 1967), p. 267.

³⁸Robert Harrington and James Knoblett, "Instructional Closed-Circuit Television: A Case Study," The Journal of Educational Research, 62 (September, 1968), pp. 40-45.

a medium of both formal and informal instruction to a non-institutional mass audience. Others have centered attention upon the potential of a closed-circuit television as a means of formal classroom instruction at the elementary and secondary levels. In this usage, television is seen as a substitute for existing methods of instruction, rather than as a supplement to formal education. Attention has been drawn by still others to the potential value of closed-circuit television as an alternative means of instruction at the university level.

The purpose of this study was to analyze results of an experiment in the use of closed-circuit television teaching at Indiana State University. Specifically, there was an attempt to determine the extent to which, if any, significant differences in performance levels existed between students in a conventional as opposed to a closed-circuit television lecture situation.

Data for the study were compiled from experience with "Introduction to Business," a course designed for all freshmen students declaring a business major or minor. The professor was the same in both the control and experimental groups. In closed-circuit television teaching, it was necessary to have an assistant in each classroom to take roll, to operate television sets, to maintain orderliness, and to administer examinations. Assistants in this experiment did not participate in teaching, and their activities were directed by the professor through conferences and memoranda. Although assistants were not used in the control sections, their limited role in the television sections is believed not to have changed the environment significantly.

Student quality was measured by a predicted GPA, calculated for entering freshmen in terms of (a) high school rank, (b) S. A. T. verbal and mathematical test scores related to achievement level experience at Indiana State University.

Data for the study were collected over a period of four semesters. Excluded from the study were (a) those students for whom no predicted index was available, and (b) those students who withdrew from the course. First and second semesters made up the control groups, in which teaching was of the conventional lecture-discussion type. Third and fourth semesters made up the experimental group, in which teaching was via closed-circuit television.

The conclusions from the study were:

1. Students in the experimental group generally achieve at a lower level than predicted and lower than comparable students in the control group.
2. Differential achievement is greatest in the middle ranges of prediction.
3. Excluding costs of equipment, television instruction becomes less costly per student than conventional instruction with enrollments of 350 and above.

This study indicated that achievement levels will be lower in the televised class than in the conventional class, but this may not always be the case. Also, to conclude that achievement will necessarily be lower than predicted could be erroneous.

Audio-Visual Aids in Typewriting Instruction

In this section, the research and literature is summarized to present the most important material as it applied to typewriting instruction specifically. In addition, research and literature supporting further experimenting and reporting in the area of audio-visual techniques in the teaching of typewriting is cited.

Pasework³⁹ conducted an experiment at New York University to measure the effectiveness of closed circuit television as a medium of learning beginning typewriting. He used two groups--one experimental and one conventional. He administered timed writings at the end of the semester and the results showed that the students who received television instruction types significantly faster than those in the conventional group. They also typed with fewer errors. The students taught by the conventional method, however, were slightly more accurate in production testing.

As the results of the two sections were analyzed, Pasework concluded that:

1. The performance of the experimental groups was superior to the conventional group.
2. The pattern of learning of the conventional group was similar to that of the experimental group.
3. There was no significant difference in students' ability to use typewriting skills to complete a production test.

³⁹William R. Pasework, "The Effectiveness of Television as a Medium of Learning Typewriting," (Unpublished Doctoral Dissertation, New York University, 1956).

4. Television was an effective medium of learning beginning typewriting.

Smith⁴⁰ conducted an experimental study at Holyoke High School in Colorado using closed circuit television. The purposes of this experiment were: (1) to determine if closed circuit television could be used to improve basic skill performance by improving techniques, and (2) to determine the cost of using the closed circuit television equipment.

The equipment used consisted of a television camera, a video tape recorder, and a monitor set. An experimental and control group were used. In the experimental class, the typing techniques of the students were filmed periodically. The control class was not exposed to television equipment. The controls were employed to assure that both classes were handled alike in all other aspects of instruction.

The evaluation consisted of a series of timed writings given approximately every two weeks. Records were kept of each typist's gross words and errors per minute. An analysis based on the findings resulted in the following conclusions:

1. The experimental group was significantly better in both speed and accuracy performance on the final two of the thirteen tests given.
2. From the first test given to the last test given, the experimental group gained significantly more total words per minute typed and gained in accuracy (fewer errors per minute) than the control group.

⁴⁰Sherrilyn B. Smith, *op. cit.*, pp. 39-41.

3. Therefore, on the basis of the findings of this study, typewriting performance, as measured by speed and accuracy, was improved by using television equipment to show students how they could improve typewriting techniques.
4. The cost of the equipment was prorated according to the amount of time of its use. The prorated cost of using the television equipment was \$63.73 per student.

Schuette⁴¹ found that one of the general characteristics desired for a typewriting methods book by a majority of the experienced teachers was a methods book which places a moderate emphasis on recently developed mechanical teaching media, such as instructional tapes, the skill builder, closed circuit television, for the teaching of typewriting.

Crawford⁴² with the assistance of Seymour of Duquense University, conducted a study at Indiana University to determine the effect of television on: (1) typewriting students; (2) the typewriting teacher; and (3) student typewriting performance.

An experimental and control group were used in the experiment. The control group consisted of two teacher-conducted beginning typewriting classes--one taught by each of the two researchers. The experimental group consisted of a television class at Indiana University and a large number of home-viewers

⁴¹Oscar Schuette, "An Identification of Specific Topics and Instructional Procedures with Their Recommended Degree of Emphasis for Inclusion in Typewriting Methods Books," (Unpublished Doctoral Dissertation, University of Denver, 1968).

⁴²T. James Crawford, "Teaching Typewriting by Television," The Balance Sheet (February, 1960), pp. 244-46.

from Eastern Illinois, Northern Kentucky, and approximately two-thirds of Indiana. Crawford simultaneously taught the television studio class monitored on campus and the homeviewers.

After following up this initial investigation with subsequent classes, Crawford drew the following conclusions regarding the effectiveness of television as a medium of typewriting instruction on student performance:

1. Students learned to type and to type well. Those taught by television showed impressive skill for the time invested.
2. There was commendable skill developed by post-retirement-age students as well as by the younger students.
3. Techniques, however, were not so well developed by television students as by non-television students.
4. Students taught by the teachers, personally, did better on all of the tests than those taking instruction via television.
5. Television students reporting to the campus for testing did not do so well as those mailing in their tests.
6. Results achieved by television students were reasonably comparable to those realized in regular classrooms in the same period of time. It was difficult, however, to determine the amount of practice time invested by television students. This conceivably could have influenced the outcomes.

Crawford concluded from this experiment that students of all ages can learn to type via television. However, he noted that there were many limitations using this method. The most important was that: (1) the learner's visual impressions must be good; and (2) the need for the teacher to be present to watch the learner at work is equally crucial. Furthermore, he concluded that

televised instruction cannot be considered a substitute for superior classroom teaching by an individual. However, it can be superior to mediocre classroom performance by mildly interested teachers.

The difficulties in the use of television for teaching are numerous; but colleges, particularly, may be in a position to present televised lessons in many subject areas. The typewriting class is a "natural" for television purposes, using, as it does, demonstration-imitation procedures to a great degree. When typing is taught over television, closeups of a teacher demonstration can be used, and every eye can follow the action.

In addition, Crawford stated the effect of television on students:

1. Students reacted well to television; there was great interest in and curiosity about the program.
2. There was evidence of pride and pleasure in learning to type. Those who learned at home were excited about the convenience of home instruction.
3. Adults became quite enthusiastic about their progress and reported without invitation on their success.
4. Procedures viewed by students were remembered; however, there were many instances in which the performance of the student reflected an incorrect interpretation of the forceful image he had seen.
5. Initial enthusiasm appeared to wane as the course progressed.
6. Television commanded attention--at first. As original student reserve disappeared, there were evidences of great inattention.
7. Visual aids were considerably more vivid via television.

8. The tempo of television seemed too rapid for students not accustomed to working continuously.
9. Though directions were provided effectively via television, disciplinary problems arose in situations where students did not grasp directions quickly.
10. Items to be stressed in demonstrations were received with curiosity when presented over the television network. In many instances, however, the original curiosity did not translate itself into purposeful behavior for the learner.
11. Techniques were not so well developed by television as by personal contact of the teacher. Television-trained students without benefit of supplementary teaching evidenced considerably poorer technique than those taught by a teacher in the classroom.
12. Without the presence of a teacher, students revealed a feeling of not belonging.
13. Adults evidence more "staying power" than the younger students.

One of the most enlightening factors brought out in this study was the effect of television medium on the teacher:

1. Teacher presentations were enhanced by the improved visual aids possible through television.
2. There was good rapport between the television teacher and the students.
3. There seemed to be very little difference in the quality of teacher performance between the two media.
4. The teacher seemed equally at ease in the television studio and in the regular classroom.
5. While there was warmth on the part of the teacher, there was less "personableness" on the television than in the regular classroom.

6. Television eliminated personal teacher-student contacts. Relationships between teacher and student were less personal via television.
7. Television limited the opportunities for the teacher to deal with existing problems. References to problems were generally anticipated rather than actual.
8. The television medium seems particularly well suited to popularizing the successful teaching methods of the teacher.

Poland,⁴³ in a study at Michigan State University, surveyed students in beginning typewriting classes taught by television.

All schools in this survey which offered televised typewriting instruction were public colleges or universities. Commercial television was used in one institution; educational television was used in two schools; and closed circuit television was used in two schools. In one school, classes were taught live; in one, video tapes were used; three schools used both live instruction and video tapes.

Beginning typewriting was offered via television in five schools, intermediate, advanced, and personal-use typewriting were also offered by three schools. In two instances, televised classes were provided solely for students, two schools offered such classes to both students and the public, and one school provided instruction via television for the public only.

⁴³Robert P. Poland, "The Use of Television Instruction in Typewriting," National Business Education Quarterly, XXXIV(Spring, 1966), p. 30.

Conclusions from this study were:

1. Teaching typewriting by television is not widespread in schools which belong to the National Association for Business Teacher Education.
2. Five schools were teaching typewriting courses by television; one school uses television for research purposes only. There were no indications that the number will increase significantly in the future.
3. Three major reasons listed for not teaching typewriting by television were: no television facilities, excessive expense, and staff time required for other courses.
4. The development of experimental video tapes or kine-scopes (films) for use by colleges and universities may be warranted by the number of respondents expressing an interest in them.
5. Several courses other than typewriting were offered in institutions which completed the survey form. Accounting was the course offered most frequently.
6. Students taught by television believed that they learned more by a class taught by television than a class not taught by television.
7. A majority of the students felt there was about the same personal/individual contact in a class taught by television as compared to a class not taught by television.
8. Students felt they were prepared for the television class about the same or a little more as compared with a class not taught by television.
9. A large majority of the students who completed the questionnaire stated that they would choose a typewriting class taught by television over a class not taught by television.

Poland,⁴⁴ in 1970, made the following observations in a review of teaching typewriting via television:

1. Instructors were relieved of much of the routine and many of the details of lesson planning when video tapes were used.
2. If the lessons were well-constructed, they were of the same quality of instruction regardless of the time they were presented.
3. Students preferred televised typewriting instruction and appeared to learn more than they would have in a non-televised class.
4. Through the use of television and well-developed lessons, it appeared that more material could be taught.
5. Today's students are accustomed to television at home and their adjustment to television lessons appeared to be easy.
6. Many of the instructional devices used to teach by television are applicable to regular classroom teaching.
7. A set of video tapes for teaching typewriting would be valuable to other instructional systems.
8. Television is not the educator, it is simply the machine that connects the input (teacher) and the output (student) in our educational process.

Poland continued with:

As a result of the apparent success of teaching typewriting by television and the ability to cover more subject matter without apparently impairing skill development, our

⁴⁴Robert P. Poland, "Televised Typewriting," Michigan State University New Horizons, Prepared for distribution to business teachers in the state of Michigan, April, 1970.

department (Michigan State University) is developing a new series of television tapes and media system in which to use them. Our typewriting courses were reduced from four to three in the new system.

We believe that we have effectively involved television for demonstration purposes, for increasing the effectiveness of instruction, and for aiding in providing instruction for a larger number of students.

Television is the basic core of our new typewriting system of media. Television is used effectively to teach the initial skills, to provide remedial instruction, and to provide a means of further media such as single-concept films, slides, programmed materials, etc. in teaching typewriting classes.

Television provided the basis of a team of instructional planners and producers with which our instructors could improve typewriting instruction.

Mosier and Garrison,⁴⁵ in an article in The Balance Sheet of December, 1970, stated:

Educational media that can be used as effective teaching aids in typewriting according to research and classroom evidence, would be tapes, transparencies, and television. In the classroom, teachers will probably have the use of a portable television camera and monitor, helping the student to analyze his own typing procedures, increasing the effectiveness of demonstrations, and serving as an effective pacing device.

⁴⁵Cecile Mosier and Lloyd Garrison, "The Crystal Ball and Business Education," The Balance Sheet, LII (December, 1970), p. 167.

In writing the introductory editorial for the Business Education Forum of November, 1970, Carrington said that:

Television teaching of typewriting has received much notice, both favorable and unfavorable, by those prominent in the field. To sum up the findings of the majority, however, much has been discovered about the feasibility, acceptability, effectiveness, and appropriateness of television teaching, and generally speaking, the answer was in the affirmative. More research is still in progress. It is important to bear in mind that television is only a medium. It can transmit the bad as well as the good, the mediocre as well as the superior. Consequently, it demands the very best of creative, imaginative talent to do the job well.⁴⁶

In their book, Philosophy and Psychology of Teaching Typewriting, Russon and Wanous⁴⁷ wrote about the use of television in typewriting:

Television has been hailed as the most remarkable medium of the century for communicating ideas to mass audiences. Its possibilities as an educational aid have been looked upon with great optimism. Studies are currently underway which will test the effectiveness of television as a teaching-learning medium. . . .

Giving the advantages and disadvantages, they wrote further:

Teaching typewriting over television, whether by the open-circuit, closed-circuit, or commercial channel, has the possible advantages (1) of providing instruction by a well-prepared and skilled teacher, (2) of providing fast-paced lessons with a minimum of unproductive time, (3) of providing up-to-date information, (4) of providing instruction that is interesting to the viewers, and (5) of instructing a

⁴⁶Carrington, op. cit., p. 7.

⁴⁷Allien R. Russon and S. J. Wanous, "Television," Philosophy and Psychology of Teaching Typewriting (Cincinnati, Ohio: South-Western Publishing Company, Inc., 1960), pp. 276-283.

greater number of viewers than would be possible in a conventional classroom. If the teacher shortage becomes more acute, this advantage may become singularly significant.

There are some disadvantages, too, to the use of television in the teaching of typewriting: (1) Television is expensive when equipment and the salaries of technical personnel and teachers are considered; however, this sum is not quite so impressive when we consider the number of students taught typewriting at the same time by one teacher. (2) The unpredictability of mechanical and technical factors might interrupt the lessons. (3) The onesidedness of the operation, involving students who have no recourse if they are unable to follow the instructions, can result in ineffective learning. (4) There may not be a "master" or willing teacher to teach the course since he would have to compile a "special" set of teaching materials different from those used in a conventional classroom.

In summary, teaching typewriting on television can have a great future. The teacher or administrator interested in this field must, however, be ready for the expenditure of time, energy, and money. The lessons must be regarded as performances, in which the lines must be spontaneous, the timing accurate to the split second, and the "star" relaxed, enthusiastic, and in complete control of the situation.

When and if special lessons of interest to typewriting classes become generally available through educational television, schools should consider making this type of instruction available. In the meantime, commercial television may be expected to bring instructional facilities into homes where many viewers who could not otherwise obtain instruction will be able to acquire typing skill.

Barbara Hoffer as the Chairman of the Typewriting Department at the Berkeley School in East Orange, New Jersey reported that:

Television as an instructional tool is here to stay. Its value as an educational aid in the field of business education has finally been recognized and accepted.

There are many advantages in teaching beginning type-writing with the aid of closed circuit television. Only a few will be mentioned here. First the teacher is relieved of the demanding job of introducing the keyboard to the class. This gives him the opportunity to spend his time helping individual students. He can also observe typing technique very carefully by catching poor habits before they develop.

The next outstanding advantage is that of pacing. Type-writing can be taught successfully only through the art of pacing the students properly, which is one of the most difficult skills an inexperienced teacher must develop. With the help of professionally prepared tapes, the teacher can perfect his ability to pace students according to their needs. It is a time-worn but nonetheless truthful and relevant maxim that it is much better to develop a good habit slowly than a poor habit quickly.

Television is unique as an educational medium because it can utilize every other audio-visual aid that is available--filmstrips, recordings, test keys, and others. One of the techniques used on the tapes was achieved by telecasting practice words on adding machine tape that rotated on the screen at a controlled rate. This is an excellent motivational device, and it has the added advantage of developing the power of concentration in the students.

The time-consuming task of going over back assignments with absentees is completely eliminated when the lessons are recorded on tape. Remedial work is also simplified because the students can review an entire lesson when necessary without monopolizing the instructor's attention or disrupting the regular class period.

With the use of closed-circuit television, all students can be taught by an expert in the field. Moreover, a beginning teacher can learn many fine points about teaching from the television instructor while he is actually teaching his own class.

However, the potential of television instruction in typewriting can be realized and developed only through its continued use in the business education classroom.⁴⁸

James A. Hallam⁴⁹ in a doctoral study at the University of Iowa in 1965 reported in his section on research in business education and typewriting that:

Research is one of the key elements to progress. Business Education needs good research to keep pace with the ever-changing business world.

The problem of the paper was twofold: (1) There is a need to analyze the research which has been done in business education in the past and (2) there is a need to determine what research should be carried out in business education in the future.

There was one category of suggested research on typing in which there were no completed research topics. This was the area of College Typing. The category of Methods of Teaching Typing seemed to be the area of most concern to Business Teachers. This category had the most completed topics and it also had the most suggested problems needing further research.

⁴⁸ Barbara Hoffer, "Television in the Beginning Typewriting Class," The Balance Sheet, LII (March, 1971), pp. 252-253.

⁴⁹ James A. Hallam, "New Dimensions for Research in Business Education as Revealed by a Study of the Titles of Research Completed, 1954-1964, and by an Opinion Survey of a Selected Group of High School and College Business Educators Regarding Recommended Research," (Unpublished Doctoral Dissertation, University of Iowa, 1965).

There were two areas of questions. Under methods of teaching typewriting the following questions were asked:

1. Can we shorten the time necessary to teach typewriting?
2. How does one learn to type?
3. Is there some way in which typing skill could be taught in shorter periods of time?
4. What methods and techniques can be used to shorten the learning period?

In the area of speed and accuracy, the two major questions were:

1. How is typing with both speed and accuracy taught at the same time?
2. How do you develop speed and still maintain accuracy?

Typewriting ranked fourth in the area of need for further research in Business Education. Typewriting was the subject of one hundred suggested problems in the skill course area of business education. Methods of teaching was the subject for twenty-three of the suggested problems in typewriting.

Hallam concluded that:

1. Typewriting is still a problem area to teachers although there have been many research projects carried out concerning typewriting.
2. Teachers are concerned with methods of teaching typewriting.
3. Although most of the completed research studies in typewriting dealt with methods of teaching typewriting, the same area of methods of teaching typewriting had the most problems suggested as being in need of further research.

John F. McCreary⁵⁰ conducted a study on "The Effect of Video Tape Recording Upon Student Self-Analysis in Production Typewriting." His Statement of the Problem, Sources of Data and Methods of Procedure, and Implications as shown in the Alpha Epsilon Newsletter are given in the following paragraphs:

The purpose of this study was to determine the effectiveness of the video tape recorder as a tool for student self-analysis in improving speed and accuracy in a production oriented college typewriting course. Essentially, this study focused upon the typist's own ability to observe and to analyze his proficiency in production typewriting.

Data for this study were collected on the achievement of students employing the video tape recorder as a self-analysis aid for comparison with the achievement of students taught without the video tape recorder as a self-analysis tool. Participants in the study included all students, except for drop-outs and repeaters, enrolled in Office Administration 2130 (the third course in a series of four courses) at the University of Tennessee during the fall, winter, and spring quarters of the 1967-68 academic year. A total of 153 students were involved in this study.

The experimental plan provided one experimental class during each of the three quarters, two control classes in the fall and winter quarters, and one control class in the spring quarter. During the first two weeks of each quarter, a series of six tests--four five-minute straight-copy timed writings, a thirty-minute letter-manuscript test, and a thirty-minute tabulation test--were administered as pretests to all students. Classroom activities for experimental and control classes were held constant throughout the experiment by means of teacher lesson plans similar to those previously used in the course. Students in all classes were encouraged at the

⁵⁰John F. McCreary, "The Effect of Video Tape Recorder Upon Student Self-Analysis in Production Typewriting," (Unpublished Doctoral Dissertation University of Tennessee, 1968) in Alpha Epsilon Newsletter, Research Issue, Volume X, No. 2, Spring 1970, pp. 41-42.

beginning of the course to exercise self-analysis in remedying typewriting inefficiencies. To help the students to pinpoint problem areas, self-evaluation checklists for straight-copy and for production typing were distributed.

Students in the experiment classes were videotaped by their instructor for varying amounts of time on straight-copy timed writings and on production material. On four occasions, students reported for video tape playback sessions in order to make a self-analysis of their typewriting proficiency.

Students in the control classes had scheduled conferences with their instructor. At this time, students would bring completed self-evaluation checklists so that they could discuss areas of improvement with the instructor. During the final two weeks of the course, the original series of six tests was repeated to measure the amount of improvement from pretest to posttest.

Implications, supported by significant findings of six tested hypotheses of the study were:

1. The use of the video tape recorder as a self-analysis tool can be an effective aid in assisting students to become faster typists on straight-copy material without sacrificing accuracy.
2. In letter-manuscript production typewriting, the video tape recorder as a self-analysis tool can be a most effective aid in assisting students to become more productive typists in terms of the amount of material typed and the quality of the finished product.
3. The use of the video tape recorder as a self-analysis tool can be a most effective aid in assisting students to become more productive typists with respect to tabulation production typewriting in terms of the amount of material typed and the quality of the finished product.
4. By using the video tape recorder as a self-analysis tool for the student, the teacher can refresh his instructional methodology, becoming increasingly cognizant of applications for its basic learning principles in typewriting skill development.

Summary

Writings and research studies by prominent business educators on the use of audio-visual aids in the teaching of business subjects, and more specifically the teaching of typewriting, indicate a need for additional research in these two areas.

Experimental research comparing student accomplishment using audio-visual aids and television in the teaching of typewriting has been completed. However, such studies are not numerous when compared to the use of television instruction in general education. Vooge and Kinder recognized this need when they emphasized the fact that typewriting teachers should be familiar with new types of equipment and teaching ideas. Roper's study indicated that equipment is available, however, teachers do not wish to be or are not acquainted with it.

Both McCormick and Thompson supported instructional television as an outstanding innovation in recent years. In Principles and Problems of Business Education, Nolan, Hayden, and Malsbary presented six distinct advantages of the use of educational television. From their research study at Indiana State University, Harrington and Knoblett presented three impressive conclusions concerning the use of educational television in the teaching of general business.

Pasework conducted a most worthwhile experiment at New York University measuring the effectiveness of television as a medium of learning beginning typewriting. He determined that television was an effective learning tool. In a later study to determine improvement of basic skill performance and cost of television

equipment at Holyoke High School, in Colorado, Smith concluded that typewriting performance, as measured by speed and accuracy, was improved by using television equipment to show students how they could improve typewriting techniques.

Crawford's study provided the reader with the effect of television instruction in typewriting on both the student and the teacher. In his conclusions, Crawford wrote that students who received television instruction learned to type and to type well, but students taught by teachers, personally, did better on all of the tests than those taking instruction via television. Crawford also noted that two important limitations to television instruction were: (1) the learner's visual impression must be good; and (2) the need for the teacher to be present to watch the learner at work is equally critical.

Robert P. Poland did an exhaustive survey and follow up at Michigan State University of students in beginning typewriting classes taught by television. He found that the teaching of typewriting by television is not widespread; students preferred televised typewriting instruction and appeared to learn more than they would have in a non-televised class; through the use of television and well-developed lessons, it appeared that more material could be taught; and television is not the educator, it is simply the machine that connects the input (teacher) and the output (student) in our educational process.

Russon and Wanous pointed out that the teaching of typewriting on television can have a great future, but the teacher and administrator must be ready for the expenditure of time, energy, and money. In a most interesting article,

Barbara Hoffer, warned that the potential of television instruction in typewriting can be realized and developed only through its continued use in the business education classroom.

Recognizing the need for further research and an evaluation of the present research in business education, James Hallam, in his study at the University of Iowa, reported that there is a greater need for additional research in college typewriting and that Methods of Teaching Typewriting seemed to be the area of most concern to business teachers.

In reporting the implications of his study of using television as a self-analysis tool conducted at the University of Tennessee, John McCreary found that television can be an effective aid in assisting students to become faster typists without sacrificing accuracy.

Much of the previously completed research and literature has reported the teaching of beginning typewriting by the use of television, self-analysis of certain typewriting techniques using audio-visual means, and surveys and opinions regarding television instruction. There is not very much research and literature available which is more directly applicable to college typewriting and/or intermediate and advanced typewriting on both the high school and college levels. Therefore, there still remains a need for additional research in the teaching of typewriting by audio-visual methods.

Chapter III will present a detailed examination of the procedures utilized in this study and the means of analyzing the data to determine whether or not a

significant difference exists between the learning progress in the teaching of typewriting by audio-visual tapes and the conventional teacher presentation after one quarter of instruction at Utah State University during the Spring and Fall Quarters, 1971.

CHAPTER III
PROCEDURES AND RESEARCH DESIGN

Introduction

Chapter III presents the (1) Methods of Procedures; (2) Course Outline; (3) Testing Program--Reliability and Validity; and (4) The Research Design and the Evaluation Techniques used in developing and analyzing the data for the purpose of comparing achievement between the two systems of teaching.

Methods of Procedures

For this study, one experimental group and one control group was used to evaluate speed development and accuracy in Intermediate Typewriting during the Spring and Fall Quarters, 1971, at Utah State University. The experimental classes received instruction through the utilization of prepared video tapes. The control group received instruction through the conventional teacher presentation. All students in the classes had previous typewriting instruction.

Classroom procedures

A course description was provided to each group outlining the course objectives, lessons to be completed, and the evaluation scale. The text, College Typewriting, 8th ed., Lessenberry, Wanous, and Duncan, South-Western Publishing Company, 1969, was used by both groups with concentration on sections 10 through 22.

Each group used IBM electric typewriters. The warmup portion of each class period was conducted by the teachers of both groups. The warmups consisted of basic typing drills for speed and accuracy development. Discussions of previously completed work were also under the direction of the teachers present in the classrooms. Students in both groups were required to file all classwork materials in a personal folder. Toward the end of the quarter, this folder was checked by the instructors to insure that all work assigned had been completed.

The control group received all instructions and testing in the conventional teacher-controlled manner. The control group completed the same materials as the experimental group. The same instructions and lessons were presented to both classes on the same day. There were no changes in classroom procedures or lessons. In order to limit teacher variability, teacher involved in the study taught both groups--one week with the experimental group and one week with the control group. This assignment was carried out during both the Spring and Fall Quarters.

All lesson instruction in the experimental group was provided by the prepared video tapes which were correlated with the textbook. All the tapes were prepared by the Business Education Department of Utah State University under the direction of Dr. Lloyd Bartholome. Each tape gave a description of the work to be done, speed and accuracy practice, and the assignment for the class period. The time length of the tapes varied from 10 to 20 minutes. The tapes were supplied to the classroom through the central television complex.

There were eight television monitors provided for the experimental group. The teacher was present in the room to help coordinate the materials and answer any questions that arose. As a partial evaluation of the entire program, the experimental group was required to fill out a questionnaire in which they offered their suggestions and recommendations for the improvement of the video tapes. A summary of questionnaire findings is given in Appendix A.

None of the groups participating in the study were made aware that an experiment was taking place. No consideration was given to the Hawthorne Effect. William H. Baker⁵¹ conducted the following study at Brigham Young University pertaining to the Hawthorne Effect:

The purpose of this study was to provide answers to the following questions: (1) When students in a college instruction type of class (a class in which the main purpose is to teach the student ideas, facts, and concepts without any form of manipulative application of the knowledge gained) are told that they are involved in a classroom experiment, will their terminal achievement be affected because of that awareness? (2) When college students are aware that they are involved in an experiment, will they imagine the classroom situation to be different than it actually is because of that awareness? (3) Does the administration of a pretest in a college instruction type class serve as an indirect cue to students that they are involved in an experiment?

⁵¹William H. Baker, "A Study of the Hawthorne Effect in the Classroom Experimentation," (Unpublished Master of Science Thesis, Brigham Young University, 1970).

The method and sources were: (a) Two economics classes participated in the study. (b) The students in the experimental group were told that they were involved in an experiment, but the students in the control group knew nothing of the experimental situation. (c) Both classes were taught by the same teacher, were given identical tests and assignments, and were instructed in as similar a manner as possible. (d) The only known difference in the two groups was that the experimental group knew that they were participating in an experiment, while the other group did not. (e) Both groups were given a pretest and a posttest to reveal any differences in the classroom achievement of the two groups. (f) A paper-and-pencil questionnaire was administered to both student groups to determine the extent to which students were aware of the experiment being conducted.

Baker's Summary of Findings were:

1. When college students in an instruction type class are aware that they are involved in a classroom experiment their study will not be affected by that awareness.
2. When a college student is aware that he is involved in a classroom experiment, he will not imagine the classroom situation to be different than it actually is because of that awareness.
3. The administration of a pretest in a college instruction-type class does not serve as an indirect cue to students that they are involved in an experiment.

Baker's study as well as other literature in the research area tends to disclaim previous evidence that the Hawthorne Effect does provide significant difference in the performance of groups undergoing experimentation.

Course Outline

To enable the reader to better understand the scope of the classroom instruction, a partial course outline is presented.

Course description

Assumes previous training in typewriting. Emphasis on skill building, typing of letters, envelopes, manuscripts, business forms and tabulation exercises. Prerequisite: Elementary Typewriting or equivalent.

Performance objectives

As a result of this course, students should be able to:

1. Demonstrate proficiency of speed and control on the typewriter to the point that specified straight copy scores are achieved on at least three timed writings.
2. Students will be expected to use the following techniques and conditioners of typing:
 - a. Keep eyes on the copy from which typing is being done.
 - b. Sit in a comfortable, relaxed position directly in front of the typewriter with feet flat on the floor.
 - c. Hold elbows in a relaxed, natural position at the sides of the body.
 - d. Keep fingers well curved and upright.
 - e. Use a quick, snap stroke.
 - f. Use uniform stroking pressure behind each key stroke.

3. Improve skill of manipulative parts of the typewriter by demonstration to the instructor of these parts.
4. Erase neatly.
5. Pass with 100 percent accuracy a pre-entry test consisting of fundamental concepts used in elementary typewriting.
6. Type one- and multi-page manuscripts with and without footnotes according to suggested margins and style.
7. Translate and apply common proofreader's marks to various typing jobs.
8. Define the common parts of a business letter.
9. Correctly type business letters in block or modified block style with open or mixed punctuation and various notations and special parts.
10. Correctly type a heading for the second page of a two-page letter.
11. Type letters with carbon copies, erasing neatly on both the original and the carbon copy.
12. Explain the purposes for and correctly type purchase requisitions, purchase orders, invoices, credit memos, statements of account and voucher checks.
13. Correctly type tables without column headings as well as tables with column headings of various widths on full and half sheets of paper.
14. Correctly type tables with horizontally and/or vertically ruled lines.
15. Correctly type tables with main and/or secondary headings.
16. Correctly type letters with tabulated reports.
17. Correctly type letters on half-size stationery.

18. Correctly type letters on executive size stationery.
19. Type assigned skill improvement sheets at least one time.

Outline of lessons

1. Waiver Testing--Theory and timed writings.
2. Parts used to set margins
Inserting and removing paper
Review of keyboard
Impression controls
Raising and lowering horizontal typing line
Ribbon reverse and touch control
Shifting and tabulating review
3. Unit ---Manuscript typing
4. Unit 2--Memorandums, Letters, Envelopes
5. Unit 3--Business Letters with special features
6. Unit 4--Business Forms
7. Unit 5--Tabulation

Testing Program--Reliability and Validity

All test instruments in the experiment were developed by the author. Both groups involved in the experiment during each quarter were given pretests and posttests on straight-copy timed writings, manuscript typing, letter production, and statistical tabulations. These tests are presented in Appendix B.

Both the pretests and the posttests contained the same syllable intensity (1.5) and approximate word length. The pretests were administered at the

beginning of each quarter to both the experimental and control groups. The posttests were given to both groups during each quarter at the end of each unit of instruction in accordance with the course outline.

A brief description of each testing procedure is presented here to provide the reader with additional information:

Straight-copy timed writings

The length of the straight-copy timed writings was five minutes. This test was given after eight weeks of Intermediate Typewriting instruction. Speed building and accuracy drills were stressed during this period of time. The purpose of this test was to measure the mean increase or decrease in gross words per minute and accuracy for the experimental and control groups.

Manuscript typing

The length of the manuscript typing tests was twenty minutes. The students had to determine the margins, center the main heading, and place the footnotes on the proper pages in the correct manner. The posttest in this area was given after four weeks of Intermediate Typewriting instruction. During this period of time the students received training on the correct manuscript typing techniques.

Letter typing

The length of the letter typing tests was fifteen minutes. The students were instructed to continue to type the letter as many times as possible in the

time allotted. The students had to determine margins, correct letter setup and parts placement. An attention line and subject line were used in both tests. The posttest in this area was given after six weeks of Intermediate Typewriting instruction on correct letter typing techniques.

Tabulation typing

The length of the tabulation typing tests was fifteen minutes. The students were instructed to continue to type the problem as many times as possible in the time allotted. The students had to determine both horizontal and vertical placement of the material to be typed. Students received instruction on the correct procedures during this unit of instruction. The posttest was given after ten weeks of Intermediate Typewriting instruction.

With the exception of straight-copy timed writings, all testing was based upon total gross words typed during the time allotted with no penalty for errors. Accuracy was measured based upon the International Typewriting Rules, which are given in Appendix C.

Testing reliability and validity

In order to select good tests, but more importantly, to construct good evaluative instruments for classroom use, it is essential to know and to understand the qualities requisite to a satisfactory evaluation device. The same criteria for judging a good published test are basic to a good teacher-made test, and are applicable to the selection of informal evaluation techniques. A good

test or other evaluative device must possess to a high degree the characteristics of validity, reliability, and objectivity.⁵²

Hardaway contends that:

Validity is the most important single characteristic of a good test. A test is valid when it actually measures what it purports to measure. Validity as applied to evaluation devices means the extent to which the device is good for measuring a specific objective. Validity may be established by analyzing the contents of a test to determine whether the test content--the aggregate of exercises contained in the test--is representative of, and in agreement with, the objective of the course in which the instrument is to be used. Teacher-made tests and evaluation techniques used in the classroom rely on this type of validity almost exclusively. It represents the extent to which the given measure agrees with some previously established criterion measure of the present status of pupil behavior, knowledge, or performance.⁵³

The validity of a test is the extent to which it measures what it is intended to measure. In the case of achievement tests, which are used in the evaluation process, the assessment of validity must rely primarily on the logical appropriateness of the test items to the course instruction.

Regarding validity further, Downie and Heath wrote:

When a test is so constructed that it adequately covers both content and the objectives of a course or part of a course of learning, it is said to have content validity.⁵⁴

⁵²Hardaway, *op. cit.*, pp. 22-25.

⁵³*Ibid.*, pp. 23-25.

⁵⁴N. Downie and R. Heath, Basic Statistical Methods, third edition (New York, N. Y.: Harper and Row, 1970), p. 249.

All testing in the experiment was correlated with the course content and the objectives of the course which were presented earlier in this chapter.

Commenting on testing reliability, Hardaway wrote that:

When a test measures consistently whatever it does measure, it is said to be reliable. It is not necessary that identical scores be earned by each individual on the test and retest, only that a known uniform relationship exists between the two scores. The degree of accuracy of measurement, of course, determines the degree of reliability. If such a uniform relationship exists between the two sets of scores obtained by two administrations of a test (or two different forms of a test), the instrument is consistent in measuring what it does measure and is reliable.⁵⁵

Downie and Heath made the following statements regarding the size of reliability coefficients:

In general, reliability coefficients of well-made tests tend to be high, .90 or above. There is no hard and fast rule that says that any reliability has to be of a certain size before any test or measuring instrument can be useful. Today we look upon reliability as a relative thing, and there are certain areas and certain techniques where reliability coefficients fall well below this .90 and the techniques are still used and found to be very useful. Rating scales are examples of this.

As noted above, the length of any test influences the size of the reliability coefficient for that instrument. Since reliability coefficients are correlation coefficients, they too are greatly affected by the range of scores in the sample on which the reliability correlation is computed. The more homogenous the sample, the lower the reliability coefficient. The size of the reliability coefficient will differ when computations are based upon different samples. Thus no test has a single characteristic reliability coefficient.⁵⁶

⁵⁵ Hardaway, *op. cit.*, pp. 25-26.

⁵⁶ Downie and Heath, *op. cit.*, p. 247.

In the administration manual for the "Typewriting Achievement Tests" developed by the Psychological Corporation for Business Education Achievement Tests and published by Gregg Division of McGraw-Hill Book Company in 1967, the following statement is made:

The reliability of a test concerns the accuracy, or precision, of a test score. A high coefficient of reliability for a test is evidence that the score a student obtains is relatively free of chance errors and is therefore a relatively accurate measure of his ability on that test. A high reliability coefficient also indicates that the test can discriminate small differences in the ability being measured.⁵⁷

To establish a basis for conducting a correlation coefficient for the tests used in the experiment, the pretests and posttests were given to the Intermediate Typewriting Students at Utah State University during the Winter Quarter, 1971.

Hardaway made the following statement regarding the measures of agreement or correlation.

Several measures of agreement or correlation between two variables for the same group of individuals are available to meet different statistical requirements. The purpose of any measure of correlation is to summarize in one numerical term the degree of relationship that exists between two sets of paired scores; that is, the extent to which high, medium, and low values of one variable correspond respectively to high, medium, and low values of the other variable.

⁵⁷ "Typewriting Achievement Tests," Psychological Corporation, Gregg Division of McGraw-Hill Book Company, 1967, p. 22.

The measure of agreement most frequently used with test score data is the product-moment method of correlation devised by Karl Pearson. It can be used appropriately only when the traits that are measured by both sets of scores can be assumed to vary continuously along their respective scales of value. Test score data generally meet this requirement. In situations where the measures of one or both traits must be grouped into descriptive categories, or into not more than two or three value divisions, other methods of correlation must be used.

The Pearson coefficient, designated by "r," measures the variation of one variable in association with the second variable. The coefficient is a measure of the relationship of the standard deviation distances of each pair of scores from the mean of its respective distribution. It is the arithmetic mean of the products of the standard deviation scores (Z scores) for each individual in the group.

The coefficient of correlation may be computed from raw scores yielded by two tests given to the same group of students without grouping the scores into class intervals and preparing a correlation table.

This method utilized the principles of starting from the arbitrary origin of zero and using the mean as the correction. No frequency tables and no correlation table need be prepared. The results are accurate because no grouping errors are introduced. For very small groups, where grouping is impractical or introduces serious errors, this method is definitely recommended.

The formula, which will be recognized as comparable to that used for grouped data follows:

$$r = \frac{\sum XY}{N - (M_x \cdot M_y)} \cdot \frac{\sigma_x \cdot \sigma_y}{\sigma_x \cdot \sigma_y}$$

where

ΣXY is the sum of the products of each pair of scores

M_x is the mean of distribution X obtained from ungrouped scores

M_y is the mean of distribution Y so obtained

σ_x is the standard deviation of distribution X computed from ungrouped scores.

σ_y is the standard deviation of distribution Y so obtained.⁵⁸

The correlation coefficient of the four tests in both speed and accuracy was calculated in the Computer Center at Utah State University. This was accomplished by using the statistical program of IBM Application Program System/360 Scientific Subroutine Package, (360-CM-03X) Version II. The size of the Utah State University Computer Programming Unit is 256K, where 1 K = 1024. The correlation programs run in a partition of 44D. The program used the following I/O devices:

Card Reader--Unit 5

Line Printer--Unit 6

Card Punch--Unit 7

The basic program used disk files 12, 13, and 14.

The manuscript, letter, and statistical tabulation tests were determined on the basis of total gross words typed in the allotted time. The straight-copy timed writings used gross words typed per minute which incorporates the following formula.

⁵⁸Hardaway, *op. cit.*, pp. 438-445.

Total words typed - Length of Test (5 Minutes) -

Total gross words per minute

The testing errors were determined in the following manner:

Speed Tests--one error for each of the following:

- Each incorrectly typed word
- Incorrect spacing
- Failure to indent paragraphs
- Strikeovers

Letters--one error for each of the following:

- Misspelled words
- Incorrect spacing
- Incorrect letter set-up
- Incorrect placement of letter parts

Manuscript--one error for each of the following:

- Misspelled words
- Incorrect spacing
- Incorrect placement of footnotes
- Incorrect centering of heading

Statistical Tabulation--one error for each of the following:

- Misspelled words
- Incorrect horizontal spacing
- Incorrect vertical spacing
- Incorrect columns
- Incorrect columnar headings
- Incorrect centering of headings

Table 1 on the following page presents the correlations of the testing program. The testing correlation coefficients for reliability were all in the .90's. Forty students took both the straight copy timed writings and the manuscript testing with speed reliability coefficients of .96 and .97 respectively.

Table 1. Testing correlation coefficient summary (based on scores by students in intermediate typing at Utah State University, Winter Quarter, 1971).

Test	r_{12}	N	First testing		Second testing		SE_m^b
			Mean	S. D.	Mean	S. D.	
Straight-Copy Speed ^a	.96	40	57.3	11.0	61.2	11.1	2.2
Straight-Copy Accuracy	.82	40	11.4	5.9	8.1	4.8	2.5
Manuscript Speed	.97	40	495.6	108.9	517.3	105.7	18.8
Manuscript Accuracy	.82	40	22.3	10.6	14.8	7.4	4.5
Letter Speed	.93	43	387.9	98.5	426.5	104.0	26.1
Letter Accuracy	.81	43	10.0	4.9	7.5	4.4	2.1
Tabulation Speed	.94	43	182.7	60.2	218.9	71.4	14.7
Tabulation Accuracy	.92	43	4.9	1.4	3.8	1.4	0.4

^aBased on gross words per minute; all other tests based on total gross words typed in allotted time.

^b $SE_m = SD \sqrt{1 - r_{12}}$ where SD is the standard deviation of the test part for the first administration, and r_{12} is the reliability coefficient.

There were 43 students tested on letter speed and tabulation speed with reliability coefficients of .93 and .94.

The accuracy reliability coefficients were slightly lower. Both straight copy timed writings and manuscript accuracy reliability coefficients were .82 with letter accuracy the lowest at .81. Tabulation accuracy reliability coefficient was the highest with a .92.

The mean scores for all speed testing increased from the pretest to the posttest. The mean scores for all accuracy testing decreased from the pretest to the posttest. The raw data is presented in Appendix D.

Sample of the population

Regarding the use of samples of 30 or more in inferential statistics, Tate stated that:

Since the standard error of the [population] mean can be approximated from the sample statistics and since the sampling distribution of the mean tends to be normal in form, it follows that normal curve relationships can be used in making inferences about a population mean, provided the sample is about 30 or more in size.⁵⁹

A further comment in relation to the size of the sample was that of Guilford when he said:

The distinction between large-sample and small-sample statistics is not an absolute one, the one realm emerging into and overlapping the other. If one asks,

⁵⁹Merle W. Tate, Statistics in Education (New York: MacMillan Company, 1955), p. 238.

'How small is N before we have a small sample?' the answers from various sources vary. There is general agreement that the division is in the range of 25-30....⁶⁰

The population sample for this study was:

Experimental Group, Spring Quarter, 1971	40
Control Group, Spring Quarter, 1971	20
Experimental Group, Fall Quarter, 1971	20
Control Group, Fall Quarter, 1971	40

Both Fall groups had larger class enrollment, but only the students who completed the four pre and posttests were used in the study. Total population sample referred to in this study is: Experimental 60; Control 60. Each student in the study was assigned a number to facilitate the processing of the data.

Research Design and Evaluation Techniques

Analysis of covariance

After all the data had been collected, a statistical technique known as the analysis of covariance was employed to make tests for significant differences in achievement in the comparison groups and to allow for the use of intact groups. This technique permits the use of intact groups by compensating for individual differences in mental ability, previous typewriting instruction

⁶⁰ J. Guilford, Fundamental Statistics in Psychology and Education fourth edition (New York: McGraw-Hill Book Company, Inc., 1965), p. 181.

and typewriting aptitude. High or low ability in these capacities could conceivably affect student achievement in typewriting.

Concerning the use of intact groups and the analysis of covariance statistics for educational experiments, Lindquist stated that:

... if a research worker wishes to experiment with school pupils, he frequently must work with classes already organized in the cooperating schools. To recognize the cooperating schools may not be administratively feasible.⁶¹

Peatman commented on the use of intact and unmatched groups in research study when he said:

The impossibility of matching unmatchables does not necessarily present a hopeless situation for research. On the contrary, something quite significant can often be done about it. An unmatchable factor ... can be taken into account when and if relevant information, analogous to the information of a matching variable, is available for random samples of different populations or for numbers of intact groups. In the latter instance, when random sampling is presumably out of the question, any generalization from the results of an experimental investigation would need to be restricted to the intact groups.⁶²

A further discussion of the use of analysis of covariance technique with intact groups by Wert, Neidt, and Ahmann stated that:

If groups are to be compared on the basis of their response to a criterion, and if individual differences among the members within the groups are either known to influence the criterion or suspected of such influence, an attempt must be

⁶¹E. F. Lindquist, Design and Analysis of Experiments in Psychology, and Education (Boston: Houghton-Mifflin Company, 1958), p. 172.

⁶²John Peatman, Introduction to Applied Statistics (New York: Harper and Row, 1962), p. 357.

made to control those individual differences. Such difference might be identified by stratification of the groups or by measurement of attaining a measure of control of individual differences, the statistical technique known as analysis of variance and of regression. In general, it will provide tests of significance for the comparison groups whose members may have been measured with regard to one or more variable characteristics other than the criterion. . . . Individual differences in ability and aptitude known to exist among students are frequently embodied in such research problems and must be considered in the treatment of the data.⁶³

W. James Popham wrote about Analysis of Covariance in his book

Educational Statistics:

If the educational researcher had all the freedom he might wish in such a situation, he could simple manipulate the groups composing self samples by stratified random sampling procedures, so that all subgroups representing the independent variable were equivalent with respect to possible confounding relevant variables. However, this is usually impossible to do in most ongoing school programs. Fortunately, a statistical tool of considerable value known as "Analysis of Covariance" can be employed in such an instance.

Analysis of covariance may be used when a relationship is being studied between a dependent variable and two or more groups representing an independent variable. This powerful technique allows the researcher to "statistically equate the independent variable groups with respect to one or more variables which are relevant to the independent variable." To put it another way, analysis of covariance allows the researcher to study the performance of several groups which are unequal with regard to an important variable as though they were equal in this respect.⁶⁴

⁶³ James Wert, Charles Neidt, and J. Stanley Ahmann, Statistical Methods in Education and Psychological Research (New York: Appleton-Century-Crofts, Inc., 1954), p. 343.

⁶⁴ W. James Popham, Educational Statistics (New York: Harper and Row, 1967), p. 223.

Summary

The treatment of this study is video instruction from prepared tapes in Intermediate Typewriting. The groups receiving the treatment had 60 students, and the control groups also numbered 60. These groups were both enrolled in Intermediate Typewriting during the Spring and Fall Quarters, 1971, at Utah State University.

Because the tests were constructed by the author, a technique of correlation coefficient was conducted to prove test reliability. This information was summarized in Table 1. References of noted authorities in the field were presented to establish test validity and support reliability.

A covariance analysis was applied in order to determine if there was a significant difference at the .05 level of confidence between the experimental group receiving instruction via video prepared television tapes and the control group taught in the conventional teacher directed method. The comparison was based on the speed and accuracy of the four testing areas used in the study.

Chapter IV presents the analysis and interpretation of the data used in the experiment.

CHAPTER IV
ANALYSIS AND INTERPRETATION OF DATA

Introduction

In this study the following null hypotheses were tested for significance at the .05 level:

1. There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.
2. There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.
3. There is no difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.
4. There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.
5. There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

6. There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.

7. There is no difference in letter typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.

8. There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.

Because the experimental and control groups used in this study were composed of intact or administratively organized classes, a statistical procedure known as the analysis of covariance was employed to control or equate individual student differences in factors which might affect achievement in typewriting.

Analysis of Covariance

The analysis of covariance technique was utilized in this study to reduce the possibility of individual student differences from biasing the study in the direction of the group having students with higher levels of ability in these areas. In this study it was necessary to conduct the experiment with classes or students as they were already organized in the university. Therefore, it was

necessary to control or equate individual differences by statistical means rather than by direct selection.⁶⁵

The procedures suggested by Wert, Neidt, and Ahmann⁶⁶ for using the analysis of covariance in experimental situations were followed in this study.

In summary form these steps are described in the following sections:

1. Compute the sums and means of the criterion and control variables in raw score form.
2. Compute the sums of squares and sums of all possible crossproducts.
3. Compute the sums of squares and sums of all possible crossproducts in deviation form for the total sample and for within the two subgroups.
4. Calculate the regression equations for the total sample and for within the two subgroups.
5. Carry out a test of the null hypothesis using the analysis of covariance statistic.
6. When a significant F-value is found, the criterion means of the subgroups must be adjusted by using the within regression equation. This adjustment allows the researcher to determine how each group would have performed on the criterion measure had they been equal at the beginning of the study with respect to abilities and aptitudes on the control measures.

⁶⁵B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill Book Company, Inc., 1962), p. 581.

⁶⁶Wert, Neidt, Ahmann, op. cit., pp. 343-49.

Analysis of Covariance Results

This study took place in the Business Education Department of Utah State University during the Spring and Fall Quarters, 1971. There were four teachers engaged in the study. The experimental groups were taught by prepared video tapes while the control groups received their instruction via the conventional teacher presentation. The total sample size was 120 students. There were 40 experimental and 20 control students during the Spring Quarter and 20 experimental and 40 control during the Fall Quarter.

The final measure utilized for comparing learning programs in the two groups was student performance in the following areas:

Straight Copy Timed Writings--Gross Words Typed Per Minute

Manuscript Typing--Total Gross Words Typed

Letter Typing--Total Gross Words Typed

Statistical Tabulation--Total Gross Words Typed.

Error measurement was based upon error rate rather than absolute errors. The reason for the percent of errors analysis is that one group may have been faster on the pretest and the probability is that they may have been faster on the posttest. This group could have also made a greater number of errors. Therefore, it is necessary to determine whether their percent of errors is greater.

Through the statistical process of Analysis of Covariance, the groups are statistically equated prior to any statements concerning their relative learning progress. This statistical procedure allows the assumption that both groups are equal in typewriting aptitude and ability.

The statistical procedure of analysis of covariance used in this study was conducted at the Utah State University Applied Statistics Department Computer Center. The IBM Application program H 20-0205-3, System/360 Scientific Subroutine Package (360-A-CM-03X) Version III Programmers Manual was used to prepare the program. The size of the CPU is 256K, where 1 K = 1024. The basic analysis of covariance programs was run in 96 K which uses disk files 12, 13, and 14.

The null hypotheses tested in this study are presented in the following order:

Section I--Results of Spring Quarter Speed

Section II--Results of Fall Quarter Speed

Section III--Results of Spring and Fall Speed Combined

Section IV--Results of Spring Quarter Accuracy

Section V--Results of Fall Quarter Accuracy

Section VI--Results of Combined Quarters Accuracy

Section I--Spring Quarter Speed

Straight copy timed writing words

The assessment of differences in achievement on the straight copy timed writings for the Spring Quarter is presented in Table 2.

The table is divided into three distinct areas: Pretest, Posttest, and the Adjusted Analysis. The pre- and posttest parts list the source of variation, degrees of freedom, sum of squares, mean square, the F ratio and the treatment means.

The adjusted analysis part presents the source of variation, degrees of freedom, mean square, the adjusted F ratio, significance value, and the adjusted means.

The following formulas were utilized in determining the degrees of freedom:⁶⁷

$$D. F. \text{ for total} = N-1 = 59$$

$$D. F. \text{ for difference} = n-1 = 1$$

$$D. F. \text{ for within} = D. F. \text{ for total} - D. F. \text{ for the difference} = 58$$

where

N = total number of cases in the sample

n = total number of groups

⁶⁷W. James Popham, op. cit., p. 241.

Table 2. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on straight copy timed writing words per minute

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	8074.850		$F_{1,58} = \frac{226.8750}{135.3099} =$
Within	58	7847.975	135.3099	
Difference	1	226.875	226.8750	1.676*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	53.57	
		Control	57.70	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	10472.73		$F_{1,58} = \frac{88.40}{197.0401} =$
Within	58	10384.33	179.0401	
Difference	1	88.40	88.40	.493*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	60.37	
		Control	62.95	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	38.96446	$F = \frac{38.96446}{31.93916}$	
Regression	1	8563.793		
Error	57	31.93916	1.219*	
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	61.81	
		Control	60.07	

The mean square within value is derived by dividing the within sum of squares by the within degrees of freedom. The difference between the sum of squares for total and within was part of the sum of squares for the total sample. The mean square difference value was obtained by dividing the difference degrees of freedom into the difference sum of squares.

The pretest is presented to show the testing for the difference between the two treatment means on the X (pretest) variable. The posttest is presented to show the testing for the difference between the two treatment means in the Y (posttest) variable. This is actually the unadjusted Y.

The Adjusted Analysis is presented to adjust the posttest scores for the pretest scores and then make a test to see if the adjusted treatment means are equal. The F ratio for this section is derived by dividing the mean square for treatment by the mean square for error.

The adjusting is necessary because it may just happen that most of the better typists were in one group or the other. At the end of the training session these students would have the better scores. However, this would not necessarily reflect the fact that the training method for one group was superior to the other, because no adjustment for the fact that these students had better scores going into the training period was made. For this reason, both groups must be adjusted down to a common starting point (based on their pretest scores), so that their posttest scores reflect the skills they have acquired in their respective training methods, given the fact that they both started on an equal basis.

In many instances the conclusions reached for differences among the means change through the adjustment made for the pretest scores. There may be no difference in the unadjusted means, but a difference in the adjusted means or vice versa, or difference in both, or no differences in both.

The final F-value was then tested for significance in order to accept or reject the null hypothesis. The F-value was tested for significance at the .05 level of significance or that level in which there are only five chances out of one hundred that the result is accidental. The 57 error degrees of freedom and the 1 treatment degree of freedom were employed to look up the .05 F-value in an F-table.⁶⁸

The level of significance required for rejecting the null hypothesis at the beginning of this study was .05. At this level, Wert, Neidt, and Ahmann⁶⁹ stated that the sample mean difference is so great that it would occur in less than 5 percent of the samples from populations in which the mean differences are zero. In similar terms, there are less than five chances in one hundred that such a difference would occur by random fluctuation.

The preceding paragraphs have provided an explanation and an example of the use of the analysis of covariance statistical treatment of data collected in this study for the comparison of two methods of instruction for Intermediate Typewriting.

⁶⁸Popham, *Ibid.*, p. 402.

⁶⁹Wert, et al. *op. cit.*, p. 128.

The adjusted F-value is 1.219 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 61.81 and Control 60.07.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is accepted.

Manuscript typing total gross words

The assessment of difference in achievement on the manuscript typing total gross words for the Spring Quarter is presented in Table 3.

The adjusted F-value is .067 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 640.53 and Control 653.03. In this particular test, the control group showed a regression from the pretest mean to the posttest mean of 15.40 words.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in manuscript typewriting speed between the experimental group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests" is accepted.

Table 3. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on manuscript typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1019057		$F_{1,58} = \frac{182598.0}{14221.70} =$
Within	58	836458.7	14421.70	
Difference	1	182598.3	182598.0	12.66*
*Significant at .05 level $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	599.42	
		Control	716.45	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1855461		$F_{1,58} = \frac{95259.68}{30348.29} =$
Within	58	1760201	30348.29	
Difference	1	95259.68	95259.68	3.14*
*Not significant .05 level of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	616.52	
		Control	701.05	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	1710.032	$F = \frac{1710.032}{25321.94} =$	
Regression	1	316850.1		
Error	57	25321.94		.067*
*Not significant .05 value of $F_{1,57} = 4.00$				
Adjusted Means:				
		Experimental	640.53	
		Control	653.03	

Letter typing total gross words

The assessment of difference in achievement on the letter typing total gross words for the Spring Quarter is presented in Table 4.

The adjusted F-value is .506 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 840.13 and Control 822.83.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen-minute letter typewriting tests" is accepted.

Statistical tabulation typing total gross words

The assessment of difference in achievement on the statistical tabulation problem typing total gross words for the Spring Quarter is presented in Table 5.

The adjusted F-value is 3.26 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 239.54 and Control 217.43.

The control group regressed from a pretest mean of 241.80 to a posttest mean of 229.35. However, the experimental group showed a gain from the pretest mean of 216.84 to a posttest mean of 233.58.

Table 4. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on letter typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.1584684		$F_{1,58} = \frac{.0333333}{27322.14} =$
Within	58	.1584684	27322.14	
Difference	1	.0333333	.0333333	.0000012*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	763.30	
		Control	763.25	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1847878		$F_{1,58} = \frac{4013.633}{31790.76} =$
Within	58	1843864	31790.76	
Difference	1	4013.633	4013.633	.126*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	840.15	
		Control	822.80	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	3991.958	$F = \frac{3991.958}{7874.155} =$	
Regression	1	1395037		
Error	57	7874.155	.506*	
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	840.13	
		Control	822.83	

Table 5. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on statistical tabulation typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	186041.0		$F_{1,58} = \frac{8283.408}{3064.786} =$
Within	58	177757.6	3064.786	
Difference	1	8283.408	8283.408	2.70*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	216.87	
		Control	241.80	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	200634.3		$F_{1,58} = \frac{238.0083}{3455.109} =$
Within	58	200396.3	3455.109	
Difference	1	238.0083	238.0083	.069*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	233.58	
		Control	229.35	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	6227.330	$F = \frac{6227.330}{1910.193} =$	
Regression	1	91515.32		
Error	57	1910.193	3.26*	
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	239.54	
		Control	217.43	

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is accepted.

Section II--Fall Quarter Speed

Straight copy timed writing words

The assessment of difference in achievement on the straight copy timed writing gross words per minute for the Fall Quarter is presented in Table 6.

The adjusted F-value is .00056 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 63.19 and Control 63.18.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is accepted.

Table 6. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on straight copy timed writings words per minute

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	6654.183		$F_{1,58} = \frac{374.5333}{108.2698} =$
Within	58	6279.650	108.2698	
Difference	1	374.5333	374.5333	3.46*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	57.15	
		Control	51.85	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	5082.983		$F_{1,58} = \frac{205.4083}{84.09612} =$
Within	58	4877.575	84.09612	
Difference	1	205.4083	205.4083	2.44*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	65.80	
		Control	61.88	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0014332	$F = \frac{.0014332}{25.47860} =$	
Regression	1	3425.295		
Error	57	25.47860	.000056*	
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	63.19	
		Control	63.18	

Manuscript typing total gross words

The assessment of difference in achievement on the manuscript typing total gross words for the Fall Quarter is presented in Table 7.

The adjusted F-value is .529 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 770.09 and Control 744.95.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty-minute manuscript typewriting tests" is accepted.

Letter typing total gross words

The assessment of difference in achievement on the letter typing total gross words for the Fall Quarter is presented in Table 8.

The adjusted F value is 13.22 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 902.94 and Control 744.95.

The F-test revealed that the criterion means of the comparison groups differed significantly from each other. Therefore, the null hypothesis of "There is no difference in letter typewriting speed between the experimental group and

Table 7. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on manuscript typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1380437		$F_{1,58} = \frac{342187.2}{17900.86} =$
Within	58	1038250	17900.86	
Difference	1	342187.2	342187.2	19.12*
*Significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	786.25	
		Control	626.05	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1666905		$F_{1,58} = \frac{314982.5}{23309.01} =$
Within	58	1351923	23309.01	
Difference	1	314982.5	314982.5	13.51*
*Significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	855.80	
		Control	702.10	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	6335.646	$F = \frac{6335.646}{11986.66} =$	
Regression	1	668683.3	.529*	
Error	57	11986.66		
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	770.09	
		Control	744.95	

Table 8. Assessment of difference between learning progress of prepared video-tape instruction and the conventional teacher instruction for statistical significance on letter typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1367370		$F_{1,58} = \frac{21735.21}{23200.60} =$
Within	58	1345635	23200.60	
Difference	1	21735.21	21735.21	.937*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	724.20	
		Control	683.83	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	1585586		$F_{1,58} = \frac{177485.2}{24277.60} =$
Within	58	1408101	24277.60	
Difference	1	177485.2	177485.2	7.31*
*Significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	926.70	
		Control	811.33	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	832424.77	$F = \frac{83424.77}{6310.025} =$	
Regression	1	1048430		
Error	57	6310.025	13.22*	
*Significant		.05 value of $F_{1,57} = 4.00$		
Adjusted means:		Experimental	902.94	
		Control	823.20	

the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests" is rejected.

Statistical tabulation total gross words

The assessment of difference in achievement on the statistical tabulation total gross words for the Fall Quarter is presented in Table 9.

The adjusted F-value is 2.49 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental 238.55 and Control 217.29.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is accepted.

Section III--Spring and Fall Quarters Combined Speed

Straight copy timed writing words

The assessment of differences in achievement on the straight copy timed writing gross words per minute for the combined Spring and Fall Quarters is presented in Table 10.

The Combined Fall and Spring Quarter Tables are divided into three distinct areas: Pretest, Posttest, and the Adjusted Analysis.

Table 9. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on statistical tabulation total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	256960.4		$F_{1,58} = \frac{13803.07}{4192.368} =$
Within	58	243157.3	4192.368	
Difference	1	13803.07	13803.07	3.29*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	230.85	
		Control	198.67	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	316354.2		$F_{1,58} = \frac{29516.03}{4945.485} =$
Within	58	286838.2	4945.485	
Difference	1	29516.03	29516.03	5.97*
*Significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	255.75	
		Control	208.70	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	5699.894	$F = \frac{5699.894}{2290.301} =$	
Regression	1	156291.0		
Error	57	2290.301	2.49*	
*Not significant .05 value of $F_{1,57} = 4.00$				
Adjusted Means:				
		Experimental	238.55	
		Control	217.29	

Table 10. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance of straight copy timed writing words per minute

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	14782.37		$F_{1,118} = \frac{28.03333}{125.0367} =$
Within	118	14754.33	125.0367	
Difference	1	28.03333	28.03333	.224*
*Not significant Treatment Means:				
		.05 value of $F_{1,118} = 3.92$	Experimental 54.77	
			Control 53.80	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	15669.79		$F_{1,118} = \frac{.0750000}{132.7942} =$
Within	118	15669.72	132.7942	
Difference	1	.0750000	.0750000	.00056*
*Not significant Treatment Means:				
		.05 value of $F_{1,118} = 3.92$	Experimental 62.18	
			Control 62.23	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	24.98225	$F = \frac{24.98225}{33.32463} =$	
Regression	1	11770.74		
Error	117	33.32463	.749*	
*Not significant Adjusted Means:				
		.05 value of $F_{1,117} = 3.92$	Experimental 61.75	
			Control 62.67	

The pretest and posttest parts list the source of variation, degrees of freedom, sum of squares, mean square, the F ratio, and the treatment means.

The adjusted analysis part presents the source of variation, degrees of freedom, mean square, the adjusted F ratio, significance value, and the adjusted means.

The following formulas were utilized in determining the degrees of freedom:

$$D. F. \text{ for total} = N - 1 = 119$$

$$D. F. \text{ for difference} = n - 1 = 1$$

$$D. F. \text{ for within} = D. F. \text{ for total} - D. F. \text{ for difference} = 118$$

where

N = total number of cases in the sample

n = total number of groups

The mean square within value is derived by dividing the within sum of squares by the within degrees of freedom. The difference between the sum of squares for total and within was part of the sum of squares for the total sample. The mean square difference value was obtained by dividing the difference degrees of freedom into the difference sum of squares.

The pretest is presented to show the testing for the difference between the two treatment means on the X (pretest) variable. The posttest is presented to show the testing for the difference between the two treatment means in the Y (posttest) variable. This is actually the unadjusted Y.

The Adjusted Analysis is presented to adjust the posttest scores for the pretest scores and then make a test to see if the adjusted treatment means are equal. The F ratio for this section is derived by dividing the Mean Square for treatment by the Mean Square for error.

The adjusting is necessary because it just may happen that most of the better typists were in one group or the other. At the end of the training session these students would have the better scores. However, this would not necessarily reflect the fact that the training method for one group was superior to the other, because no adjustment for the fact that these students had better scores going into the training period was made. For this reason, both groups must be adjusted down to a common starting point (based on their pre-test scores), so that their posttest scores reflect the skills they have acquired in their respective training methods, given the fact that they both started on an equal basis.

In many instances the conclusions reached for differences among the means change through the adjustment made for the pretest scores. There may be no difference in the unadjusted means, but a difference in the adjusted means or vice versa, or difference in both, or no differences in both.

The final F-value was then tested for significance in order to accept or reject the null hypothesis. The F-value was tested for significance at the .05 level of significance or that level in which there are only five chances out of one hundred that the result is accidental. The 117 error degrees of freedom and

the 1 treatment degree of freedom were employed to look up the .05 F-value in an F-table.

The adjusted F-value is .749 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental 61.75 and Control 62.67.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is accepted.

Manuscript typing total gross words

The assessment of difference in achievement on the manuscript typing total gross words for the combined Spring and Fall Quarters is presented in Table 11.

The adjusted F-value is 1.447 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental 727.19 and Control 704.18.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Table 11. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance of manuscript typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	2449965		$F_{1,118} = \frac{913.0083}{20754.67} =$
Within	118	2449052	20754.67	
Difference	1	913.0083	913.0083	.044*
*Not significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	661.70	
		Control	656.18	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	3207002		$F_{1,118} = \frac{23296.53}{26980.55} =$
Within	118	3183705	26980.55	
Difference	1	23296.53	23296.53	.863*
*Not significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	729.62	
		Control	701.75	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	15873.69	$F = \frac{15873.69}{10967.68} =$	
Regression	1	1900487		
Error	117	10967.68	1.447*	
*Not significant		.05 value of $F_{1,117} = 3.92$		
Adjusted Means:		Experimental	727.19	
		Control	704.18	

Therefore, the null hypothesis of "There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests" is accepted.

Letter typing total gross words

The assessment of difference in achievement on the letter typing total gross words for the combined Spring and Fall Quarters is presented in Table 12.

The adjusted F-value is 1.191 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental 851.61 and Control 832.54.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests" is accepted.

Statistical tabulation typing total gross words

The assessment of difference in achievement on the statistical tabulation problem typing total gross words for the combined Spring and Fall Quarters is presented in Table 13.

Table 12. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance of letter typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	3082734		$F_{1,118} = \frac{47920.03}{25718.77} =$
Within	118	3034814	25718.77	
Difference	1	47920.03	47920.03	1.863*
*Not significant .05 value of $F_{1,118} = 3.92$				
Treatment Means:				
		Experimental	724.20	
		Control	683.83	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	3440594		$F_{1,118} = \frac{86994.68}{28420.34} =$
Within	118	3353600	29420.34	
Difference	1	86994.68	86994.68	3.061*
*Not significant .05 value of $F_{1,118} = 3.92$				
Treatment Means:				
		Experimental	869.00	
		Control	815.15	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	10730.40	$F = \frac{10730.40}{9010.177} =$	
Regression	1	2299409		
Error	117	9010.177	1.191*	
*Not significant .05 value of $F_{1,117} = 3.92$				
Adjusted Means:				
		Experimental	851.61	
		Control	832.54	

Table 13. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance of statistical tabulation typing total gross words

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	450474.8		$F_{1,118} = \frac{2159.008}{3799.286} =$
Within	118	448315.8	3799.286	
Difference	1	2159.008	2159.008	.568*
*Not significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	221.53	
		Control	213.05	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	518805.9		$F_{1,118} = \frac{19329.41}{4232.852} =$
Within	118	499476.5	4232.852	
Difference	1	19329.41	19329.41	4.567*
*Significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	240.97	
		Control	215.58	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	10753.28	$F = \frac{10753.28}{2084.627} =$	
Regression	1	255575.2		
Error	117	2084.627	5.158*	
*Significant		.05 value of $F_{1,117} = 3.92$		
Adjusted Means:		Experimental	237.76	
		Control	218.79	

The adjusted F-value is 5.158 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental 237.76 and Control 218.79.

The F-test revealed that the criterion means of the comparison groups differed significantly from each other. Therefore, the null hypothesis of "There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is rejected.

Section IV--Results of Spring Quarter Accuracy

The error measurement for this paper was based upon error rate rather than absolute errors. Accuracy on the straight copy timed writings is based upon errors divided by words per minute. The other testing errors are reported as errors divided by total gross words.

Douglas, Blanford, and Anderson wrote the following regarding accuracy:

In the more advanced stages of learning, studies of the students' errors have shown that at this stage there is little pattern in the errors. The students do not consistently make the same errors, and authorities are inclined to believe that the typing errors of advanced typists are change errors dependent sometimes upon the nature of the copy, sometimes on the physical condition of the student, sometimes upon noise and other distractions making concentration difficult. . . .

...error allowance increases as the number of words typed a minute increases. It seems only logical to allow a student more errors if he is typing more strokes...⁷⁰

Erickson, in an article written for the 1971 National Business Education Association Yearbook wrote that:

An additional problem, often overlooked by the researchers, is that statistical significance does not necessarily prove a point. The data findings have to be evaluated in terms of their meaningfulness.

Research shows that speed and accuracy are not highly correlated... Typists at all speeds can be found with varying degrees of accuracy. Research on accuracy can be described as murky. An error score on one piece of work is not a particularly good predictor of the error score on the next piece of copy by the same typists.⁷¹

McGraw-Hill in their administration manual for "Typewriting Achievement Tests" made the following statement:

Percent of error is used because it takes into account the number of words typed and is, therefore, a better measure of accuracy than number of errors.⁷²

Straight copy timed writings accuracy

The assessment of difference in achievement on the straight copy timed writings accuracy for the Spring Quarter is presented in Table 14.

⁷⁰Douglas, Blanford and Anderson, op. cit., p. 154 and 173.

⁷¹Lawrence W. Erickson, "The Teaching of Typewriting," "Contributions of Research to Business Education," National Business Education Yearbook, IX (National Business Education Association, 1971), p. 18 and p. 24.

⁷²McGraw-Hill, op. cit., p. 20.

Table 14. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on straight copy timed writing errors

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.5967563		$F_{1,58} = \frac{.0007342}{.0087245} =$
Within	58	.5060220	.0087245	
Difference	1	.0007342	.0007342	.084*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.146	
		Control	.153	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.4099452		$F_{1,58} = \frac{.0023651}{.0070272} =$
Within	58	.4075800	.0070272	
Difference	1	.0023651	.0023651	.336*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.137	
		Control	.150	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0015016	$F = \frac{.0015016}{.0059764} =$	
Regression	1	.0669239		
Error	57	.0059764		.25*
*Not significant .05 value of $F_{1,57} = 4.00$				
Adjusted Means:				
		Experimental	.138	
		Control	.148	

The adjusted F-value is .251 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .138 and Control .148.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is accepted.

Manuscript typing accuracy

The assessment of difference in achievement on the manuscript typing accuracy for the Spring Quarter is presented in Table 15.

The adjusted F-value is 1.31 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .025 and Control .029.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests" is accepted.

Table 15. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on manuscript typing accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0200441		$F_{1,58} = \frac{.0000089}{.0003454} =$
Within	58	.200352	.0003454	
Difference	1	.0000089	.0000089	.26*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.027	
		Control	.028	

<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0150193		$F_{1,58} = \frac{.0002868}{.0002540} =$
Within	58	.0147324	.0002540	
Difference	1	.0002868	.0002868	.011*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.026	
		Control	.029	

ADJUSTED ANALYSIS

Source of variation	Degrees of freedom	Mean square	Adjusted F
Treatment	1	.0002421	$F = \frac{.0002421}{.0018423} =$
Regression	1	.0042309	
Error	57	.0018423	1.31*
*Not significant .05 value of $F_{1,57} = 4.00$			
Adjusted Means:			
		Experimental	.025
		Control	.029

Letter typing accuracy

The assessment of difference in achievement on the letter typing accuracy for the Spring Quarter is presented in Table 16.

The adjusted F-value is .020 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .025 and Control .022.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in letter typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests" is accepted.

Statistical tabulation problem accuracy

The assessment of difference in achievement on the statistical tabulation problem accuracy for the Spring Quarter is presented in Table 17.

The adjusted F-value is .029 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .020 and Control .027.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Table 16. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on letter typing accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0132646		$F_{1,58} = \frac{.0000002}{.0002286} =$
Within	58	.0132644	.0002286	
Difference	1	.0000002	.0000002	.009*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.028	
		Control	.028	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0094235		$F_{1,58} = \frac{.0001625}{.0001597} =$
Within	58	.0092610	.0001597	
Difference	1	.0001625	.0001625	.010*
*Not significant .05 value of $F_{1,58} = 4.00$				
Treatment Means:				
		Experimental	.025	
		Control	.022	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0001692	$F = \frac{.0001692}{.0000847} =$	
Regression	1	.0004432		
Error	57	.0000847		.020*
*Not significant .05 value of $F_{1,57} = 4.00$				
Adjusted Means:				
		Experimental	.025	
		Control	.022	

Table 17. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on statistical tabulation problem accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0116627		$F_{1,58} = \frac{.0007308}{.0001885} =$
Within	58	.0109319	.0001885	
Difference	1	.0007308	.0007308	.039*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.020	
		Control	.028	

<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0131775		$F_{1,58} = \frac{.0010265}{.0002095} =$
Within	58	.0121510	.0002095	
Difference	1	.0010265	.0010265	.049*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.020	
		Control	.027	

ADJUSTED ANALYSIS

Source of variation	Degrees of freedom	Mean square	Adjusted F
Treatment	1	.0005918	$F = \frac{.0005918}{.0002006} =$
Regression	1	.0007144	
Error	57	.0002006	.029*
*Not significant		.05 value of $F_{1,57} = 4.00$	
Adjusted Means:		Experimental	.020
		Control	.027

Therefore, the null hypothesis of "There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is accepted.

Section V--Results of Fall Quarter Accuracy

Straight copy timed writing accuracy

The assessment of difference in achievement on the straight copy timed writing accuracy for the Fall Quarter is presented in Table 18.

The adjusted F-value is 55.309 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .182 and Control .066.

The F-test revealed that the criterion means of the comparison groups differed significantly from each other. Therefore, the null hypothesis of "There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is rejected. Due to confusion in control group post testing, different scores were used as a result of a substitution for the posttests.

Table 18. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on straight copy timed writing accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.9021120		$F_{1,58} = \frac{.0026306}{.0155083} =$
Within	58	.8994814	.0155083	
Difference	1	.0026306	.0026306	.170*
*Not significant Treatment Means:				
		.05 value of $F_{1,58} = 4.00$	Experimental .193	
			Control .179	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.3837080		$F_{1,58} = \frac{.1848816}{.0034280} =$
Within	58	.1988264	.0034280	
Difference	1	.1848816	.1848816	53.932*
*Significant Treatment Means:				
		.05 value of $F_{1,58} = 4.00$	Experimental .183	
			Control .065	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.1787870	$F = \frac{.0032324}{.1787870} =$	
Regression	1	.0145743		
Error	57	.0032324	55.309*	
*Significant Adjusted Means:				
		.05 value of $F_{1,57} = 4.00$	Experimental .182	
			Control .066	

Manuscript typing accuracy

The assessment of difference in achievement on the manuscript typing accuracy for the Fall Quarter is presented in Table 19.

The adjusted F-value is 1.24 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .021 and Control .025.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests" is accepted.

Letter typing accuracy

The assessment of difference in achievement on the letter typing accuracy for the Fall Quarter is presented in Table 20.

The adjusted F-value is .068 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .031 and Control .031.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Table 19. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on manuscript typing accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0204369		$F_{1,58} = \frac{.0010210}{.0003347} =$
Within	58	.0104159	.0003347	
Difference	1	.0010210	.0010210	3.05*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.036	
		Control	.027	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0117149		$F_{1,58} = \frac{.0000462}{.0002011} =$
Within	58	.0116687	.0002011	
Difference	1	.0000462	.0000462	.230*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.022	
		Control	.024	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0002233	$F = \frac{.0002233}{.0001804} =$	
Regression	1	.0013833	1.24*	
Error	57	.0001804		
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	.021	
		Control	.025	

Table 20. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on letter typewriting accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0154818		$F_{1,58} = \frac{.0106744}{.0002485} =$
Within	58	.0144144	.0002485	
Difference	1	.0106744	.0106744	4.30*
*Significant Treatment Means:		.05 value of $F_{1,58} = 4.00$		
		Experimental	.025	
		Control	.039	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0160554		$F_{1,58} = \frac{.0004012}{.0002699} =$
Within	58	.0156542	.0002699	
Difference	1	.0004012	.0004012	1.49*
*Not significant Treatment Means:		.05 value of $F_{1,58} = 4.00$		
		Experimental	.028	
		Control	.033	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0000013	$F = \frac{.0000013}{.0001903} =$	
Regression	1	.0048017		
Error	57	.0001903	.068*	
*Not significant Adjusted Means:		.05 value of $F_{1,57} = 4.00$		
		Experimental	.031	
		Control	.031	

Therefore, the null hypothesis of "There is no difference in letter type-writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests" is accepted.

Statistical tabulation accuracy

The assessment of difference in achievement on the statistical tabulation problem typewriting accuracy for the Fall Quarter is presented in Table 21.

The adjusted F-value is 1.14 compared to the .05 value of the F-value table which is 4.00. The adjusted means presented are: Experimental .039 and Control .033.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is accepted.

Section VI--Spring and Fall Quarters Combined Accuracy

Straight copy timed writing accuracy

The assessment of difference in achievement on the straight copy timed writings accuracy for the combined Spring and Fall Quarters is presented in Table 22.

Table 21. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on statistical tabulation problem typewriting

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0362923		$F_{1,58} = \frac{.0002580}{.0006213} =$
Within	58	.0360343	.0006213	
Difference	1	.0002580	.0002580	1.415*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.032	
		Control	.028	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	59	.0217934		$F_{1,58} = \frac{.0005469}{.0003663} =$
Within	58	.0212465	.0003663	
Difference	1	.0005469	.0005469	1.49*
*Not significant		.05 value of $F_{1,58} = 4.00$		
Treatment Means:		Experimental	.039	
		Control	.033	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0003867	$F = \frac{.0003867}{.0003400} =$	
Regression	1	.0018620		
Error	57	.0003400	1.14*	
*Not significant		.05 value of $F_{1,57} = 4.00$		
Adjusted Means:		Experimental	.039	
		Control	.033	

Table 22. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on straight copy timed writing accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	1.445642		$F_{1,118} = \frac{.002284}{.012232} =$
Within	118	1.443358	.012232	
Difference	1	.002284	.002284	.187*
*Not significant				
Treatment Means:				
		.05 value of $F_{1,118} = 3.92$		
		Experimental	.162	
		Control	.170	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.8341995		$F_{1,118} = \frac{.1032663}{.0061943} =$
Within	118	.8309332	.0061943	
Difference	1	.1032663	.1032663	16.671*
*Significant				
Treatment Means:				
		.05 value of $F_{1,118} = 3.92$		
		Experimental	.152	
		Control	.093	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.1095461	$F = \frac{.1095461}{.0057191} =$	
Regression	1	.0617888		
Error	117	.0057191		19.154*
*Significant				
Adjusted Means:				
		.05 value of $F_{1,117} = 3.92$		
		Experimental	.153	
		Control	.093	

The adjusted F-value is 19.154 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental .153 and Control .093.

The F-test revealed that the criterion means of the comparison groups differed significantly from each other. Therefore, the null hypothesis of "There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings" is rejected. Data included the previously mentioned substitute scores for the posttest of the Fall Quarter.

Manuscript typing accuracy

The assessment of difference in achievement on the manuscript typing accuracy for the combined Spring and Fall Quarters is presented in Table 23.

The adjusted F-value is 1.34 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental .023 and Control .026.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minutes manuscript typewriting tests" is accepted.

Table 23. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on manuscript typewriting accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0407033		$F_{1,118} = \frac{.0002056}{.0003432} =$
Within	118	.0404977	.0003432	
Difference	1	.0002056	.0002056	.60*
*Not significant				
Treatment Means:				
		.05 value of $F_{1,118} = 3.92$		
	Experimental		.300	
	Control		.273	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0269577		$F_{1,118} = \frac{.0001176}{.0002274} =$
Within	118	.0268401	.0002274	
Difference	1	.0001176	.0001176	.517*
*Not significant				
Treatment Means:				
		.05 value of $F_{1,118} = 3.92$		
	Experimental		.024	
	Control		.026	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0002501	$F = \frac{.0002501}{.0001871} =$	
Regression	1	.0049478		
Error	117	.0049478	1.34*	
*Not significant				
Adjusted Means:				
		.05 value of $F_{1,117} = 3.92$		
	Experimental		.023	
	Control		.026	

Letter typing accuracy

The assessment of difference in achievement on the letter typing accuracy for the combined Spring and Fall Quarters is presented in Table 24.

The adjusted F-value is .033 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental .027 and Control .028.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Therefore, the null hypothesis of "There is no difference in letter type-writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests" is accepted.

Statistical tabulation typing accuracy

The assessment of difference in achievement on the statistical tabulation typing accuracy for the combined Spring and Fall Quarters is presented in Table 25.

The adjusted F-value is 1.71 compared to the .05 value of the F-value table which is 3.92. The adjusted means presented are: Experimental .027 and Control .031.

The F-test revealed that the adjusted means of the comparison groups did not differ significantly from each other and did not refute the null hypothesis.

Table 24. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on letter typewriting accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0289961		$F_{1,118} = \frac{.0007482}{.0002394} =$
Within	118	.0282479	.0002394	
Difference	1	.0007482	.0007482	3.13*
*Not significant .05 value of $F_{1,118} = 3.92$				
Treatment Means:				
		Experimental	.027	
		Control	.032	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0271437		$F_{1,118} = \frac{.0003406}{.0002394} =$
Within	118	.0268031	.0002271	
Difference	1	.0003406	.0003406	1.50*
*Not significant .05 value of $F_{1,118} = 3.92$				
Treatment Means:				
		Experimental	.026	
		Control	.029	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0000048	$F = \frac{.0000048}{.0001439} =$	
Regression	1	.0099626		
Error	117	.0001439	.033*	
*Not significant .05 value of $F_{1,117} = 3.92$				
Adjusted Means:				
		Experimental	.027	
		Control	.028	

Table 25. Assessment of difference between learning progress of prepared video tape instruction and the conventional teacher instruction for statistical significance on statistical tabulation typewriting accuracy

<u>PRETEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0493214		$F_{1,118} = \frac{.0003856}{.0004147} =$
Within	118	.0489358	.0004147	
Difference	1	.0003856	.0003856	.930*
*Not significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	.024	
		Control	.028	
<u>POSTTEST</u>				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Total	119	.0395212		$F_{1,118} = \frac{.0007982}{.0003282} =$
Within	118	.0387230	.0003282	
Difference	1	.0007982	.0007982	2.43*
*Not significant		.05 value of $F_{1,118} = 3.92$		
Treatment Means:		Experimental	.026	
		Control	.031	
<u>ADJUSTED ANALYSIS</u>				
Source of variation	Degrees of freedom	Mean square	Adjusted F	
Treatment	1	.0005053	$F = \frac{.0005053}{.0002959} =$	
Regression	1	.0041009		
Error	117	.0002959	1.71*	
*Not significant		.05 value of $F_{1,117} = 3.92$		
Adjusted Means:		Experimental	.027	
		Control	.031	

Therefore, the null hypothesis of "There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests" is accepted.

In further analysing the data, it can be shown that the error rate of the straight copy timed writings may be found by dividing the results by 5. This will give the true error rate. Therefore, the error rates for this testing would be as shown in Table 26.

Table 26. Straight copy timed writing error rates

	Spring quarter		
	Pretest	Posttest	Adjusted analysis
Experimental	.028	.027	.028
Control	.031	.030	.030
	Fall quarter		
	Pretest	Posttest	Adjusted analysis
Experimental	.039	.037	.036
Control	.036	.013	.013
	Combined quarters		
	Pretest	Posttest	Adjusted analysis
Experimental	.032	.030	.031
Control	.034	.019	.019

Results of the Student Evaluation of the

Video-Tape Presentation

The 60 students involved in the experimental group answered an eight question evaluation of the video-tape presentation. The students provided the following evaluations:

Question 1. Did you learn from the tapes?

Above Average to Excellent	60 percent
Average	36 percent
Below Average to Poor	4 percent

Question 2. How would you evaluate the quality of the tapes?

Above Average to Excellent	57 percent
Average	38 percent
Below Average to Poor	5 percent

Question 3. Were the instructions explicit?

Above Average to Excellent	87 percent
Average	13 percent
Below Average to Poor	0 percent

Question 4. Would you recommend the use of video tapes in typing instruction?

Above Average to Excellent	90 percent
Average	7 percent
Below Average to Poor	3 percent

Question 5. How would you rate the TV instructor's voice?

Above Average to Excellent	17 percent
Average	75 percent
Below Average to Poor	8 percent

Question 6. Were the tapes long enough for you to understand the problem explanation?

Above Average to Excellent	60 percent
Average	38 percent
Below Average to Poor	2 percent

Question 7. Is it a good idea to have the student type along with the TV instructor?

Above Average to Excellent	67 percent
Average	18 percent
Below Average to Poor	15 percent

Question 8. Would it be better to have a picture of the finished problem remain on the screen while typing the problem?

Above Average to Excellent	92 percent
Average	5 percent
Below Average to Poor	3 percent

Summary

This chapter presented the analysis and interpretation of the data gathered in the study. The study design incorporated two intact comparison groups for purposes of investigating differences on the criterion variable at the end of one quarter of study. By using the analysis of covariance technique, it was possible to control or allow for individual student differences on selected variables which could affect achievement in typewriting. By statistically controlling these variables in the comparison groups, it was possible to test for unbiased mean differences between the groups.

The Wert, Neidt, and Ahmann procedures for analysis of covariance were followed in this research to test the null hypotheses.

The adjusted F-value was obtained for each of the areas under consideration. Accuracy was analyzed at rate of error rather than absolute error. The F-values were tested for significance at the .05 level of confidence.

In the analysis of covariance, a significant F-value requires that further processing be carried out to determine which group is superior. This consists of adjusting the criterion means up or down in terms of the relative advantage or disadvantage evidenced by scores on the pretests. This adjustment allows the researcher to determine how each group would have performed on the criterion measure had they been equal at the beginning of the study with respect to abilities and aptitudes.

A synthesis of the primary findings of this study, grouped according to the tested hypotheses for each quarter and the combined quarters are:

1. There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Accepted

2. There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Accepted

3. There is no difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.

Spring Quarter--Accepted

Fall Quarter--Rejected

Combined Quarters--Accepted

4. There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Rejected

5. There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

Spring Quarter--Accepted

Fall Quarter--Rejected

Combined Quarters--Rejected

6. There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Accepted

7. There is no difference in letter typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Accepted

8. There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.

Spring Quarter--Accepted

Fall Quarter--Accepted

Combined Quarters--Accepted

Chapter V will present the summary, conclusions, and recommendations for this research study.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The findings of this study were presented and discussed in Chapter IV. This chapter contains a summary of the total research effort, the conclusions regarding the typewriting achievement of the two comparison groups, and the recommendations based on the findings from this study.

Summary

The purpose of this study was to compare the relative effectiveness of teaching intermediate typewriting utilizing a system incorporating prepared video tapes with the conventional teacher method of instruction. It is possible that students instructed by prepared video tapes might accomplish more in one quarter of instruction than those taught by the conventional method of instruction. If such is actually the case, justification exists for incorporating prepared video tapes into the business education curriculum as a means of reducing the time required to learn typewriting.

This experimental research was conducted in the Department of Business Education of Utah State University, Logan, Utah, during the Spring and Fall Quarters, 1971. The statistical population consisted of 120 students. During the Spring Quarter there were 40 students in the Experimental group and 20 in the Control group. There were 20 students in the Experimental group and 40 students in the Control group during the Fall Quarter.

The study was designed to test the following eight null hypotheses for the Spring, Fall, and Combined Spring and Fall Quarters:

1. There is no difference in straight copy speed between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

2. There is no difference in manuscript typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.

3. There is no difference in letter typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.

4. There is no difference in statistical tabulation problem typewriting speed between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.

5. There is no difference in straight copy timed writing accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by five minute straight copy timed writings.

6. There is no difference in manuscript typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by twenty minute manuscript typewriting tests.

7. There is no difference in letter typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute letter typewriting tests.

8. There is no difference in statistical tabulation problem typewriting accuracy between the experimental group and the control group at the end of one quarter of instruction as measured by fifteen minute statistical tabulation problem tests.

The study employed two groups of students who did not have pre-experimental sampling equivalence. The groups available were intact or administratively organized groups within the University. It was, therefore, necessary to equate the groups statistically so that a meaningful and unbiased comparison of the two teaching methods could be carried out.

Statistically equating the groups required that scores be obtained for every student on pretests and posttests in the areas of straight copy timed writings, manuscript typing, letter typing, and statistical tabulation problems. These tests were developed by the author and were correlated with those commonly used to measure achievement in typewriting. Chapter III presented testing validity, reliability, and correlation coefficients for the instruments used.

Both the pretests and the posttests contained the same syllable intensity (1.5) and approximate word length. The pretests were administered at the beginning of each quarter to both the experimental and control groups. The posttests were given to both groups during each quarter at the end of each unit of instruction in accordance with the course outline.

The test scores were then used in the analysis of covariance technique to insure previous typewriting experience, aptitude, and abilities within one of the groups would not bias the results of the study. This measure of student achievement provided scores which were statistically tested for significance at the .05 level. Accuracy was further analyzed for percent of error to show a comparison of any gain in total words typed with the percent of error. The probability exists that the more words typed by a student or group of students the greater the chance for an increase in errors.

Chapter IV presented the statistical procedures followed in the analysis of covariance technique in developing the data from each group to test for significant differences at the .05 level. When a significant difference was found, it was assumed that at least part of this difference was due to the method of instruction. Another part of the difference was due to the variance in previous typewriting experience, aptitude, and abilities. Therefore, an adjustment factor was calculated to equate the comparison groups. This procedure allowed the researcher to determine how each group would have performed on the criterion had they been equal in previous typewriting experience, aptitude, and abilities affecting achievement in typewriting. It was then possible to make statements concerning the relative learning achievement of the two groups. Generalizations from the results of this study are applicable to similar student populations. The conclusions are based on findings from data developed and tested for significance by the analysis of covariance technique.

There were two areas in which the students taught by the prepared video tapes were superior: Fall Quarter Letter Typing Total Gross Words, and Combined Quarters Statistical Tabulation Problem Typing Total Gross Words.

There were two areas in which the students taught by the conventional teacher presentation were superior when measured by total errors: Fall Quarter Straight Copy Timed Writing Accuracy, and the Combined Quarters Straight Copy Timed Writing Accuracy.

However, when the percent of error comparison was used to determine any increase of words typed from the pretest to the posttest against percent of error made by the groups, the experimental group did better in all accuracy areas except the Fall Quarter and Combined Spring and Fall Quarters Timed Writing Straight Copy Accuracy.

There was no significant difference between the Experimental group and the Control group in all other areas of measurement.

Conclusions

As a result of this study, the preformulated null hypotheses were then broken down and evaluated in terms of (1) findings, (2) conclusions based on the findings, and (3) implications of the findings.

Findings

There were four areas of significant difference at the .05 level in the achievement of Intermediate Typewriting after one quarter of instruction.

The Experimental group achieved higher than the Control group during the Fall Quarter in letter typing total gross words and during the Combined Quarters in statistical tabulation total gross words. However, the Experimental group achieved a more significant amount of errors during the Fall Quarter in straight copy timed writing accuracy and during the Combined Quarters in straight copy timed writing accuracy.

At all other areas statistically measured at the .05 level of confidence, there was no significant difference, therefore, the null hypotheses of no difference between the Experimental group and the Control group was accepted in each case.

In analyzing the accuracy data further, it was interesting to note that the error rate ranged from a low of .019 to a high of .036. It appears that the difficulty of the test copy had very little effect upon the accuracy rate of the students.

With the exception of Question 5 (How would you rate the TV instructor's voice?) on the student evaluations of the video-tape presentations, the students reported a high percentage in the above average to excellent category.

Conclusions

1. Students taught by prepared video tapes were superior to those taught by the conventional teacher presentation during the Fall Quarter in letter typing total gross words.

2. Students taught by prepared video tapes were superior to those taught by the conventional teacher presentation during the Combined Quarters in statistical tabulation problem total gross words.

3. Students taught by the conventional teacher presentation were superior to those taught by prepared video tapes during the Fall Quarter in straight copy timed writing accuracy when measured by rate of errors. However, there was some confusion with straight copy timed writings given to the control group. Scores may not have been true indications of what the students could do on the posttest.

4. Students taught by the conventional teacher presentation were superior to those taught by prepared video tapes during the Combined Quarters in straight copy timed writing accuracy when measured by rate of errors. Because of the above, these results may not be a true measurement of the students.

5. There was no significant difference at the .05 level between students taught by prepared video tapes and the conventional teacher presentation in the following areas:

Spring Quarter:	Straight copy timed writing words
	Manuscript typing words
	Letter Typing words
	Statistical tabulation words

Fall Quarter:	Straight copy timed writing words Manuscript typing words Statistical tabulation words
Combined Quarters:	Straight copy timed writing words Manuscript typing words Letter typing words
Spring Quarter:	Straight copy timed writing accuracy Manuscript typing accuracy Letter typing accuracy Statistical tabulation accuracy
Fall Quarter:	Manuscript typing accuracy Letter typing accuracy Statistical tabulation accuracy
Combined Quarters:	Manuscript typing accuracy Letter typing accuracy Statistical tabulation accuracy

6. No matter what difficulty of copy used in the testing program, the error rates of the students seemed to fall closely within the same range.

7. The students in the Experimental group answering an evaluation form pertaining to the video instruction, gave high approval to the use of prepared video tapes as a medium of instruction.

Implications

The results presented in this study imply that:

1. The use of prepared video tapes can be an effective aid in assisting students in the learning of business letter typewriting.
2. The use of prepared video tapes can be an effective aid in assisting students in the learning of statistical tabulation problem typewriting.

3. Because there was no significant difference in the areas of straight copy timed writing words and manuscript typing words, the use of prepared video tapes is just as effective as the conventional teacher presentation instruction.

4. Students, by their answers on the video instruction evaluation sheet, gave an overwhelming support to the use of prepared video tapes as a medium of instruction.

Recommendations

The following recommendations seem justified on the basis of this research study:

1. Business educators at all levels of education must recognize that the use of prepared video tapes are as effective as the conventional teacher presentation instruction in speed development in the areas of straight copy timed writings, manuscript typewriting, letter typewriting, and statistical tabulation problem typewriting.

2. Business educators at all levels of education must recognize that the use of prepared video tapes are an effective means of instruction for accuracy development in the areas of manuscript typewriting, letter typewriting, and statistical tabulation typewriting.

3. Further research is deemed necessary to determine whether the use of prepared video tapes can be effective for larger class size instruction.

4. Further research is deemed necessary to determine to what extent the use of prepared video tapes can provide for more efficient use of the teacher's classroom time and energy.

5. Further research is deemed necessary to determine to what extent the use of prepared video tapes can help the teacher to provide for more effective individualized instruction.

6. Further research is needed to determine justification for the cost of the equipment necessary for the effective use of prepared video tapes in the instructional process.

7. Further research is necessary to determine in what other phases and levels of the teaching of typewriting that prepared video tapes may be effective.

8. Further research should be made on error rate to compare with difficulty of copy that is used in the testing program.

9. Because the students in the Experimental group gave overwhelming support to the use of prepared video tapes as an effective means of instruction, it is recommended that serious consideration be given to incorporating greater use of this medium as a method of instruction.

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APPENDIXES

APPENDIX A

A Composite of the Experimental Groups

Evaluation of Video Tape Instruction

Table 27. A composite of the experimental groups evaluation of video tape instruction

Questions	Evaluation				
	Excellent	Above avg.	Avg.	Below avg.	Poor
Did you learn from the tapes?	6	30	22	2	0
How would you evaluate the quality of the tapes?	4	30	23	2	1
Were the instructions explicit?	28	24	8	0	0
Would you recommend the use of audio- visual tapes in typing instruction?	24	30	4	1	1
How would you rate the TV instructor's voice?	2	8	45	3	2
Were the tapes long enough for you to understand the problem explanation?	12	24	23	1	0
Is it a good idea to have the student type along with the TV instructor?	20	20	11	8	1
Would it be better to have a picture of the finished problem remain on the screen while typing the problem?	45	10	3	2	0

APPENDIX B

Tests Used for Study

Straight Copy Timed Writing--Pre and Posttest--5 Minutes

5 Minute timed writing

1.5 SI

5.6 AWL

80% HFW

Directions: 70 space line. Double spacing. 5 space paragraph indentation.
Encircle all errors. Compute gross words.

Credit is a vital sales tool. Without it, many companies could not stay in business. Often the more credit firms grant, the larger will be their total annual sales. This principle is based on the fact that a credit sale is easier to make than a cash sale. Statistics show that a credit buyer gets more and in larger amounts. A credit customer is usually a steady one. All sales must be profitable, however, and this calls for good business credit. (18/72)

What is credit? It is the ability a buyer has to acquire goods or services from a seller in exchange for his word to pay a specific amount at a specific future time. Thus, firms do not grant credit; they accept it. Companies offer their goods or services. The buyer, on the other hand, either offers cash or his credit. If he offers credit, you either accept or reject his credit and business. Either decision is basically yours to render. (36/90)

Firms, in appraising a buyer as a credit risk, examine him from four angles. The first of these is his character. His former dealings are analyzed and judged. One writer said, "It is more important to know a customer's philosophy than his income. If he is a scoundrel, there is no need to continue." Those who have the desire to pay their bills generally have the ability. Finally, the debtor's memory should be as good as that of the creditor. (54/109)

Manuscript Pretest--20 Minutes

Directions: Type the following unbound manuscript with double spacing and 1 inch margins. Start typing on line 9. Continue typing until time is called. Do not erase errors. No carbons.

FOREIGN TRADE

The major difference between domestic and foreign trade is the extensive control exercised by the Federal Government over commercial transactions with business firms in foreign countries. These controls are imposed in an effort to promote the economic welfare of the country through a favorable balance of payments or the equalization of the dollar value of imports and exports. Chief among the measures used to control foreign exchange are tariffs, trade restrictions, commercial treaties, and reciprocal trade agreements. (108)

The Trade Expansion Act of 1962¹ granted the President considerable power to regulate international trade. Under this Act, the President may reduce or increase certain tariffs up to 50 percent, prohibit the import of items that are causing damage to domestic producers, modify import restrictions, and enter into trade agreements with foreign countries. The Act also provides for monetary relief and technical assistance to companies or groups of workers who are adversely affected by imported goods. (209)

"It is unusual for an American business firm to buy goods directly from a company in a foreign country."² Most foreign goods are purchased through middlemen or agents who specialize in buying goods from foreign merchants. Most American businessmen prefer to deal through middlemen in foreign trade

because it is more convenient to do so. Middlemen are experts in the complex regulations which govern the import of goods. In addition, they are specialists in the language, business customs, laws, and currencies of foreign countries. Although the titles of the agents who deal in international trade differ, their basic purpose is to effect the sale of foreign goods to American business firms. (348)

An import commission agent sells goods shipped on consignment from a foreign country. He does not take title to the goods nor does he assume any of the business risk involved. For his efforts, he receives a commission on the sale of the goods. (402)

An indent house imports foreign goods on the basis of orders received from domestic firms. Requests for price quotations, or indents, are sent to foreign merchants after the agent has received a definite order. The indent house may operate on a commission or fee basis. (461)

An import broker is a middleman who brings a domestic buyer and a foreign seller together and negotiates the sale of goods for a fee. The import broker does not take title to the goods nor does he assume any of the risks involved. After the contract has been negotiated, the domestic buyer imports the goods and arranges for payment directly with the seller. (536)

¹Act passed by United States Congress in 1962 under Presidency of Dwight Eisenhower. (17 words)

²Dale Yoder, Business Management and Industrial Relations (5th ed.; Englewood Cliffs, N.J.: Prentice Hall; I c., 1962), pp. 748-749. (36 words)

Manuscript Posttest--20 Minutes

Directions: Type the following unbound manuscript with double spacing and 1 inch margins. Start typing on line 9. Continuing typing until time is called. Do not erase errors. No carbons.

ABSENTEEISM--A MILLION-DOLLAR HEADACHE

Absence may make the hearts of some people grow fonder, but to American industry, it is nothing but an expensive headache.¹ Although exact figures are not available, conservative estimates place the cost of absences in industry at more than a million dollars each month. This figure represents only salaries paid to absent employees and does not include the cost of the interruption, delay, and rescheduling of work when employees are absent. (92) The first step in the control or reduction of absenteeism is to determine who is absent, for how long, and why. The determination of who and how long are simple administrative matters; the why is more difficult to discover. Yet, no corrective action can or should be taken until the specific causes of absenteeism have been discovered. (93) Even though the causative factors in employee absences will vary from one company to another, numerous studies reveal certain universal causes. "Most common causes of absenteeism are illness and injury, which together account for about one-half of all such absences."² In addition, "the absenteeism may be symptomatic of unsatisfactory working conditions, poor supervisory-employee relations, or bad relations between employees." (94) Sex, age, and time are contributing factors in absenteeism. Women are absent more frequently than men. This difference is usually caused by sickness or family

responsibilities. Younger employees are absent more often than are more mature workers. This, no doubt, reflects the increase in responsibility that normally accrues with age. More absences occur on Monday than on other days of the week. It is not surprising that there are fewer absences on pay day than on any other day of the year. During November and December, because of the Thanksgiving and Christmas holidays, the absenteeism rate is often twice that of other months. (25) Only after the specific causes of absenteeism have been uncovered can corrective action be taken. Unfortunately, negative or punitive measures appear to be most popular in industry today. Efforts made to control absenteeism include reprimands, loss of privileges or wages, suspension, and, in extreme cases, discharge. "Rewards for avoiding absenteeism may be more effective. Some firms, for example, add an extra day of vacation for a perfect 60- or 90 day record." Other positive measures include plaques, certificates, pins, or cash awards for absence-free time. (26) Absenteeism is a complex problem involving innumerable factors. Once the real causes of absences have been uncovered, however, corrective action, positive or negative can be taken to help alleviate this "million-dollar headache." (535 words)

¹Dale Yoder, Personnel Management, (4th Ed.; Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1956), p. 748 (34 words)

²Richard P. Calhoun, Personnel Management and Supervision (New York: Appleton-Century-Crofts, 1967), p. 260 (29 words)

Letter Pretest--15 Minutes

Directions: Modified block style with indented paragraphs; mixed punctuation. Continue to type this letter until time is called. Do not erase errors. No carbons.

November 18, 1971

The Financial News Letter Central Office Building 1660 West Broad
Street Perth Amboy, NJ 08861

Attention: Mr. Charles Lloyd Jefferson, Associate Editor

Gentlemen: Reference: Information about K. L. Martinson Department Stores

(#1) It is a sincere pleasure to furnish to you additional information about the

K. L. Martinson Department Stores that you requested in your letter of

October 20. (#2) the K. L. Martinson Department Stores were founded in

Birmingham, Alabama in 1906. Our only outstanding stock consists of

\$5,223,000 shares of Common Stock. The stock is listed on the New York

Stock Exchange, and you will find the price quoted in most daily papers.

The recent price has been around \$28. (#3) Regular quarterly dividends of

32 cents have been paid in the past two years on the first of the months of

March, June, September, and December, making the total dividend annually

\$1.28 per share. (#4) Our current Annual Report should be completed by

November 31. At that time, I will send you a copy along with a Special Report

of Progress showing the growth of the company during the past ten years. If

you have any questions after reading the material, please do not hesitate to

write to me again. Sincerely yours, Martin L. Thompson, Director of Public

Relations Department (256 words)

Letter Posttest--15 Minutes

Directions: Modified block style with indented paragraphs; mixed punctuation. Continue to type this letter until time is called. Do not erase errors. No carbons.

August 3, 1971

Home Products, Inc., 540 East 14th Street, Des Moines, IA 50316

Attention Mr. Eugene L. Webster, Purchasing Officer

Gentlemen Reference: Your Order #86375

(~~1~~) Your Order #86375 dated June 16 1971 was scheduled for delivery in Des Moines on August 14. The goods were shipped by the manufacturer to Yokohama on July 17 for transshipment via the Pacific Star to San Francisco. Unfortunately, the vessel was delayed for some time by Typhoon Hazel.

(~~2~~) Your order is now due to arrive in San Francisco on August 11. It is anticipated, however, that there will be a delay of approximately three days in discharging cargo because of the recent strike of longshoremen. We plan to ship your order via Pacific Van Lines on August 15 for delivery in Des Moines on August 20. (~~3~~) We regret very much that factors beyond our control have delayed the shipment of your order. If you wish we can arrange to have the goods shipped air express to Des Moines immediately upon receipt. Under these conditions the goods should arrive in Des Moines no later than August 17. Please let us know if you would like us to ship the goods by air so that we may make the necessary arrangements. (~~4~~) We hope that we may have the pleasure of serving you again in the near future. Sincerely yours Carlos X. Rafael President.

(261 words)

Tabulation Pretest--15 Minutes

Directions: Center this problem vertically and horizontally. Allow 8 spaces between columns. Do not erase errors. No carbons. Continue to retype until time is called.

				Words
HOLMES MEDICAL CENTER				4
SCHEDULE OF ACCOUNTS RECEIVABLE				11
May 31, 1971				13
<u>Debtor</u>	<u>Amount Due</u>	<u>Original Amount</u>	<u>Age in Months</u>	17 33
George E. Burkridge	\$ 87.80	\$ 100.00	3	41
Juanita Connors	8.00	8.00	2	49
Edward L. Edwards	15.00	15.00	1	56
Harold S. Isbell	27.00	45.00	18	64
Adam V. Krubinoff	8.00	8.00	2	72
E. Donald Loiseau	250.00	300.00	1	80
Norman M. O'Lafferty	187.60	325.00	9	88
Preston C. Orange	240.00	300.00	6	96
Charles T. Quittman	8.00	8.00	1	104
B. A. Rounciman	92.45	92.45	1	111
Luke Seibert	1.00	22.30	14	118
Walther V. Ubermann	38.60	55.60	8	126
Elizabeth Wilson	15.00	75.00	4	134

Tabulation Posttest--15 Minutes

Directions: Center this problem vertically and horizontally. Allow 8 spaces between columns. Do not erase errors. No carbons. Continue to retype until time is called.

				Words
ANDERSON-ROBEK CARPETS, INC.				6
SCHEDULE OF ACCOUNTS RECEIVABLE				12
June 30, 1971				15
<u>Debtor</u>	<u>Amount Due</u>	<u>Original Amount</u>	<u>Age in Months</u>	19 25
James K. Braemmer	\$ 72.50	\$ 115.50	2	33
Ellis W. Jones	90.00	125.00	2	41
Clark W. Lawson	140.00	140.00	1	48
Patricia Patterson	43.85	93.85	2	57
Mary Recupero	162.35	162.35	1	64
Regent Theater	2,500.00	3,000.00	3	71
St. Mark's Church	1,425.00	1,425.00	1	79
James K. Tuscuero	482.25	482.25	1	87
T. James Walker	612.10	1,000.00	3	95
Claretta Wister	175.00	500.00	5	102
Gary B. Van Ryn	190.35	750.00	4	110
Alan Worpler	72.20	172.20	3	117
David E. Young	8.12	212.12	12	126

APPENDIX C

International Typewriting Rules

International Typewriting Rules

**Note: Not all of these rules are applicable to various typewriting tests.

1. Work must be double-spaced.
2. Paragraphs must be indented five spaces.
3. A space and a punctuation point are treated as parts of the preceding work; but if they are incorrectly made, inserted, omitted, or in any manner changed from the printed copy, an error must be charged unless the preceding word has already been penalized.
4. A dash must be written with two hyphens without spacing before or after.
5. Any word written so close to the top, bottom or side of a sheet, that a portion of any letter is cut off, must be penalized.
6. A word wrongly divided at the end of a line must be penalized.
7. If the outline of any character is discernible, there is no error.
8. Letters transposed in any word constitute an error.
9. No word shall occupy fewer than its proper number of spaces.
10. Characters beginning all lines, except the first lines of paragraphs, must be struck at the same point of the scale.
11. The use of an eraser is not allowed.
12. Every word omitted, inserted, misspelled, or in any manner changed from the printed copy must be penalized.
13. But one error shall be penalized in any one word.
14. If only parts of the proper character appear, an error is charged.

APPENDIX D

Correlation Coefficient Raw Data

Table 28. Speed correlation coefficient raw data

Student no.	*Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1001	48	50	413	421	349	356	131	181
1002	54	56	443	455	341	361	194	229
1003	59	63	531	527	341	351	131	155
1004	58	60	532	497	454	459	236	274
1005	46	53	388	390	351	369	135	140
1006	56	58	472	482	381	495	210	274
1007	54	57	467	499	294	333	155	162
1008	53	56	454	492	413	462	182	241
1009	53	54	399	410	413	421	175	218
1010	61	65	509	529	341	419	182	174
1011	57	57	470	539	267	341	105	106
1012	68	70	551	592	341	372	105	109
1013	43	53	373	376	217	291	155	174
1014	77	80	689	698	363	381	201	219
1015	41	41	313	371	413	381	162	193
1016	54	55	448	465	479	486	229	255
1017	66	70	543	529	307	341	131	155
1018	53	64	587	531	475	571	287	367
1019	56	59	520	545	305	344	124	187
1020	75	77	714	706	267	291	143	156
1021	54	61	434	438	356	374	135	181
1022	82	89	758	778	431	495	225	255
1023	59	67	559	582	387	470	205	248
1024	36	45	485	559	437	429	198	248
1025	63	73	343	382	557	608	267	354
1026	43	45	321	404	361	421	154	200
1027	53	61	474	496	639	683	286	335
1028	53	58	483	489	458	545	199	212
1029	57	59	568	569	278	341	143	212
1030	62	66	526	582	487	512	290	306
1031	60	67	527	573	299	304	137	181
1032	57	59	477	487	391	406	175	204
1033	37	39	324	323	349	390	149	194
1034	77	79	681	680	453	421	188	233
1035	66	70	543	593	387	445	142	212
1036	42	48	404	396	409	373	155	212
1037	65	65	543	561	242	267	120	106
1038	68	69	530	559	526	603	199	218
1039	77	81	735	753	481	583	210	283
1040	50	50	396	439	267	325	154	174
1041	--	--	---	---	351	470	191	212
1042	--	--	---	---	683	701	420	473
1043	--	--	---	---	341	351	142	193

*Based on gross words per minute. All other tests were based upon total gross words typed in time allotted.

Table 29. Accuracy correlation coefficient raw data

Student no.	Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1001	9	4	18	13	6	7	6	5
1002	13	8	23	18	8	8	4	3
1003	6	3	21	8	27	25	4	3
1004	10	5	18	13	3	3	3	2
1005	23	21	37	23	1	1	3	2
1006	16	9	18	19	8	6	6	4
1007	8	6	14	14	10	8	4	4
1008	17	15	45	23	8	6	3	2
1009	6	6	7	4	10	7	6	5
1010	6	6	13	5	14	6	7	6
1011	17	12	25	19	13	7	5	4
1012	5	4	21	15	10	12	4	3
1013	8	8	37	16	2	4	3	2
1014	6	5	13	8	3	1	3	2
1015	8	5	18	8	14	12	6	5
1016	20	15	45	28	10	10	6	4
1017	11	7	24	13	13	10	4	3
1018	24	16	29	24	8	5	7	5
1019	16	13	36	30	12	15	6	6
1020	3	3	6	5	12	12	5	5
1021	26	20	20	20	12	7	3	2
1022	19	4	23	22	14	9	6	5
1023	13	11	26	23	13	8	6	6
1024	18	14	17	6	12	10	2	1
1025	11	12	37	21	3	3	2	1
1026	11	10	37	19	20	8	6	4
1027	13	5	31	20	15	13	7	6
1028	10	7	10	9	13	9	5	3
1029	16	12	38	33	15	14	5	3
1030	9	6	15	9	10	6	4	4
1031	6	6	10	9	13	12	4	3
1032	8	4	5	6	12	5	6	4
1033	12	6	20	10	1	3	4	2
1034	5	5	7	8	11	5	3	2
1035	11	3	21	14	6	4	7	5
1036	6	11	28	13	7	5	4	3
1037	5	2	26	16	7	5	7	6
1038	5	2	24	12	11	7	6	5
1039	3	3	10	4	15	10	7	5
1040	17	12	20	15	8	6	5	4
1041	--	--	--	--	10	4	6	5
1042	--	--	--	--	5	0	6	5
1043	--	--	--	--	9	5	6	5

APPENDIX E

Experimental Group Raw Score Data

Table 30. Experimental group speed raw score data (Fall Quarter, 1971)

Student no.	<u>*Straight-Copy</u>		<u>Manuscript</u>		<u>Letter</u>		<u>Tabulation</u>	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1141	45	57	527	633	512	771	167	179
1142	67	67	1066	898	849	1094	317	271
1143	69	69	872	1047	861	1224	484	620
1144	37	52	582	556	512	742	134	246
1145	56	63	799	822	768	936	167	268
1146	58	72	839	815	782	951	213	264
1147	58	65	752	840	709	862	202	190
1148	56	69	880	770	706	846	248	236
1149	47	54	790	813	681	921	198	252
1150	48	57	723	826	676	816	236	252
1151	48	56	512	660	588	783	206	210
1152	63	69	895	818	864	1086	268	271
1153	58	58	801	757	619	891	211	233
1154	44	58	597	678	457	727	189	189
1155	72	78	1003	1072	805	1044	222	264
1156	53	69	633	819	754	870	167	228
1157	83	86	1168	1193	1024	1044	240	252
1158	73	75	910	1130	880	1010	301	256
1159	58	64	757	1043	781	1044	213	221
1160	50	59	619	926	656	872	234	213

*Based on Gross Words Per Minute. All other tests were based upon total gross words typed in the time allotted.

Table 31. Experimental group accuracy raw score data (Fall Quarter, 1971)

Student no.	<u>Straight-Copy</u>		<u>Manuscript</u>		<u>Letter</u>		<u>Tabulation</u>	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1141	13	26	29	12	15	34	11	10
1142	12	9	38	20	9	26	7	5
1143	1	4	10	15	6	19	14	15
1144	18	14	42	35	37	49	12	14
1145	15	8	43	25	24	39	6	16
1146	11	21	20	13	22	27	5	6
1147	8	14	17	25	17	28	1	8
1148	2	7	13	9	15	18	12	16
1149	7	6	18	11	15	17	2	9
1150	16	14	23	20	11	28	6	11
1151	13	10	44	26	33	24	10	9
1152	20	8	29	17	16	30	12	12
1153	10	6	7	15	7	21	3	5
1154	9	17	5	8	15	13	1	5
1155	5	14	33	23	14	22	5	9
1156	7	11	10	12	9	20	5	7
1157	12	16	12	17	14	17	1	5
1158	8	4	55	23	23	15	17	14
1159	9	16	37	33	19	27	10	12
1160	10	9	43	7	15	23	4	7

Table 32. Experimental group accuracy raw score data (Spring Quarter, 1971)

Student no.	Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1101	8	5	36	23	19	19	2	5
1102	4	5	11	19	25	23	7	4
1103	6	9	11	16	49	54	10	7
1104	2	10	7	7	10	14	4	1
1105	5	5	4	5	10	5	1	0
1106	5	6	16	20	23	15	3	4
1107	10	20	22	18	22	34	6	6
1108	8	7	20	13	9	24	4	2
1109	4	11	16	10	12	19	3	8
1110	5	3	7	5	13	17	2	7
1111	8	5	13	17	20	28	3	4
1112	5	10	10	15	13	15	0	0
1113	8	4	13	17	16	30	1	1
1114	5	8	14	17	18	20	8	12
1115	14	12	47	21	34	30	6	10
1116	2	6	24	15	23	14	4	4
1117	2	6	9	7	18	12	5	3
1118	9	8	14	7	17	8	2	4
1119	10	7	20	16	23	22	2	3
1120	7	7	11	16	22	16	3	2
1121	3	3	4	1	5	13	7	5
1122	7	8	12	15	12	19	3	3
1123	10	10	16	10	19	19	8	4
1124	5	4	7	8	10	17	2	6
1125	22	15	28	44	19	17	7	7
1126	23	6	7	13	28	10	7	3
1127	7	4	29	22	17	13	4	4
1128	5	7	12	4	15	15	2	10
1129	6	4	12	21	13	21	4	4
1130	7	10	8	7	5	7	0	4
1131	5	6	20	21	45	35	9	3
1132	7	5	15	17	13	15	3	3
1133	4	5	7	16	24	14	1	4
1134	11	7	13	21	19	23	6	4
1135	8	15	6	19	11	16	6	4
1136	8	7	20	27	34	37	4	7
1137	6	8	30	15	25	28	12	1
1138	9	15	16	23	29	25	0	5
1139	9	10	10	11	53	30	8	3
1140	9	4	7	5	9	4	3	2

Table 33. Experimental group speed raw score data (Spring Quarter, 1971)

Student no.	*Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1101	35	36	559	473	768	615	190	174
1102	18	24	277	297	272	399	104	126
1103	74	75	461	529	1131	1305	268	378
1104	54	59	589	592	619	808	134	87
1105	37	51	455	408	534	554	190	159
1106	52	59	447	648	619	783	167	213
1107	51	50	543	636	572	738	167	183
1108	43	47	447	392	528	600	190	156
1109	38	41	589	582	595	678	214	183
1110	51	60	589	592	768	876	167	236
1111	53	61	536	725	771	798	167	252
1112	51	68	589	805	768	985	230	252
1113	62	75	591	761	887	1044	134	199
1114	52	59	594	596	730	808	214	236
1115	36	41	380	596	512	568	156	145
1116	38	35	536	377	512	547	206	197
1117	57	80	643	743	875	861	252	369
1118	48	60	586	629	801	829	245	285
1119	46	53	601	641	668	688	167	159
1120	47	53	594	614	686	756	190	227
1121	69	77	672	791	1057	1152	415	403
1122	63	72	714	832	768	957	252	285
1123	49	54	588	592	768	808	317	258
1124	52	53	596	629	681	783	198	220
1125	49	53	599	529	668	675	222	252
1126	64	66	588	641	863	845	218	226
1127	60	63	721	847	851	967	175	205
1128	54	62	599	648	784	829	280	213
1129	54	59	612	623	807	808	206	221
1130	74	89	812	913	961	1152	175	252
1131	74	75	832	1058	1143	1106	281	275
1132	70	75	817	921	899	1122	301	264
1133	61	68	601	783	764	876	175	252
1134	62	60	756	808	841	967	198	267
1135	55	68	742	824	851	906	268	252
1136	49	57	569	529	668	769	183	213
1137	51	53	574	584	756	675	260	277
1138	51	59	642	707	768	845	230	252
1139	63	70	631	744	986	915	268	252
1140	76	95	706	1022	1032	1212	301	288

*Based on gross words per minute. All other tests were based upon total gross words typed in the time allotted.

APPENDIX F

Control Group Raw Score Data

Table 34. Control group raw score speed data (Spring Quarter, 1971)

Student no.	*Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1201	59	76	862	842	817	861	245	236
1202	60	65	651	735	743	808	206	252
1203	77	72	910	865	817	1026	252	126
1204	70	72	915	824	817	876	314	283
1205	47	53	609	632	720	783	302	252
1206	50	54	589	584	668	690	167	190
1207	64	77	767	832	986	861	260	277
1208	64	77	906	783	1046	1044	268	167
1209	51	54	589	633	656	881	214	190
1210	51	65	812	716	790	982	175	250
1211	35	38	583	435	512	537	210	227
1212	58	54	605	610	656	675	206	197
1213	70	75	879	873	1040	999	317	339
1214	66	72	866	759	656	906	301	293
1215	70	75	589	743	765	808	268	213
1216	53	53	647	592	693	738	222	205
1217	58	59	767	725	801	815	260	236
1218	49	53	589	592	643	706	206	221
1219	57	62	605	592	765	815	260	197
1220	45	53	589	654	674	645	183	236

*Based on gross words per minute. All other tests were based upon total gross words typed in the time allotted.

Table 35. Control group accuracy raw score data (Spring Quarter, 1971)

Student no.	Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1201	9	11	36	27	26	16	11	9
1202	5	5	12	11	26	14	5	7
1203	39	15	41	50	37	38	8	7
1204	8	9	19	29	20	16	10	2
1205	10	7	9	20	27	25	10	7
1206	10	4	18	14	10	7	2	4
1207	7	4	17	18	6	15	6	5
1208	5	6	12	12	16	6	4	3
1209	6	16	27	18	24	21	8	7
1210	4	4	18	7	20	17	3	4
1211	5	14	23	23	18	34	2	9
1212	7	2	19	20	23	15	5	8
1213	5	16	19	11	26	21	9	14
1214	7	8	12	21	6	16	7	4
1215	6	5	3	14	21	15	8	3
1216	11	6	29	41	30	16	6	13
1217	5	13	15	15	26	10	15	5
1218	11	17	26	22	16	9	4	7
1219	6	7	13	19	21	23	14	6
1220	12	10	24	8	19	10	2	2

Table 36. Control group speed raw score data (Fall Quarter, 1971)

Student no.	*Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1221	58	68	589	779	768	804	214	159
1222	50	66	639	737	724	997	210	146
1223	54	63	589	638	708	809	220	213
1224	68	86	675	598	924	1055	209	282
1225	54	63	589	606	756	845	209	197
1226	53	61	699	788	622	843	248	277
1227	58	63	698	825	585	910	176	159
1228	54	56	697	766	768	967	242	232
1229	51	66	589	692	705	681	107	162
1230	62	66	689	921	943	1056	252	296
1231	41	51	526	598	606	754	198	210
1232	45	52	573	610	643	620	167	217
1233	43	51	589	599	553	730	170	211
1234	29	47	461	485	433	600	167	183
1235	53	71	679	890	768	1017	268	274
1236	45	56	589	619	512	687	145	197
1237	54	57	704	821	656	769	230	167
1238	68	75	760	1011	1024	1061	268	378
1239	60	70	815	844	724	966	118	107
1240	65	78	748	931	867	1019	175	269
1241	47	50	589	673	662	721	147	159
1242	64	67	697	799	636	819	235	242
1243	53	69	654	688	608	783	198	151
1244	56	68	693	756	768	842	268	252
1245	46	52	589	598	645	753	138	154
1246	49	56	720	803	780	883	272	267
1247	40	67	589	459	491	600	210	160
1248	58	57	589	705	705	873	152	271
1249	49	56	589	730	606	711	154	178
1250	61	67	780	542	628	896	373	287
1251	38	50	589	484	608	798	152	205
1252	55	63	737	664	755	818	193	252
1253	37	52	327	475	456	547	147	161
1254	59	60	605	646	547	587	149	174
1255	66	73	589	803	1004	1044	252	214
1256	60	72	733	904	991	992	300	206
1257	61	65	753	943	802	1020	268	268
1258	38	61	475	618	512	547	134	136
1259	36	57	491	515	408	507	134	134
1260	36	47	357	541	452	522	88	141

*Based on gross words per minute. All other tests were based upon total gross words typed in the time allotted.

Table 37. Control group accuracy raw score data (Fall Quarter, 1971)

Student no.	Straight-Copy		Manuscript		Letter		Tabulation	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1221	12	4	9	38	32	15	3	6
1222	3	5	14	20	20	23	5	2
1223	9	4	6	13	16	15	6	8
1224	2	5	5	11	17	22	3	15
1225	13	5	35	11	37	41	8	11
1226	11	2	17	36	16	35	4	5
1227	9	4	11	10	13	35	4	5
1228	9	3	17	26	24	43	4	6
1229	4	3	9	3	9	3	2	2
1230	1	3	10	18	24	43	4	6
1231	5	4	14	14	15	51	5	9
1232	9	4	20	6	32	11	4	5
1233	6	3	15	30	23	50	3	16
1234	9	5	23	15	16	37	1	18
1235	2	5	10	20	19	29	6	8
1236	7	5	11	11	19	25	1	2
1237	19	3	13	22	31	27	6	1
1238	4	4	35	18	41	44	12	25
1239	16	6	26	16	24	37	3	2
1240	3	5	4	5	11	13	3	12
1241	5	2	6	15	36	16	3	10
1242	12	5	17	9	11	20	4	8
1243	1	4	8	6	16	19	4	6
1244	4	5	14	19	10	17	5	6
1245	3	1	10	10	25	15	4	1
1246	11	2	19	14	16	42	9	12
1247	12	5	19	20	24	24	7	5
1248	19	5	19	16	19	30	2	5
1249	9	6	13	12	19	18	6	2
1250	10	5	30	6	20	26	12	7
1251	28	3	35	15	35	33	9	5
1252	7	3	17	13	9	18	3	4
1253	10	3	9	13	23	21	3	4
1254	11	5	10	11	8	10	1	1
1255	9	2	21	16	43	38	7	7
1256	6	5	27	22	24	22	8	3
1257	9	5	11	10	15	23	4	4
1258	14	2	17	53	42	56	5	7
1259	5	5	35	12	22	15	8	4
1260	10	5	17	22	28	13	15	8

VITA

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Candidate for the Degree of

Doctor of Education

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