A STUDY OF CERTAIN FACTORS INFLUENCING SUCCESS IN THE LEARNING AND ACHIEVEMENT OF SHORTHAND

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ABSTRACT

A STUDY OF CERTAIN FACTORS INFLUENCING SUCCESS IN THE LEARNING AND ACHIEVEMENT OF SHORTHAND

by Evelyn Jane Rittenhouse

Purpose of the Study

This study was concerned with the two most common methods of shorthand teaching: the manual approach representing the science-type and the functional approach representing the language arts. Specifically, it sought to determine the effect of adding shorthand workbook practice (which represents the science-type) to the conventional-type homework practice (which lends itself to the language arts). It also sought to isolate factors within the learner which may affect achievement in shorthand as related to homework practice as well as when homework practice is not considered a factor.

Procedures

The sample for the first part of the study consisted of 74 students enrolled in five classes of beginning shorthand at four colleges. Three of the colleges were on the West Coast, and one was in Michigan. The sample comprising the second part of the study consisted of 222 students from seven colleges representing a cross-section of the United States.

The experimental design used was the Posttest-Only Control Group Design. A control and an experimental group were determined through random selection. Both groups followed the conventional-type homework practice. The experimental factor was the addition of the evolutionary drills from the Gregg Shorthand Workbook (science-type practice) to the homework of the experimental group.

During the final two weeks of the year, three-minute dictation tests were administered to all classes to compare the two sections. In order to determine what psychological factors within the learner may affect shorthand achievement, selected psychological tests were used and student scores on these tests were correlated with achievement as measured by the Dictation Test. The statistical procedures used were analysis of variance and correlation analysis.

Findings

1. There was no significant difference in achievement between students using the evolutionary drills from the Gregg Shorthand Workbook for supplementary homework practice and those using the conventional-type homework practice only.

2. Student performance on each of the following tests--The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference Schedule--did not differentiate between students who learn shorthand more effectively using the conventional homework practice only from those who learn shorthand more effectively using the workbook for supplementary homework practice.

3. There was no significant difference in shorthand achievement between students ranking in the top quartile and those ranking in the lowest quartile on each of the following tests as well as on the battery of tests (regardless of whether they used the workbook or the conventional homework): The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and the selected subtests--order, change, and consistency--on the Edwards Personal Preference Schedule.

Conclusions

The following conclusions were based upon the findings of this study:

1. That adding science-type (workbook practice) to the conventional homework does not significantly affect achievement.

2. That the psychological tests used in this study either singly or as a battery were of no value in differentiating which students would learn shorthand more efficiently by either of the methods--science-type or language arts.

3. That the factors determining shorthand success were not isolated as pertaining to the method or to the learner.

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By

Evelyn Jane Rittenhouse

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ACCEPTANCE

This thesis has been accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in the Graduate School of Michigan State University.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

I. Introduction

The chief characteristic of today's world is rapid change. In such a world those who prepare secretaries dare not remain complacent. The well-qualified secretary must continue to be a master of the requisite technical skills for her job and, in addition, must demonstrate greater breadth of general education, a better understanding of modern office equipment, and increased understanding of accounting and economics than ever before.

Not only is there a need for well-qualified secretaries, but also an insistent demand for more secretaries to be prepared in less time. Since business education departments are charged with this dual responsibility of preparing more and better secretaries, teachers of secretarial studies must either justify the methods they are using or devise more efficient ones.

Shorthand is one of the most important areas in the secretarial curriculum and much study has already been given to methods of teaching this subject. Change and refinement have characterized the history of shorthand methodology. However, further research is needed in order to discover more effective means of teaching and learning this essential skill.

Since the teaching of shorthand was first introduced, two basic approaches have emerged. These are the science-type and the language-arts methods. These two methods are undoubtedly related to the major classifications of learning theory. The science-type method appears to follow the Connectionist's theory of learning while the language-arts approach is related to Gestalt psychology.

In 1889, John Robert Gregg published his system known variously through subsequent years as the "manual," the "anniversary," or the "traditional" method. Because of the heavy emphasis in the early years upon the teaching of rules or generalizations, it has also been labeled the "science method." Other distinctive features of the science-type method are the early introduction of writing and the use of word list tests to ensure theory coverage. The terms "manual," "anniversary," "traditional" and "science-type" all refer to methods of teaching and not to the system itself. The system is Gregg and is essentially the same system, even though there have been certain modifications throughout the years.

From the first, Gregg believed that shorthand should be taught as a skill or an art rather than a science. Although he did not deem the teaching of rules important, he knew that he had to "sell" his system which did not depend upon the teaching of rules to teachers who were familiar with systems that did depend upon rules. Hence, he devised a textbook containing rules, for he could not afford to insist on methods with which the teachers were not accustomed. For nearly forty years, the science-type method dominated the field of shorthand teaching in America.

In 1934, Louis A. Leslie introduced a vastly different approach to the teaching of shorthand--the functional method. This method is frequently referred to as the "language arts" type of teaching because of the emphasis upon meaning extracted from symbols. Leslie explains his method by differentiating between "the art of shorthand writing" and the "science of shorthand." His approach considers shorthand to be skill learning, distinct from knowledge learning. The language-arts learner is taught to automatize the correct shorthand responses without verbalizing or consciously knowing the generalizations or rules. According to Leslie, there are nine points of difference between the manual method and the functional method. The functional method is distinguished for:

1. No writing at the beginning--the reading approach
2. No formal penmanship drills
3. No rules to be taught
4. No questions from or to the students
5. No tests except for administrative purposes
6. No papers to correct except the few tests given for administrative purposes
7. No word lists to be written
8. No formal review
9. No repetition practice[1]

The functional method of teaching has now been in use for over twenty years. While it has many followers, there is still a great deal of controversy regarding its superiority over the manual method. Recently a number of teachers have been taking a new and critical look at the functional method. Crank, Condon, and Liles are among the educators who support a greater emphasis

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[1]Louis A. Leslie, Gregg Shorthand Manual for the Functional Method, Teacher's Handbook (New York: The Gregg Publishing Company, 1936), p. vii.

on theory in teaching beginning shorthand. In stating specific outcomes for first-year shorthand, Crank says that students should develop the theory principles sufficiently to be able to form correct outlines in dictation.[2] While he realizes that first-year students should not be expected to write all outlines correctly during dictation, they ought to be able to write most of them correctly. Class drills on theory principles are necessary to reach this goal. Knowledge of shorthand theory is also valuable in constructing outlines for unfamiliar words.

According to Condon memorizing the rules is not necessary, but a thorough comprehension of the principles is important. He recommends that students write word lists to the point of instant response and suggests that writing word lists in sequence of two or three words will provide more meaningful practice.[3]

Liles believes that one of the major fallacies in shorthand teaching is that knowledge of theory is unnecessary. He does not agree with those business educators who maintain that any shorthand outline that can be transcribed is an acceptable outline. If a student does not have a good knowledge of shorthand theory, valuable time will be spent thinking up outlines while taking dictation. This practice is undesirable for it impedes shorthand progress. Liles emphasizes

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[2]Floyd Crank, "Basic Considerations for First-Year Shorthand," Secretarial Education with a Future, American Business Education Yearbook, XIX (Somerville, N. J.: Somerset Press, 1962), p. 62.

[3]Arnold Condon, "Principles for the Development of Theory and the Building of Writing Skills in First-Year Shorthand," Secretarial Education with a Future, American Business Education Yearbook, XIX (Somerville, N. J.: Somerset Press, 1962), p. 141.

that "correct shorthand will probably contribute more than any other one thing to the ultimate objective--the mailable transcript."[4] The search to determine the best procedures and materials for teaching shorthand must and will continue.

Important as it is to discover the best method of teaching shorthand, it is possible that there are psychological factors within the teacher or the learner which will affect learning success. These factors as well as method must be examined and accounted for. Years ago Tolman[5] suggested that there may be a number of different kinds of learning and that the theory and laws which are appropriate to one kind may well be different from those appropriate to other kinds.

A thoughtful consideration of these differing positions suggest a number of questions which seem to deserve investigation. Can principles derived from learning theory be applied to secretarial teaching? Since shorthand lends itself to two different types of teaching, would it not be possible that each method is suitable to a certain type of teacher or student? Will the student with science-type orientation be more successful when instructed by the "manual" method and the language-arts orientated student do better under the "functional" method of teaching? Or does the key to shorthand achievement lie within the teacher?

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[4]Parker Liles, "Issues in Teaching Shorthand," The Balance Sheet, XLV (October, 1963), p. 52.

[5]Edward C. Tolman, "There Is More Than One Kind of Learning," Psychological Review, LVI (May, 1949), pp. 144-145.

II. Statement of the Problem

Purposes of Study

The primary purpose of this study was to investigate the relative merit of using the evolutionary drills in the Gregg Shorthand Workbook for supplementary homework practice as compared with conventional homework practice only for beginning classes in college shorthand. The evolutionary drills represent the science-type approach to shorthand learning, whereas the conventional method can be either science-type or language-arts but lends itself to language-arts.

The secondary purpose of the study was twofold: (1) to determine the extent, if any, to which learning and achievement in the workbook homework group and in the conventional homework group were affected by selected ability and personality factors; and (2) to determine the extent, if any, to which learning and achievement in shorthand were affected by selected ability and personality factors regardless of whether students used the workbook or the conventional-type homework practice.

This study was designed to seek answers to the following questions:

1. Do students using the evolutionary drills from the workbook for supplementary homework practice do significantly better in shorthand achievement than those following the conventional-type homework practice? (Primary purpose)

2. Do students ranking in the top quartile of the School and College Ability Test (Verbal) do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the workbook for supplementary homework practice? (Secondary purpose 1)

3. Do students ranking in the top quartile of the School and College Ability Test (Verbal) do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the conventional-type homework practice? (Secondary purpose 1)

4. Do students ranking in the top quartile of the School and College Ability Test (Verbal) do significantly better in shorthand achievement than those ranking in the lowest quartile regardless of whether they use the workbook or the conventional-type homework practice? (Secondary purpose 2)

5. Do students ranking in the top quartile of the Test of Critical Thinking do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the workbook for supplementary homework practice? (Secondary purpose 1)

6. Do students ranking in the top quartile of the Test of Critical Thinking do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the conventional-type homework practice? (Secondary purpose 1)

7. Do students ranking in the top quartile of the Test of Critical Thinking do significantly better in shorthand achievement than those ranking in the lowest quartile regardless of whether they use the workbook or the conventional-type homework practice? (Secondary purpose 2)

8. Do students ranking in the top quartile of the Rokeach Dogmatism Scale do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the workbook for supplementary homework practice? (Secondary purpose 1)

9. Do students ranking in the top quartile of the Rokeach Dogmatism Scale do significantly better in shorthand achievement than those ranking in the lowest quartile when they use this conventional-type homework practice only? (Secondary purpose 1)

10. Do students ranking in the top quartile of the Rokeach Dogmatism Scale do significantly better in shorthand than those ranking in the lowest quartile regardless of whether they use the workbook or the conventional-type homework? (Secondary purpose 2)

11. Do students ranking in the top quartile on selected personality subscales of the Edwards Personal Preference Schedule do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the workbook for supplementary homework practice? (Secondary purpose 1)

12. Do students ranking in the top quartile on selected personality subscales of the Edwards Personal Preference Schedule do significantly better in shorthand achievement than those ranking in the lowest quartile when they use the conventional-type homework practice? (Secondary purpose 1)

13. Do students ranking in the top quartile on selected personality subscales of the Edwards Personal Preference Schedule do significantly better in shorthand achievement than those ranking in the lowest quartile regardless of whether they use the workbook or the conventional-type homework practice? (Secondary purpose 2)

Hypotheses to be Tested

The research hypotheses were:

1. There will be a significant difference in shorthand achievement between students using evolutionary drills from the Gregg Shorthand Workbook for supplementary homework practice and those using the conventional-type homework practice only.

2. Student performance on each of the following tests--the School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking--and selected subtests of the Edwards Personal Preference Schedule will significantly differentiate between students who will learn shorthand more effectively using the conventional-type homework practice from those who will learn shorthand more effectively using the workbook for supplementary homework practice.

3. There will be a significant difference in shorthand achievement between students ranking in the top quartile and those ranking in the lowest quartile on each of the following tests as well as on the battery of tests (regardless of whether they use the workbook or the conventional-type homework): The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking and selected subtests of the Edwards Personal Preference Schedule.

These basic hypotheses will be tested as experimental hypotheses in null form in the Analysis of Data in Chapter IV.

Importance of the Study

Many factors contribute to success in shorthand. A search of the literature shows that considerable attention has been given to teaching

effectiveness in the classroom. Comparatively few studies, however, have been concerned with homework practice. Therefore, the first part of this investigation was undertaken to compare the shorthand achievement of students using the workbook for supplementary homework practice with students following the conventional-type homework practice only.

The second and third parts of the study were concerned with isolating factors within the learner and their effect on the shorthand achievement of students using the workbook homework practice and of those using the conventional-type homework practice. An attempt was also made to isolate factors within the learner and their effect on student achievement regardless of the type of homework used.

Shorthand teachers for years have been interested in the selection of students and in the prediction of their success. At the present time there is no single prognostic instrument that offers a definite prediction for success in shorthand. To date, English grades and total grade point average appear to be the factors which show the greatest promise as predictors. According to Anderson, investigations in which a combination of factors are studied may give more valuable findings than studies of single factors. She also suggests the use of personality variables as possible predictors of shorthand success as the present findings are both limited and inconclusive.[6] It is recognized that affective or noncognitive variables influence academic behavior and achievement as well as cognitive variables. It may be that personality characteristics, since they

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[6]Ruth I. Anderson, "An Analysis and Classification of Research in Shorthand and Transcription" (unpublished Doctor's thesis, Indiana University, 1946), pp. 645-733.

measure a different dimension than academic potential, will aid in the predictive process.

Definitions of Terms

The following terms are defined briefly as used in the study:

Evolutionary drills. Isolated words and derivative found in the Gregg Shorthand Workbook.

Supplementary homework practice. Homework practice using the evolutionary drills as found in the workbook.

Conventional homework practice. Homework practice consisting of copying from shorthand plates and writing large amounts of connected material usually including business vocabulary.

The "functional" or "language-arts" method. These terms are used interchangeably to mean the teaching of shorthand as an art rather than as a science considering shorthand to be skill learning, distinct from knowledge learning with emphasis upon the learner's being taught to automatize the correct shorthand responses without verbalizing or consciously knowing the generalizations or rules.

The "manual," "anniversary," or "traditional" method. These terms are used interchangeably to mean that method of teaching shorthand which relies heavily on the teaching of rules or generalizations, the use of word lists to ensure theory coverage, the early introduction of writing, and the teaching of shorthand as if it were a science.

Delimitations of the Study

This study was concerned only with shorthand homework practice and the effects of such practice on achievement behavior of students in selected liberal arts colleges. The schools used for the study were church-related colleges under the direction of the Seventh-day Adventist denomination. The schools were chosen for the reasons that they were readily accessible to the researcher for the purpose of experimentation and that they were felt to be representative of college shorthand classes. The students and classes were not considered atypical or differing from other college shorthand students or classes for the following reasons:

1. The college enrollment is not restricted on the basis of religion. All the colleges enroll students from other religious persuasions.

2. The shorthand class sections varied in size from 30-40 students.

3. All of the colleges are fully accredited with their respective regional accrediting association which indicates adequate standards, equipment, and teaching staff.

The only tests used were the School and College Ability Test (Verbal), the Test of Critical Thinking, Rokeach Dogmatism Scale, selected subtests of the Edwards Personal Preference Schedule, and the Criterion Test for determining shorthand achievement.

III. Organization of the Thesis

This study has been organized into five chapters:

Chapter I presents the problem, its scope, the definition of the terms, the delimitations, and the hypotheses to be tested.

Chapter II surveys the literature. It includes a review of important studies involving the two main approaches to shorthand teaching--science and language arts, while the second section reviews the research concerned with factors which contribute to success in shorthand.

Chapter III describes the methods of procedures, the collection of the data, and the treatment of the data.

Chapter IV contains the findings and the interpretation of the results.

Chapter V is devoted to the summary, conclusions, and recommendations.

CHAPTER II

REVIEW OF THE LITERATURE

The research, both formal and informal, which has been concerned with the measurement of shorthand achievement and with the determination of significant factors thought to have some relationship to shorthand learning and achievement is extensive. Therefore, it is not possible to review all of the studies which are in some way related to the present investigation. Those studies most directly related are considered in this chapter. Part I reviews pertinent literature on the teaching of shorthand. This section deals specifically with the Functional versus the Manual Method of teaching shorthand with reference to: (1) methodology, (2) the teaching of shorthand theory, and (3) shorthand homework preparation. Part II reviews the literature concerned with shorthand success.

Reports of research studies in shorthand are numerous and widely spread throughout the business education literature and other educational and psychological publications. The Shorthand Secretarial Research Index which gives a complete listing of research studies from 1891 to 1965, shows 33 reports on methods of teaching shorthand and 138 reports on prognosis of success in secretarial studies.[7]

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[7]Harves Rahe, ed., Shorthand Secretarial Research Index (New York: Gregg Division, McGraw-Hill Book Company, 1965), p. 66.

The first two studies reviewed in this chapter are by Anderson[8] and Frink,[9] respectively, who made comprehensive compilations and analyses of all research findings in the field of shorthand through the year 1957. The Anderson dissertation provides an analysis and classification of 298 research studies in shorthand and transcription conducted in the United States prior to January, 1946. All available masters' and doctors' theses and other studies of shorthand and transcription were included. The research studies were abstracted and classified into groups according to the nature of the investigation. According to Anderson's findings, 61 studies, or 20.47 percent of all the research in shorthand and transcription problems, were concerned with achievement. Forty-four of the 61 studies in this classification dealt with the measurement of shorthand achievement and 17 with the devices and tests for the measurement of achievement.[10]

Frink reviewed the research pertaining to shorthand and transcription covering the years 1946 to 1957. She found that the great majority of the 117 studies and 258 items from professional literature which she analyzed and classified were concerned with prognosis.[11]

Researchers studied achievement and the factors related to achievement for the specific purpose of finding an answer to the question of who can be

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[8]Anderson, op. cit., p. 14.

[9]Inez Frink, "A Comprehensive Analysis and Synthesis of Research and Thought Pertaining to Shorthand and Transcription, 1946-1957" (unpublished Doctor's dissertation, Indiana University, 1961).

[10]Anderson, op. cit.

[11]Frink, op. cit., pp. 38-40.

expected to succeed in shorthand. Attempts were made to isolate factors which would predict, prior to study, the level of achievement in shorthand which students should attain. The studies by Anderson and Frink respectively are of value to the present investigation for their unusually thorough reviews of research on methodology and on prognosis in shorthand.

I. Literature on the Teaching of Shorthand

Because the influence of John Robert Gregg has been so largely felt in the teaching of shorthand, it seems appropriate that a review of literature might begin with a statement of his attitude:

> One of the most fascinating things about the "lithe and noble art of brief writing" is the infinite variety of methods that can be adopted in teaching it. For this reason I have always maintained a receptive attitude toward new methods of handling this subject. After all, system is my main interest, and any method that promised to contribute to the attainment of better results in teaching it was deserving of consideration.[12]

Methodology

Over the years since Gregg shorthand was first taught in America, a number of methods have been developed which have interested and sometimes confused shorthand teachers. Two basic methods of teaching shorthand have emerged from the many which have been tried; namely, the Functional and the Manual methods. Among those who have compared the relative merit of the two

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[12]Louis A. Leslie, ed., The Story of Gregg Shorthand (New York: McGraw-Hill Book Company, 1964), p. 107 quoting Gregg Shorthand Manual for the Functional Method, p. iii.

methods might be mentioned Carder,[13] Lain,[14] Dietrich,[15] Shuder,[16] Belanger,[17] and Schloemer.[18]

C. C. Carder was among the first to study shorthand methodology using the experimental method.[19] Using two matched groups of students, he compared the achievement of students taught by the Functional method with the achievement of students taught by the Manual method at the Northeast Experimental Junior College of Kansas City, Missouri. Results of intelligence tests and of stenographic prognostic tests were secured for all students of both classes. These tests were used to make a double matching of pairs of students from the two

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[13]C. C. Carder, "Comparison of Functional and Non-Functional Methods of Teaching Shorthand in Northeast Experimental Junior College of Kansas City, Missouri" (unpublished Master's thesis, Kansas State College of Pittsburg, 1936).

[14]George E. Lain, "A Comparison of the Traditional and Functional Methods of Teaching Shorthand" (unpublished Master's thesis, University of Southern California, 1941). Degree not conferred.

[15]Francis Frederick Dietrich, "Functional and Nonfunctional Methods of Teaching Gregg Shorthand Compared" (unpublished Master's thesis, Colorado State College, 1940).

[16]Bernice Shuder, "A Study of the Direct, Manual, and Functional Methods in the Teaching of Shorthand in Representative Schools in Northwestern Ohio" (unpublished Master's thesis, Bowling Green State University, 1941).

[17]Lillian A. Belanger, "A Comparison of the Manual and Functional Methods of Teaching Shorthand" (unpublished Master's thesis, Tufts College, 1944).

[18]Carolyn O. Schloemer, "A Study to Compare the Achievement Attained in Two Methods of Teaching Gregg Shorthand--the Theory Approach Versus the Nontheory Approach" (unpublished Master's thesis, University of Wisconsin, 1964).

[19]Carder, op. cit., p. 53.

classes--twenty intelligence matched pairs and twelve stenographic matched pairs were obtained. During and at the end of the course, tests which would measure the following were given to both classes: (1) transcription ability, (2) accuracy of shorthand vocabulary, (3) shorthand penmanship, and (4) reading ability--word meaning, comprehension, and rate.

Some of the findings of this study were:

Transcription Ability

1. Approximately 20 percent more of the Functional than of the Non-Functional students were able to produce acceptable transcripts when measured by the percentage of accuracy.

2. Approximately 20 percent more of the Functional than of the Non-Functional students were able to take dictation at the rate of 100 words per minute. Those in the Functional class who took this speed produced more accurate transcripts than did those in the Non-Functional class who took the same speed.

3. Approximately 13 percent more of the Functional than of the Non-Functional students attained the standard for dictation speed set for the two classes, 80 words per minute or above.

Accuracy of Writing Shorthand

4. The two classes were approximately equal in the accuracy of shorthand written while writing lists of words and phrases.

5. While taking the Rollinson dictation tests of 40 words per minute, the upper third of the Non-Functional students showed a slight superiority over the upper third of the Functional students in the accuracy of shorthand written.

6. While taking the Rollinson dictation test of 60 words per minute, approximately 15 percent more of the Functional than of the Non-Functional students wrote with a shorthand vocabulary accuracy of 90 percent or above. Also, approximately 15 percent more of the Functional than of the Non-Functional students wrote with a shorthand vocabulary accuracy of 80 percent or above while taking the Rollinson dictation test of 60 words per minute.

Shorthand Penmanship

7. In shorthand penmanship, the two classes showed approximate equality. The Functional students, in the pairs matched by the shorthand prognostic tests, showed a very slight superiority over the Non-Functional students in shorthand penmanship.[20]

Carder concluded that the Functional Method of teaching shorthand was superior to the Non-Functional method. Of special interest is the fact that the Functional Method produced higher achievement with every type of student--the superior, the average,and the below average.[21]

The study made by George E. Lain is one of the few experimental studies which has compared the results of the Functional Method with other methods of teaching shorthand.[22] Two classes in beginning shorthand, at the John H. Francis Polytechnic High School, Los Angeles, were taught by different teachers, one using the Manual Method and the other, the Functional Method. Students were equated on the basis of sex, age, mental ability, and occupation of parents. The results, at the end of the first year, were based on fifty-three cases.

The criteria for determining achievement were eight tests, dictated at sixty words a minute, on which the transcription scores were computed. On each test, the Functional Method students made fewer transcription errors than the Manual Method students; and on the basis of the entire group of tests, the Manual

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[20]Carder, op. cit., pp. 53-54.

[21]Ibid.

[22]Lain, op. cit., pp. 1-3.

Method students made 80.8 percent more errors than the Functional Method students.

A follow-up check of the two classes was made at the end of the second year to determine the carry-over value of the two methods. This phase of the study was based on twenty-six students; thirteen were available for each group. Six dictation tests were given at rates ranging from 93 to 100 words a minute, and the transcription scores were computed. The average number of errors per student for the Manual group was 12.8, and for the Functional Method group, 11.3. This represents a difference of 1.5, for which the critical ratio was 1, which is not significant. Apparently, the difference at the close of the two years was less than at the end of the first year.

Lain's study is interesting, but its results must be interpreted carefully because of the following factors: the small number of cases involved, the uncertainty that the teachers were of equal ability, and the fact that the apparent superiority at the end of one year seemed to have disappeared at the end of the second year.

Francis F. Dietrich conducted a study in which the purpose was threefold: (1) to show how the Functional Method shorthand techniques compared with those of other methods; (2) to compare the classroom teaching results of two Functional Method shorthand classes and of four Manual Method classes in four Kansas communities; and (3) to determine the opinions and preferences of twenty-two Kansas shorthand teachers and of twenty-nine graduate students enrolled at a summer session in Greeley.[23]

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[23]Dietrich, op. cit., pp. 1-2.

The principal findings of the study were as follows:

1. Initial learning techniques of the Functional Method are based on "parts" instead of on "wholes." This is in agreement with the Manual Method, but it is not in harmony with the direct methods.

2. The writing of shorthand outlines on the board by the teacher and the proper reading of these outlines by the students are the basic techniques of the Functional Method.

3. On brief form tests, the Functional and the Manual Method groups had almost the same median and average scores; but the Manual Method students made a better showing in the number and the percent of perfect papers.

4. The Functional Method class made slightly better average and median scores on the frequent phrase test than did the combined Manual group.

5. On the complete theory test of 200 parts, the average number of errors of the Functional Method class was 11.0, and of the Manual Method classes, 19.5.

6. The Functional Method class had an error and omission average of 14.8 on a 98-word letter dictated at 100 words a minute. The Manual Method classes combined had an error and omission average of 18.3.

7. Fifty-six percent of the Functional Method students enrolled in advanced shorthand the next school year, while only 22.0 percent of the Manual Method students enrolled. This decrease would indicate either that the Functional Method gave students better preparation for the advanced work, or that it succeeded in maintaining their interest.[24]

The purpose of the Shuder study was to compare the Direct-Manual and the Functional Method of teaching shorthand. Odell's Direct Method was apparently combined with the Manual Method. The results were based on 197 students from six different high schools in Northwestern Ohio.[25] Although Shuder

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[24]Ibid., pp. iii-vi.

[25]Shuder, op. cit., p. 136.

found the Direct-Manual Method superior to the Functional Method, her conclusion is that "no one method is best in its entirety in attaining the objective of all shorthand methods--recording the spoken word and in producing satisfactory transcription in the shortest time possible."[26] Of special significance to the present study is Shuder's final conclusion that it is not the method which determines success but it is the teacher.

In 1944, Lillian Belanger compared the Functional and Manual Methods of teaching shorthand to determine which method was preferable for the students of the East Boston (Massachusetts) High School and to discover to what extent those entering the Stenography II class retained from their skill acquired in Stenography I.[27]

Two shorthand classes taught by different teachers were used in the study of shorthand methods. Each class had 32 students with similar backgrounds and I. Q.'s averaging approximately 100. Instruction time and environmental conditions were the same for both classes. The two groups were taught together for Stenography II. Brief form, written transcription, complete theory and dictation tests were used for evaluation.

Belanger reported the following findings:

> 1. A comparison of the results achieved between the two classes on the monthly brief form tests showed that, according to the median scores for the nine months, the group using the manual method was superior to the group using the functional method in the writing of correct shorthand forms from dictation.

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[26] Ibid., p. 183.

[27] Belanger, op. cit.

In each of the nine months the median number of perfect papers was higher for the groups taught by the manual method than for the groups taught by the functional method.

Analysis of the median errors for the two groups each month revealed that the groups taught by the manual method seemed to have an advantage in writing shorthand forms from dictation the first few months but that the group taught by the functional method reached a comparable level of achievement in the nine-month period.

2. An analysis of the transcription of word lists revealed that the groups using the functional method had more nearly perfect scores than the group using the manual method in eight of the nine months. Both groups had perfect scores for the nine months in the first quartile. Throughout the third quartile the pupils taught by the functional method transcribed their notes more accurately than the pupils taught by the manual method. This seemed to indicate an advantage to the "reading group" in the ability to transcribe shorthand notes.

3. On the transcription tests, the average number of words transcribed per minute by the class using the manual method ranged from 3 to 28 words a minute and for the class using the functional method, from 8 to 35 words a minute. The differences between the two groups in average words a minute transcribed ranged from 5 to 15 words a minute. On the last transcription test, the pupils taught by the manual method transcribed at the rate of 28 words a minute and the pupils taught by the functional method, at 35 words a minute.

4. On the first theory test, the median score for the pupils using the functional method was one point above that of the pupils using the manual method. The scores of the pupils taught by the functional method were grouped about the median while the scores of the pupils taught by the manual method were scattered widely. On the second test, the groups using the functional method showed the greater improvement in average scores. The author concluded that the class using the functional method in which rules were not learned except through reading and writing made a better showing on theory than the class using the manual method in which rules were learned.

On the theory test given to the Stenography II pupils in the fall of 1943, the median for the 17 pupils that had been in the group taught by the manual method in first-year shorthand was 75; the median for the pupils who had been taught by the functional method was 60.

5. On the first letter test dictated at 80 words a minute, the median score for the class using the manual method was 97; for the class

using the functional method, 98. Scores on the test indicated that both groups could take dictation at 80 words a minute and transcribe with a high degree of accuracy.

6. On the five-minute test dictated at 60 words a minute, the error average for the class using the functional method was 12.43; for the class using the manual method, 18.9. According to the 95 percent accuracy standards set by the Gregg Publishing Company for the test, twenty-three (72.4 percent) of the pupils taught by the functional method compared to twenty-one (66.8 percent) of the pupils taught by the manual method passed the test. The author concluded that pupils using the functional method reached a higher level of achievement than pupils using the manual method.[28]

The main conclusion drawn by Belanger follows:

In the beginning shorthand course, better results were secured with the functional method than with the manual method. However, in the advanced shorthand class, the theory test showed that the group taught by the manual method retained more of the theory during the summer vacation than the group taught by the functional method.[29]

In order to draw definite conclusions, a larger number of subjects would need to be included in each of the two groups. The groups also should have been matched on the other factors in addition to intelligence. It appears that no consideration has been given to age, grade level, English ability, or previous scholastic achievement of pupils in the two groups.

Schloemer sought to determine whether the theory or nontheory approach to teaching beginning shorthand would produce the better results. The section of beginning shorthand taught using the manual method had 22 students, and the section taught using the functional method had 24 students. Three-minute dictation tests and two theory tests were the criteria used to measure

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[28] Ibid., pp. 262-264.

[29] Ibid.

shorthand achievement. While the findings of this study are interesting, they must be interpreted carefully because of the small sample used.[30]

Schloemer's findings were:

1. High dictation speeds were attained by students in both classes--100 words a minute was attained by six nontheory and four theory students.

2. Inability to take new-matter dictation was found in both classes--one person in each class was not able to pass 60 words a minute.

3. Adequate dictation speed was attained by the majority of students in each class--80 words a minute was attained by 18 (75 percent) in the nontheory class and by 12 (73 percent) in the theory class.

4. Students in the theory class were able to write more accurate outlines on the 100-word theory tests given at the end of the of the first and second semesters. However, in both tests the least number of theory errors was found on a nontheory student's paper.

5. While students in the nontheory class were not able to write as accurate outlines on the 100-word theory tests, a check of the transcription errors on these tests indicated that they were able to transcribe the outlines they had written. The median number of transcription errors was 3.5 in the nontheory class and 4.5 in the theory class.

6. An analysis of the shorthand notes written during dictation indicated that the theory class wrote slightly more accurate outlines. Since the four papers with the most accurate shorthand notes came from the nontheory class, however, it appears that a very high degree of accuracy can be attained without undue emphasis being placed on theory.

7. The writer concluded that it appears that there was no significant difference in shorthand achievement between the students taught by the manual method and those taught by the functional method. Therefore, the approach used in teaching shorthand may not be as

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[30]Schloemer, op. cit.

important as the ability of the students, their motivation, or the ability of the teacher.[31]

Generally, these investigations support Frink's conclusion that there is no evidence to show conclusively the superiority of either the functional or the manual method.[32]

After the introduction of the Functional Method, J. Francis Henderson made a study to find ways of improving the effectiveness of teaching by this method. The sub-purposes of this study were (a) to determine the controversial issues in teaching shorthand by the Functional Method; (b) to determine the problems or difficulties teachers have encountered in using the Method; and (c) to find possible activities or procedures to use in helping to alleviate these problems. Because many of the studies which had been made of the Functional Method showed conflicting opinions as far as the advantages and disadvantages of the method were concerned, the expert jury technique was used to determine the controversial issues about which there had been considerable debate. Thirty-seven points were identified as controversial.[33]

The second part of the study was a list of 34 problems revealed by teachers who had used the method. A large variety of possible teaching techniques to alleviate each problem was obtained. Some of the most significant

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[31] Ibid., pp. 38-39.

[32] Frink, op. cit.

[33] J. Francis Henderson, "Suggested Techniques for Improving the Teaching of Shorthand by Leslie's Functional Method" (unpublished Doctor's dissertation, University of Southern California, 1944), pp. 447-450.

conclusions and recommendations drawn by Henderson follow:

1. Developing in pupils the ability to write new words is one of the most difficult problems. It appears that this skill has to be developed by conscious effort and by direct instruction in the writing of such words. While techniques for developing this skill are still in a vague and uncertain stage, it is felt that previewing new words for the pupils misses the whole point of the problem, and that the Functional Method is weak in its attack upon this problem.

2. It seems unwise to postpone new-material dictation until the shorthand theory has been completed. Perhaps as soon as pupils begin writing they should be taught a method of writing new words, and in each day's dictation they should be provided experiences in initiating new outlines.

3. The essence of the problem of developing in pupils the ability to read shorthand notes fluently as well as rapidly may lie in teaching pupils to recognize words and phrases as wholes rather than to puzzle out outlines character by character through analysis, rules and synthesis, as is done with the Manual Method.

4. While there may be many advantages in having pupils read in concert, it is doubtful that this technique develops in pupils the ability to read shorthand notes meaningfully. This skill probably has to be taught directly. Leslie does not recommend concert reading only; teachers should supplement this technique with others in order to encourage meaningful, articulate, and expressive reading.

5. It appears that reading and copying shorthand plates may not develop the ability to write facile, fluent notes. During the initial writing stage, writing movements will be diffused motions, but with directed practice there will be a gradual sloughing off of the unnecessary motions until pupils will be able to write precise outlines with comparatively easy motion. This directed practice should consist of some type of writing precision or penmanship drills. It is recommended that the teacher check occasionally, even though he does not grade, the shorthand notes in order to be able to call the learner's attention to important techniques involved in writing a good quality of penmanship. Certainly, pupils will not be able to write facile notes until they learn to distinguish between points of excellence in writing and vague ideas of how outlines should be written. Reading may help somewhat, but the fine points of joinings, proportion, slant and curvature will probably have to be pointed out to the pupils before they can execute skillfully-written notes.

6. Having the pupils use a key when reading shorthand plates, appears to be a debatable procedure. Undoubtedly, the major advantage in using the key is that it saves pupils from spending too much time in deciphering outlines as has to be done in other methods. Functional Method pupils with the key are able to do a great deal more reading which probably facilitates the development of stenographic skill more than does the puzzling out of many outlines.

7. The reading approach may or may not be superior to the writing approach. But if the reading approach is used, it is doubtful that pupils should read without writing for twenty lessons. Because it is doubtful that all pupils are ready for writing at the same time, perhaps, there should not be a set time for beginning writing. It is recommended that teachers continue to experiment informally, as many are doing, in an effort to find criteria for determining when writing should be started. In this experimentation, workers should not neglect the study of a writing approach.

8. It would seem reasonable that the Functional Method could be modified in order to produce marketable results in a shorter time to help meet the acute shortage of stenographers.[34]

In 1946, ten years after the introduction of the Functional Method, Isaacson made a survey of 96 teachers using the Functional Method to determine the changes they had made.[35] The major variations indicated by the group were:

1. Modifications in the reading approach were made by 80 percent of the teachers. There was a tendency toward less open-book dictation. New-matter dictation was introduced earlier before the theory was covered. Writing was begun earlier, thus shortening the time recommended for the reading approach.

2. The use of brief form and theory tests was reported by 83 percent of the teachers.

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[34] Ibid., pp. 447-450.

[35] Helen I. Isaacson, "The Functional and Traditional Methods of Teaching Gregg Shorthand Combined" (unpublished Master's thesis, Colorado State College, 1946).

3. The correction of more papers than advocated by the functional method was reported by 81 percent of the teachers. Some dissatisfaction with the quality of the shorthand written during dictation was noted.

4. The "teaching of rules" was reported by 75 percent of the teachers. It was pointed out that teaching meant the presentation of the rule or principle and did not mean its memorization.

5. Of the teachers surveyed more than half were making changes in Leslie's Nine Points of Difference.[36]

The Teaching of Shorthand Theory

As was pointed out in the preceding section, the two principal positions which have developed regarding the teaching of shorthand are the manual method and the functional method. The position held by supporters of the manual method is that knowledge of theory is essential and is best obtained through rule presentation. The position held by functional method teachers is that instruction in shorthand competency is best achieved by automatization through extensive reading and spelling of shorthand outlines and extensive dictation. A great deal of the dictation is on familiar practiced material. New-matter dictation is delayed until the students have developed a background on familiar dictation material.

As the relationship between theoretically correct shorthand outlines and transcription skill has not been definitely established, Wagoner and others have emphasized the need for further research of this problem. Pertinent studies are reported in support of the theory approach and of the nontheory approach in

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[36] Ibid., pp. 137-140.

the teaching of shorthand.[37]

Fermenich found the highly significant correlation of .949 between correct shorthand and correct transcription. Outlines which were written correctly were more frequently transcribed correctly. However, the converse was not as significant. The degree of relationship between incorrect shorthand and incorrect transcription was .575, which was significant at the .01 level. This correlation was not high enough, however, to be considered as a satisfactory predictor. Apparently some outlines which were incorrectly written could be transcribed correctly. There was a correlation of .988, however, between illegible outlines and incorrect or omitted transcript.[38]

A study of the relationship of symbol mastery and selected dictation speeds was made by Goetz.[39] Writing on the importance of shorthand theory, he says:

> Shorthand is an abbreviated symbol writing system based on the phonetic sounds of the English language. It is based upon principles and rules. Each word is written according to a definite symbol combination. Consequently, it becomes necessary for an individual to respond instantaneously without hesitancy to the spoken word and

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[37]George A. Wagoner, "Improving Efficiency of Teaching Business Subjects--Especially Shorthand," Journal of Business Education, XXXIX (May, 1964), p. 332.

[38]William F. Fermenich, "An Analysis of the Relationship Between Applications of Some Principles of Gregg Shorthand Simplified and Errors in Transcription" (unpublished Master's thesis, Mankato State College, 1959). Cited by Ruth Anderson, Secretarial Education with a Future, American Business Education Association Yearbook (Somerville, N. J.: Somerset Press, 1962), pp. 55-60.

[39]Leo G. Goetz, "The Relationship Between Symbol Mastery and Selected Dictation Speeds" (unpublished Doctor's dissertation, University of North Dakota, 1966).

> then transfer this word into symbol form according to the principles of the system. It appears, that in order to experience success in dictation, thorough mastery of principles and symbols needed to be attained as the learning cycle unfolds.[40]

To measure the degree of symbol mastery possessed by each student, word list tests were given both at the beginning and at the end of the second semester to determine whether or not the students in a particular dictation speed range made any improvement during the second semester in regard to symbol mastery. Dictation speed was measured by three-minute tests given at a speed range of 50-100 words per minute. The highest speed attained by the end of the year determined the student's group classification: Group A (50-60 words a minute), Group B (70-80 words a minute), and Group C (90-100 words a minute).

Pertinent findings and conclusions include the following:

1. The correlation of .82 between symbol mastery and dictation speed was highly significant at the .01 level. This indicates that approximately 67 percent of a person's dictation speed may be attributable to symbol mastery. In most cases, therefore, there must be a definite degree of symbol mastery before additional dictation achievement can take place.

2. Those groups of students who possess the highest dictation speeds also attained the highest degree of symbol mastery.

3. The difference was greater between Group A and Group B than Group B and Group C with an extremely large difference between Group A and C. All differences were significant at the .01 level. For the majority of symbols

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[40] Ibid., p. 1.

measured there is a difference in the degree of symbol mastery also. When comparing Group A with Group B, 85 of the selected symbols were significant at the .05 level. When comparing Group A with Group C, 93 were significant at the .01 level. When comparing Group B with Group C, 78 were significant at the .05 level.

4. When comparing the group mean symbol mastery achievement on both selected word lists, Group C had a higher mean symbol mastery gain than Group B; Group A had a decrease in mean symbol mastery during the second semester.[41]

As a result of this study, Goetz recommends that thorough mastery of symbols should be an instructional objective of first-year shorthand. Because the students who attain the higher dictation speeds achieve most of their symbol mastery early, they should be identified at the semester and pushed beyond 100 words a minute. Since there is a decrease in symbol mastery during the second semester for the 50-60 words per minute speed group, these students should be identified; and remedial drills emphasizing all symbols must be given so as to raise their level of symbol mastery.[42]

Danielson studied the relationship between competency in shorthand vocabulary and achievement in shorthand dictation. She used 120 university students in the last three courses of the shorthand program. Competency in shorthand vocabulary was determined by administering six word list tests, each composed of

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[41] Ibid., pp. 1-5.

[42] Ibid.

250 words. These 1,500 words were obtained by sampling from the Silverthorn list. For each test, 50 words were selected at random from every 1,000 words. Any correct translation was counted correct. The outlines were not graded; the time taken to complete the transcription was not considered. The highest score that a student attained on these word lists was considered to be his vocabulary index.[43]

Shorthand dictation achievement was measured by dictating 30 different sets of letters, one each week. Each set contained speed groups of 60-130, and each set was three minutes in length. After passing three tests, students were required to go to the next speed level. Danielson found that shorthand vocabulary is significantly related to shorthand dictation achievement. She pointed out that while shorthand vocabulary plays a vital role in achievement of shorthand dictation, it is only one of the many factors involved.

Pullis investigated the relationship between shorthand accuracy and achievement in shorthand dictation.[44] He specifically sought to determine:

1. Relationship between the ability of a student to write accurate shorthand outlines and his ability to transcribe the outline.

2. Relationship between the ability of a student to transcribe shorthand outlines and his achievement in shorthand dictation.

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[43]Harriet Ann Danielson, "The Relationship Between Competency in Shorthand Vocabulary and Achievement in Shorthand Dictation" (unpublished Doctor's dissertation, Indiana University, 1959).

[44]Joe M. Pullis, "Relationship Between Accuracy and Achievement in Shorthand" (unpublished Doctor's dissertation, North Texas State University, 1966).

3. Relationship between a student's I. Q. and (a) ability to write accurate shorthand outlines, (b) ability to transcribe outlines and (c) achievement in shorthand dictation.[45]

The study sample included 135 students enrolled in four levels of shorthand instruction at North Texas State University. The major sources of data used were the results of word list tests given to each class at three-week intervals beginning with the ninth week of the semester. Both the shorthand outlines and subsequent transcription were graded. Three-minute nonpreviewed dictation tests were given weekly beginning with the twelfth week. The dictation rates ranged from 50 to 140 words per minute.

In brief, the major findings of this study were as follows:

(Relationship between accuracy and dictation)

The coefficient of correlation between shorthand accuracy and shorthand dictation was .8326, which was significant at better than the .05 level. The coefficient of determination indicated that approximately 69 percent of the achievement in shorthand dictation was directly associated with shorthand accuracy.

(Relationship between shorthand accuracy and transcription)

The value of the coefficient of correlation between shorthand accuracy and transcription was .9305, which was significant at better than the .05 level. The coefficient of determination indicated that approximately 87 percent of the student's ability to transcribe isolated shorthand outlines was directly associated with shorthand accuracy.

(Relationship between shorthand transcription and dictation)

The value of the coefficient of correlation between shorthand transcription and dictation was .8056, which was significant at better than the .05 level. The coefficient of determination indicated that approximately 65 percent of the achievement in shorthand dictation was directly associated with the student's ability to transcribe isolated shorthand outlines. It should be remembered that approximately 87

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[45] Ibid., p. 25.

percent of the student's ability to transcribe shorthand outlines was directly associated with shorthand accuracy.[46]

In a study similar to Fermenich's but based on the Jubilee Series of Gregg Shorthand, Klaseus found that correctly written shorthand outlines were transcribed correctly 96.1 percent of the time as compared with inaccurate shorthand forms which were transcribed correctly 58.8 percent of the time.[47]

Jester's study on transcription revealed that while inaccurate shorthand outlines did not necessarily result in inaccurate transcripts, they did cause greater hesitancy in transcription and thereby reduced transcription rate.[48]

Berle Haggblade investigated the relationship that exists between selected factors and achievement in shorthand.[49] Tests were given to 232 fourth-semester shorthand students in 13 central California high schools. The factors examined in terms of possible influence on shorthand achievement were as follows:

1. Ability to Write Theoretically Correct Shorthand Outlines for the High Frequency Words

2. Ability to Write Theoretically Correct Shorthand Outlines for the Brief Forms

3. Phrasing Ability

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[46]Ibid., pp. 27-28.

[47]Richard C. Klaseus, "An Analysis of Some of the Factors that Contribute to the Difficulty of Transcription Materials in Gregg Shorthand, Diamond Jubilee Series" (unpublished Master's thesis, Mankato State College, 1964), p. 94.

[48]Don Jester, "A Time Study of the Shorthand Transcription Process" (unpublished Doctor's dissertation, Northwestern University, 1959), pp. 130-133.

[49]Berle Haggblade, "Factors Affecting Achievement in Shorthand" (unpublished Doctor's dissertation, University of California, 1965).

4. Quality of Shorthand Penmanship

5. Dictation-taking Speed

6. Ability to Write Theoretically Correct Shorthand Outlines for Words Falling Outside the High Frequency List

7. Typewriting Speed

8. Typewriting Accuracy

9. Transcription Speed

10. Transcription Accuracy[50]

The selected factors were designated as either internal or external. The internal factors were measured by examining the shorthand notes students wrote in recording the criterion test of achievement. The theoretical shorthand accuracy of their shorthand outlines and the quality of their shorthand penmanship were determined. The external factors were measured by calculating the scores students received on separate tests designed to determine dictation-taking speed, speed and accuracy at typewriting and transcription, and shorthand reading ability.

The significant findings pertaining to this phase of the study are summarized below:

The ability to write theoretically correct shorthand outlines for the 5,000 words used most frequently showed the highest correlation, .76923, with shorthand achievement of any of the shorthand factors studied. This correlation suggests that there is a significant relationship between achievement in shorthand and the ability to write shorthand outlines according to the rules of Gregg theory.

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[50]Ibid., pp. 104-105.

The coefficient of determination, .5917, indicates that 59 percent of the variance in the shorthand achievement score was accounted for by this one factor.[51]

The findings of this study tend to support those reported by Danielson in her study of the relationship between competency in shorthand vocabulary and achievement in shorthand dictation. Danielson concluded "that shorthand vocabulary is significantly related to shorthand dictation achievement but that it is only one of the many factors involved."[52]

In commenting on the importance of theoretically correct shorthand, Anderson states: ". . . it matters a great deal how the outline is written if it affects the student's rate of recording dictation and the accuracy of transcript."[53]

The research studies reviewed thus far tend to emphasize the principles of shorthand and their application to writing.

The next section is concerned with the views of the writers who believe that shorthand does not have to be perfect to be functional. It is recognized that secretaries do a satisfactory job of transcribing even when their notes are not entirely perfect. Proponents of the nontheory approach to shorthand question the need for emphasizing theoretical accuracy of shorthand notes. Research in support of this position follows:

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[51] Ibid., p. 84.

[52] Danielson, op. cit., p. 85.

[53] Ruth I. Anderson, "Significant Implications of Research in Shorthand and Transcription," Secretarial Education with a Future, American Business Education Yearbook, 1962, p. 59.

Phillips and Saunders, King, and Lockwood found that shorthand notes only 71 percent accurate would produce transcripts that were at least 95 percent correct.[54]

Lusk sought to discover whether the theoretical accuracy of shorthand outlines written from dictation affected a student's ability to transcribe the outlines.[55] Seven first-year classes, containing a total of 161 students from four different schools, were included in the study. Four five-minute dictation tests, two at 60 and two at 80, were given to determine shorthand achievement.

The shorthand notes were analyzed to ascertain the degree of correct theory application. Incorrectly written shorthand outlines were classified into one of the following categories: incorrect outline, omitted outline, proportion, illegible outline, wrong outline, longhand in notes, transposed outline, and added outline. Categories were not established for line placement or phrasing.

Transcription errors were classified into four categories: incorrectly transcribed word, omitted word, transposed word, and added word. Punctuation, spelling, and paragraphing were not considered in the analysis. Lusk found that students who passed the dictation (transcribed at 95 percent accuracy) wrote approximately 70 percent of the outlines correctly. This should be understood to

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[54]Herbert Tonne, Estelle Popham, and M. Herbert Freeman, Methods of Teaching Business Subjects (2d. ed.; New York: Gregg Publishing Division, McGraw-Hill Book Company, Inc., 1957), p. 141, citing the research by Phillips and Saunders, King, and Lockwood.

[55]Norman M. Lusk, "A Study of the Comparison Between Construction of Shorthand Outlines According to Theory and the Accuracy of Transcription" (unpublished Master's thesis, University of Washington, 1959).

mean that the students who were successful on the test were able to transcribe accurately all but 5 percent of the dictation even though 30 percent of the shorthand outlines were inaccurately written. Those who failed the dictation (transcribed at less than 95 percent) wrote approximately 50 percent of the outlines correctly. The investigator's conclusion was that the low percentage of transcription errors by students who passed the dictation was an indication that emphasis upon the writing of theoretically correct shorthand outlines may have little relationship to facility in transcription.[56]

In a study of the effect of inaccuracies in shorthand outlines on transcription, Peters found that the coefficient of rank correlation between incorrect shorthand outlines and incorrect transcription was .381 indicating significance at the .05 level. From his study he concluded that a student may department from correct theory in the writing of shorthand outlines and still retain enough of the form to enable him to transcribe with a fair degree of accuracy.[57] Haggblade's study, however, does not support Peters' findings that a student may possibly write incorrect shorthand outlines and still transcribe with accuracy.[58]

Hillestad analyzed the errors made in recording dictation as a means of isolating factors which might contribute to the difficulty of dictation material. She found that application of shorthand principles accounted for only 15 percent

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[56]Ibid.

[57]Robert Peters, "Effect of Inconsistencies in Shorthand on Transcription" (unpublished Master's thesis, Mankato State College, 1958), pp. 36-42.

[58]Haggblade, op. cit., pp. 104-107.

of the errors made in transcription. However, the correlation between vocabulary level and the number of errors was .81. This means that over 65 percent of whatever causes errors in recording shorthand is accounted for by the vocabulary level. Therefore, it would appear that more emphasis should be given to the principles of word construction.[59]

Klein found hesitancy before and within outlines to be the main difference between the writing of experts and that of students. Too much emphasis on absolute accuracy of shorthand outlines, he concluded, may result in hesitant writing.[60]

Strong support of the nontheory approach in the learning of shorthand is found in the writings of the inventors of Gregg shorthand. In his early writing and teaching, Gregg appears to have favored a science-type approach to shorthand learning. However, later in his career his attitude changed. This is reflected in his writing regarding shorthand rules when he said: ". . . When I first taught shorthand, I, too, made much ado about rules. Then gradually I began to do less and less with them. The less I did, the more fluent became the writing of my students."[61] He believed that the learner should know the reason for practice

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[59]Mildred Hillestad, "Factors Which Contribute to the Difficulty of Dictation Material" (unpublished Doctor's dissertation, University of Minnesota, 1960).

[60]Abraham Klein, "Variations in the Speed of Writing of Symbol Combinations in Gregg Shorthand" (New York University, 1949), p. 292.

[61]Harm Harms and B. W. Stehr, Methods in Vocational Business Education (Cincinnati, Ohio: South-Western Publishing Company, 1963), p. 152.

and understand the principles to which his practice applied. In 1916, he wrote that a practical understanding of the application of a rule is vastly more important than a knowledge of the exact wording. For years he emphasized that shorthand was easily learned from the shorthand outlines as they were given without questioning the exact way each form should be written.

Leslie, as well as Zoubek, considered attention to outline construction or analysis of shorthand forms as detrimental. Awareness of outline detail, they insist, focuses attention on the mechanical aspects of writing and prevents one from acquiring skill in the art of writing. In interpreting what happens when conscious attention is given to the writing of shorthand outlines, psychologists point out that attention causes a difference in the movements of skill which may result either in improvement or impairment of the skill. Leslie, however, argues that conscious direction always tends to impair or to inhibit the skill.

Leslie frequently emphasized the idea that proper handling of initial diffuse movements or irradiation will greatly shorten the period of skill learning. It is characteristic of all motor skill learning that the learning process starts with a period of slow, awkward performance. The teacher's task during this stage is to be patient and to provide encouragement. Leslie maintains that insistence on perfect performance from the beginning of each level of skill learning is contradictory to the natural performance of early learning. Emphasis on theoretical correctness serves only to reduce the likelihood that the outline will be constructed with sufficient speed to be of any practical value. Although this point is strongly argued, Leslie insists that the shorthand outline seldom has any effect on legibility. Emphasis on premature perfection hampers the acquisition of skill.

Leslie and Zoubeck disapprove of the use of shorthand rules in learning shorthand by saying that "at no time, in any way, for any reason, should the learner be given any reason to suppose that shorthand rules exist."[62] It might appear that shorthand outlines which are written by students who have not been taught to write according to rules would differ from book outlines. Leslie indicates that this is not the case. An investigation by Rudolph reveals that writers who know the rules actually made more theoretical errors under stress of dictation than writers who do not know the rules but who have automatized their writing.[63] The principle that rules are relatively unimportant in the learning of shorthand appears to have psychological support.[64] Thompson, Gardner and Di Vesta state:

> Understanding and control develop slowly and attempt to give long-winded, involved, detailed explanations or demonstrations, especially at the beginning, are worse than useless. Trials are the chief sources of data for improvements in the pupil's skill. Practice helps to reinforce the more useful behaviors and to eliminate the inappropriate, less efficient ones. The teacher's function is that of directing attention to the essential features of the activity.[65]

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[62]Louis A. Leslie, Methods of Teaching Gregg Shorthand (New York: Gregg Publishing Division, McGraw-Hill Book Company, 1953), p. 114.

[63]Sister M. Clemens Rudolph, "An Investigation of the Errors Made by Students of the Functional Method of Gregg Shorthand and a Comparison of Results With Those of the Manual Method Students" (unpublished Master's thesis, University of Notre Dame, 1942).

[64]Ibid.

[65]George G. Thompson, et al., Educational Psychology (New York: Appleton-Century-Crofts, Inc., 1959), p. 370.

Writing on this same point Lawther states:

> As quickly as the beginner can get the general idea of the act, he should begin his practice trials and revisions. These first individual movements he makes are only partially identified, if at all. They are continaully adjusted and changed, anyway, as learning progresses. Only the gross errors need corrections at this stage; minor errors are unimportant. The teacher should avoid detailed verbal explanations in the early stages. Word explanations have very little meaning for the beginning learner of a motor skill.[66]

In a study of the influence of knowledge of mechanical principles on the learning of motor skills, Colville found:

> 1. There was no evidence that instruction concerning mechanical principles utilized in the performance of a motor skill facilitates the initial learning of the skill to any greater extent than an equivalent amount of time spent in practicing the skill.
>
> 2. There was no evidence that such knowledge facilitates subsequent learning as evidenced in the performance of a similar or more complicated skill to which the same principle is applicable.[67]

While Leslie and Zoubek question the value of conscious knowledge of rules, their frequent mention of unverbalized generalization apparently indicates the need for some knowledge of the shorthand system. While unverbalized generalizations may not always result in accurate outlines, they appear to assist the writer in making legible outlines which can be transcribed correctly.

The teacher's role, according to Leslie, is that of providing the learner with a good model for imitation and trying to keep the learner from analyzing and verbalizing. The most important objective of shorthand learning is

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[66]John D. Lawther, "Learning Motor Skills," Educational Psychology, Charles Skinner, Editor (4th ed.; Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1959), p. 505.

[67]Frances M. Colville, "The Learning of Motor Skills as Influenced by Knowledge of Mechanical Principles," The Journal of Educational Psychology, XLVII (October, 1957), pp. 321-327.

the ability to construct rapidly a legible shorthand outline for any word in the English language. The less the learner is conscious of the mechanical details of the skill, the more effectively he will be able to accomplish this objective.

Another controversial aspect of theory instruction is concerned with the proper time to introduce new-matter dictation. From the extensive research on this issue, the McKenna[68] and Persing[69] dissertations were selected for review.

McKenna sought to discover whether students taking new-matter dictation early in their training would achieve greater success in taking dictation and transcribing at the end of twenty weeks of instruction than students who were taught by the language-arts method in which no new-matter dictation was introduced during the period when theory was being learned.

In an experimental study conducted at Michigan State University, McKenna used students in the winter and spring classes of beginning shorthand. In the section taught using the science-type method, new-matter dictation was introduced beginning with the eighth class period. The dictation consisted of a short letter containing a few words which the students had never read or written before but which they should have been able to construct from the shorthand principles previously covered. Selected words from the Silverthorn 1500-word list and other less common words constituted the "new words" which were used

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[68]Margaret McKenna, "An Experimental Comparison of Two Methods of Teaching Shorthand" (unpublished Doctor's dissertation, Michigan State University, 1966).

[69]Bobbye Sorrels Persing, "A Classroom Investigation of When to Begin New-Matter Dictation in Gregg Shorthand" (unpublished Doctor's dissertation, The University of Oklahoma, 1966).

in the dictation letters. While the letters were not previewed, they were post-viewed by the teacher who placed the outlines of the new words as well as others on the blackboard. The letter was then dictated a second time. Two theory tests and a series of dictated letters constituted the criteria for determining possible differences in the two sections.

The findings of the study were:

1. There was no statistically significant difference between the achievement of the two groups on the dictation tests or on the theory tests. Also, there was no difference between the two groups on the number of shorthand or transcription errors made on those tests.

2. Transcription achievement as measured by the dictation tests correlated with knowledge of theory as measured by the word tests in each section and in the two sections combined.[70]

Based on these findings, the conclusions drawn were:

> 1. That the early introduction of new-matter dictation does not result in an increase in the ability to take and accurately transcribe new-matter dictation material as measured by the existing departmental standards at Michigan State University.
>
> 2. That the early introduction of new-matter dictation does not, as claimed by some experts, retard the students in their ability to take and transcribe new-matter dictation material as measured by the existing departmental standards at Michigan State University.
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> 3. That students taught by the functional method in which no emphasis is given to the principles of outline construction do not differ in knowledge of shorthand theory as measured by word tests from the students taught by a science-type approach in which rules and the principles of outline construction are discussed.

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[70]McKenna, op. cit., pp. 53-54; Abstract.

4. That there is a relationship between transcription achievement as measured by the ability to take dictation and transcribe accurately and knowledge of theory as measured by word lists.[71]

An experiment similar to McKenna's was conducted by Bobbye Persing at Central State College, Edmond, Oklahoma, during three semesters in 1964-1965. Comparative groups, involving a total of 91 students, were randomly established and were determined, through chisquare testing, to be equal (.05 level), measured by ages, collegiate grade point averages, and ACT composite and English national percentile rankings. The groups were taught and tested in identical fashion except for the early and continued training in new-matter dictation for one of the groups. The results showed that there was no significant difference (.05 level) in achievement in theory, familiar-matter dictation and new-matter dictation.[72]

Persing concluded that because the new-matter dictation debate may be much ado about an issue yielding opposing, yet validly equivalent and counterbalancing arguments, the recommendation is that each shorthand teacher should be aware of the merits of the arguments and employ in optimum manner those procedures which prove pragmatically best for him.[73]

Homework Preparation

A review of the literature on shorthand homework preparation

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[71] Ibid.

[72] Persing, op. cit., pp. 100-105.

[73] Ibid., p. 105.

revealed marked variation in the opinions of business educators regarding homework practice. While it is not possible to identify each practice with a specific method, certain practices may be associated with the functional method and other practices tend to be followed by the manual method supporters.

All of the authorities agreed that homework should be regular and well planned and that the techniques for doing homework should be taught in class. Harms and Stehr indicate the importance of preparing students for homework by recommending that assignments should be an essential part of the daily classroom plan and should tie in with the major and minor objectives of the course.[74]

The Functional Method.--The homework during the early stages of the course differs with the approach used. According to Leslie, the reading approach is the best means of producing all the learning outcomes which are desirable at this stage. He recommends that the reading approach be followed for the first twenty assignments. With the aid of the key the learner spells and reads the words and connected matter aloud once, spelling aloud any outline that causes hesitation in reading.[75] In the following quotation, Harms and Stehr show the value of spelling:

> Although it may be difficult to find the exact psychological principle undergirding this concept, there seems to be something in the spelling aloud of the shorthand words in the beginning stages of the course that conditions the organism to the fluent writing of

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[74]Harms and Stehr, op. cit., p. 149.

[75]Leslie, op. cit., p. 89.

> sounds according to certain principles found later in the course. . . . Spelling aloud in the proper setting, with the proper association, does facilitate the writing from sound and does pay dividends later when the student is required to take new-matter dictation.[76]

Advocates of the reading approach believe that problem solving should not be a part of the homework. When reading contextual material, the learner should be encouraged to use the printed key often so that he does not lose time in figuring out the outlines. Leslie asserts that the primary reason for unsatisfactory homework in the functional method is failure to obtain from the key the full advantage that is intended. The proper procedure for using the key, known as reading with two fingers, is described as:

> . . . the only technique of using the key that will enable the pupils to complete the homework assignment in a reasonable length of time with the symptoms of learning that may properly be expected and demanded at this stage of the learning process. . . . The index finger of the left hand is put under each shorthand outline as it is read. When it is necessary to consult the key, the finger of the left hand is left planted firmly under the shorthand outline that the learner was unable to read.
>
> The index finger of the right hand is kept firmly planted under the last word that was consulted in the key. Thus, as the learner turns back to the key, his finger is still under the last previous word for which he looked--seldom more than a line or so away from the new word for which he is looking. Therefore, very little time is wasted looking for the word in the key. When the learner turns back from the key to the shorthand page, he finds his finger still firmly planted under the shorthand outline. Therefore, he is able to locate the place and to continue reading in a second or two.[77]

The standard homework assignment after writing has been introduced

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[76] Harms and Stehr, loc. cit.

[77] Leslie, op. cit., pp. 104-105.

consists of reading the lesson, then copying the entire lesson once, saying each word aloud as it is written. Leslie maintains that the most effective practice, minute for minute, is the copying of large amounts of graded connected material once. According to Leslie and Zoubek, the more shorthand material the learner reads and copies, the more rapidly skill will develop. Benefits ascribed to this practice are that:

> 1. It reinforces learning of the shorthand principle presented in the assignment;
>
> 2. It provides a continuous, automatic review of word-building principles and abbreviating devices presented in previous assignments.
>
> 3. It impresses on the learner's mind the correct joining of the alphabetic strokes in many different combinations; and
>
> 4. It exposes the learner to an ever-expanding business vocabulary.[78]

Since it is believed that re-creation rather than mere repetition is the cause of learning, the learner is asked to write only the connected material. There is some evidence to indicate that merely repeating an outline is of little value and that the maximum benefit results from having to re-create the outline in the mind each time that it occurs in the various contexts of the lesson.[79]

Leslie says that the ability to construct an outline for any word is attained by practicing outlines for thousands of different words to obtain the

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[78]Louis A. Leslie and Charles E. Zoubek, Instructor's Handbook for Gregg Shorthand Functional Method, Diamond Jubilee Series (New York: McGraw-Hill Book Company, Inc., 1965), pp. 2-3.

[79]Louis A. Leslie, "Fallacies in Teaching Shorthand, 1-4," Business Education World, XXX (February, 1951), pp. 303-305.

atest familiarity with the sound and symbol combinations of the language. In ing, the repetition of the shorthand outline in constantly different contextual erials aids in forming the pattern of response and perception.[80]

Tonne, Popham, and Freeman agree with Leslie that extensive copy- of connected material is better than repetitive, intensive copying of connected erial.[81] Many years ago Rowe indicated the importance of copying shorthand es for homework practice. He recommends that the student preview through ling until he knows all outlines, and only then should he proceed to copy the es. The student will learn more by copying six pages of assigned plate erials once than he will by copying two pages three times.[82]

The Manual Method.--Homework assignments given by teachers who ow the science-type approach vary widely. Dry and Dry favor a reading ap- ch during the first three days and introduce writing as part of the homework the fourth lesson.[83] This approach to reading conflicts with the Teacher's dbook for the Gregg Shorthand Manual which suggests that reading be con- ed for the first two weeks of beginning shorthand. A typical assignment might read and copy once or twice each word appearing in the list at the beginning

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[80]Ibid.

[81]Tonne, Popham, and Freeman, op. cit., p. 170.

[82]John L. Rowe, "Shorthand Practice," Business Education World, January, 1931), p. 26.

[83]Samuel W. and Nellie Ellison Dry, Teaching Gregg Shorthand Transcription, A Practice Approach (Portland, Maine: J. Weston Walch,), p. 8.

of the lesson. A variation might be to write once or twice each second or third word in the word list. Condon believes that greater emphasis should be placed on writing theory words. He says that:

> Currently the practice of intensive writing of theory word lists is looked upon unfavorably. It is debatable, however, whether the usual reading and copy practice is sufficient to insure the desired mastery. Many students will benefit from a more intensive writing of those lists. Such practice should not be too time-consuming. It should be done rapidly and with purpose. . . . Writing several repetitions of two or three words successively is probably preferable to the practice of just repeating each word several times individually. For one thing, it demands attention. Repetition is worthwhile only so long as attention is maintained. . . . At the end of such practice, the student should give himself a self-test by writing the entire list once, using the key as a stimulus, and then check his outlines with the plate and do any necessary remedial practice.[84]

Homework assignments on the connected material of each lesson also vary from requiring that all the connected material be written once to having a small amount written repetitively.

A number of writers support the practice of self-dictation. Condon believes in teaching students the self-dictation technique to make their practice work of the most value. He says that it is not necessary that the student know how rapidly he is talking. The goal is for the student to do repetitive practice of a phrase, a clause, or whole sentence until he can keep up with his normal speaking voice.[85]

Wagoner also believes that homework should be from self-dictation instead of mere copying. This procedure requires the student to read aloud,

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[84]Condon, op. cit., p. 137.

[85]Ibid.

looking at a portion of a sentence and re-creating these outlines in the notebook from oral stimulus.[86] Another recommended procedure is that of translating from the printed key into shorthand. In commenting on this practice, Pearlis says: ". . . translating from print into shorthand requires a knowledge of shorthand, requires a great amount of thought, and develops the ability to construct new words."[87]

There is considerable disagreement regarding this practice. Leslie expresses his disapproval of writing from a printed key in these words:

> Copying from print into shorthand is not only of little value; it is definitely harmful to the learner. The one prime requisite of good shorthand teaching and learning is that every teaching and learning procedure should contribute to fluent and rapid writing. Anything that contributes to hesitation in writing should be avoided. No one factor in shorthand teaching contributes more to the development of a hesitating style of shorthand writing than copying from print into shorthand. The learner working on his homework is writing at his leisure. When he comes to a word presenting some shorthand difficulty, he will stop and think it over. He will consider the various possibilities, hoping to strike upon the best outline. Nothing can be more harmful and more opposed to correct shorthand learning.
>
> It is much better that he learn to write any outline instantly than that he learn to write the best possible outline after some hesitation. After reading, therefore, copying should be from printed shorthand.[88]

Because copying contextual material from shorthand plates may become a monotonous repetitive practice, Condon suggests the following various methods for students to use in homework practice:

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[86]Wagoner, op. cit., p. 332.

[87]Lillian Pearlis, "Effective Homework in Shorthand," Balance Sheet, XXXIX (November, 1957), p. 132.

[88]Leslie, Methods of Teaching Gregg Shorthand, op. cit., p. 7.

1. The whole sentence copy method. The students should read one sentence from the shorthand plate and then write the sentence from memory. Each sentence is taken in this manner until the entire take has been read and written. The students then repeat once or twice, trying to write more rapidly on each successive writing.

2. The time copy method. The students time themselves with an ordinary watch or clock for two or more successive timings on a given portion of the material. If properly used, this encourages repetitive writing and fluent writing style.

3. The sentence repetitive method. The student reads an entire sentence (in the case of a very long sentence, a clause) until he can repeat it from memory. He then writes it slowly enough to ensure readability. He then repeats the sentence three times, each time striving to write faster. If he is really pushing for speed, his outlines show some evidence of pressure. He writes the sentence one more time, slowing down just enough to ensure legible outlines. This same procedure is followed for all the sentences in the take.

4. The student reads a sentence from the shorthand plate. He then writes the sentence in his notebook. This process is continued until he completes a paragraph. He then reads his own notes from the entire take until he can read as fluently as from print. He reads (aloud if feasible) at a moderate reading rate and traces his notes, forcing his hand to keep up with his voice. He repeats this reading and tracing process four times, and his final dictation-reading should be at least as fast as his normal speaking rate.

5. The scribble-writing method. The student reads and rereads a shorthand paragraph until he can read it with considerable fluency. He then self-dictates at a normal reading rate. He writes the sentences on one line in the notebook, keeping eyes on the shorthand plate, while reading and writing. He occasionally drops down to another line so as not to wear a hole in the paper. He repeats this about four times forcing his dictation rate to a high speed.

6. The build-up method. The student reads two or three words or a short phrase, then he writes the section several times. He reads another small section and writes it several times. He then combines the two sections and writes several times. He continues adding a section, writing and combining until the entire sentence has been practiced. He continues with each of the remaining sentences in the paragraph.

7. The line-skip method. After the usual reading practice the

> student writes a paragraph or letter in shorthand, but skips 3 to 5 lines between each line of writing. He then reads his own notes and writes the shorthand from self-dictation on the first blank line. He continues to take self-dictation for each of the remaining blank lines, striving to write more rapidly on each repetition.[89]

Studies made by Clevenger[90] and Crandall[91] are two of the few experimental investigations on methods of studying shorthand. Earl Clevenger compared matched groups of students--one group emphasized reading (Plan A) in preparing the daily assignments and the other group emphasized writing (Plan B). The two groups were subdivided on the basis of ability in order to compare the work of the best students with that of the average, and below average students.

The major findings include:

1. Shorthand achievement scores made by students in the upper third of the classes showed that Plan A students excelled Plan B students by six points. In the middle third of the class, Plan B students exceeded Plan A students by four points, and in the lowest third Plan A exceeded Plan B students by four points.

2. At the end of the study, students were asked to give their opinions of the two plans of study. The students making the better grades preferred to use Plan A while those making the lower grades preferred Plan B. The study appears to indicate that "the student who studies the entire lesson by writing

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[89]Condon, op. cit., pp. 147-148.

[90]Earl Clevenger, "How Do You Study Shorthand," The Journal of Business Education, XII (January, 1937), pp. 21-22.

[91]Lars G. Crandall, "An Experimental Determination of the Merits of Two Methods of Studying Shorthand--Reading as Against Writing Shorthand Outlines" (unpublished Master's thesis, Brigham Young University, 1945).

each character only once (reading approach) has a more effective means of studying shorthand than the student who writes an outline several times (manual method) before studying the next outline."[92] Since only 19 pairs of students were included in the study, no definite conclusions should be drawn.

Crandall also investigated the relative merits of practicing shorthand exercises by reading and by writing. He found that pupils who practiced the exercises solely by reading increased in the rate of writing more rapidly than pupils who practiced by copying. Pupils who practiced shorthand by copying were more accurate than the pupils who practiced by reading. Eighty-four percent of the pupils preferred to practice shorthand outlines by writing than by reading.[93]

Summary

Part of this chapter has presented both the theory and the nontheory position with regard to the fundamental principles of shorthand and their application to shorthand learning.

The research on the teaching of shorthand theory revealed marked variations in the emphasis on accuracy and the degree of accuracy required in the application of shorthand principles. While a case for the theory as well as for the nontheory approach can be made, the majority of shorthand teachers find a combination of the manual and the functional approach preferable to the use of either method alone.

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[92]Clevenger, loc. cit., p. 69.

[93]Crandall, op. cit.

II. Literature Concerned With Shorthand Success

The literature reveals the early and continued interest of researchers in determining the specific factor or factors which contribute to success in shorthand. Among the variables which have been studied are intelligence, scholastic achievement, English grades, foreign languages, typewriting, reading ability, and personal characteristics.

The majority of the studies on shorthand have been concerned with prognosis. From their comprehensive reviews, both Anderson[94] and Frink[95] found that none of the shorthand prognostic tests could be used as a single predictor. While many of the studies showed contradictory results, a number of investigators found that English marks, school achievement, and foreign language grades are among the best measures yet found to predict success or failure in shorthand.

Tschider summarized the research on prognosis from 1914 to 1960. In agreement with Anderson and Frink, she found that a battery of tests is more effective for prediction than a single test.[96] With regard to further study, she recommended that:

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[94]Anderson, op. cit., pp. 733-735.

[95]Frink, op. cit., p. 40.

[96]Irene R. Tschider, "A History of Selected Studies in Shorthand Prognosis from 1914 to 1960" (unpublished Master's thesis, University of North Dakota, 1960), p. 82.

1. More research should be conducted on standard instruments which predict ability in shorthand.

2. Additional investigations should be conducted using four or five factors as criteria rather than using a single factor in the prediction of shorthand achievement.[97]

Missling investigated the predictive efficiency of the Turse Shorthand Aptitude, the Henmann-Nelson Test of Mental Maturity, grades in all high school courses excluding English grades and typewriting grades. In her study of two beginning shorthand classes, she obtained correlations of .51 and .54 between the Turse Aptitude Test and shorthand achievement. The highest correlations were between shorthand grades for each year and the average high school grades in all subjects exclusive of English. The correlation for Class 1 for the first year was .74; for Class 2, .73. The correlation for Class 2 for the second year was .67.[98] With regard to these findings, Frink noted that coefficients of .74, .73, and .67 would seem to indicate that students doing a good job in their high school courses have usually developed good work habits and are likely to succeed in shorthand.[99]

Hunt investigated the degree of relationship between the Education Research Corporation Stenographic Aptitude Test as well as other factors and achievement in first-year shorthand. The other factors considered were: high

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[97] Ibid., p. 87.

[98] Lorraine Missling, "Prognostic Testing in Shorthand" (unpublished Seminar report, University of Wisconsin, 1954), p. 81.

[99] Frink, op. cit., p. 230.

school average, previous shorthand instruction, English Placement Test Percentile rank, General Aptitude Percentile rank, average of all college subjects prior to enrolling in shorthand, total hours of college credit prior to enrolling in shorthand, and averages of grades in first-year English. Evaluative criteria were mailable letters, speed, and final grade. The sample included a total of 400 students enrolled at the University of Tennessee. Although not statistically significant, the General Aptitude Test percentile rank (.553) was found to be the best predictor of shorthand success. Hunt suggests that this correlation may indicate that shorthand ability is not separate from general ability to learn.[100]

The correlations obtained by Hunt between college average and final achievement in the first (.420); second, (.459), and third, (.299) quarter of shorthand do not support the recommendation made by Jones[101] in another study, that college average be considered as a factor in predicting achievement in shorthand. In a prognostic study on the university level, Jones found a correlation of .499 between final achievement and General Aptitude Percentile rank.

Hunt found a correlation of .497 between the E. R. C. Stenographic Aptitude Test and final achievement in shorthand. With respect to the findings of this study, she recommended that the E. R. C. as well as the other factors not be

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[100]Lillian Alice Hunt, "The Use of the ERC Stenographic Aptitude Test and Other Selected Factors for Prediction of Achievement in First-Year Shorthand" (unpublished Master's thesis, University of Tennessee, 1954), pp. 80-86.

[101]Lena Ruth Jones, "Prognosis of Shorthand Achievement at the University Level" (unpublished Master's thesis, University of Tennessee, 1951).

used for predictive purposes.[102]

Whittle studied the relationship between student achievement in first-semester shorthand and the following factors:

1. High school grades (English, foreign language, general scholastic average)

2. Attendance record in high school

3. Quartile rank in high school grade or class

4. The University of Texas Admission Test score (verbal, numerical, total)

5. The University of Texas English Placement Test scores (Reading Comprehension, English Unit Examination)

6. I. Q. scores

7. Each student's reason for electing shorthand[103]

Whittle found that the University of Texas Admission Test score (total) yielding a coefficient of .759 indicated a rather significant degree of relationship to shorthand achievement. The general scholastic average of high school grades had a correlation of .586. The investigator found no single variable by which shorthand success can be predicted accurately. The five factors (University of Texas Aptitude Test scores, English Unit Examination of the University of Texas Placement Test score, high school grades, scholastic averages and the reason for electing shorthand) was found to be sufficiently related to success in beginning

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[102]Hunt, loc. cit.

[103]Marie Whittle, "The Relationship Between Certain Variables and Achievement in Beginning Shorthand at the University of Texas" (unpublished Master's thesis, University of Texas, 1959), pp. 3-6.

shorthand as to be of value in the shorthand guidance program at the University of Texas.[104]

Pauk's study compared the predictive efficiency of the subtests of the Turse Shorthand Aptitude Test. He also included the ACE Psychological Examination for High School Students as a predictor of shorthand success. He found that the four verbal subtests of the Turse combined predicted shorthand much better than did the combined three mechanics of shorthand subtests (.66 vs. .34). The verbal subtests individually or in combination predict shorthand with the same proficiency (.56 to .66) as the total Turse test (.63). The L-Score of the ACE predicts shorthand as well as the total Turse test (.63 vs. .63).[105]

A prognostic study by Sanders included among other variables the ACE as a predictor of shorthand achievement.[106] She found: (1) that there was no relationship between what was achieved in shorthand classes in high school and what was achieved later, (2) that there was no relationship between years of prior shorthand experience and ACE Percentile rank, and (3) that there is a significant relationship between ACE Percentile rank and achievement in college shorthand classes.[107]

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[104] Ibid.

[105] Walter Pauk, "What is the Best Way to Predict Success in Shorthand," Business Education World, LXIII (April, 1963), pp. 7-8, 34.

[106] Celene Honeycutt Sanders, "A Study of the Relationship Between Certain Radford College Students' ACE Scores, Years of Shorthand in High School and Achievement in Shorthand" (unpublished Master's thesis, Virginia Polytechnic Institute, 1962).

[107] Ibid.

Veon investigated the relation of learning factors found in certain modern foreign language aptitude tests to the prediction of shorthand achievement in college. The study extended over three years and included 299 shorthand students at the George Washington University. In conducting the study, Veon used the following tests: American Council on Education Psychological Examination for College Freshmen; Iowa Placement Examination, Foreign Language Aptitude; Symond's Foreign Language Prognosis Test; Luria-Orleans Modern Language Prognosis Test; Carmichael's Shorthand Learning Test, Semester 1. The Carmichael Test was used as the criterion of shorthand achievement.[108]

The findings revealed the following correlations for selected prognostic factors with the shorthand criterion of achievement:

The Iowa Placement Examination's Foreign Language Aptitude Test, Form M	.6374
The Symond's Foreign Language Prognosis Test	.7192
The Luria-Orleans Modern Language Prognosis Test	.3165
The American Council on Education Psychological Examination for College Freshmen	.5102[109]

The multiple correlation was found to be .5421. Although the combination of tests used in this study may not be of value for prediction purposes, some of the subtests revealed somewhat significant correlations.

Lang investigated the relationship between factors considered to be

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[108]Dorothy Helene Veon, "The Relationship of Learning Factors Found in Certain Modern Foreign Language Aptitude Tests to the Prediction of Shorthand Achievement in College" (unpublished Doctor's dissertation, George Washington University, 1948).

[109]Ibid., pp. 60-62.

pertinent to success in the study of modern foreign languages and in shorthand achievement: aptitude for foreign languages, linguistic ability, vocabulary, general scholastic aptitude. Data for statistical analysis were provided by 184 elementary, intermediate, and advanced stenography students at the University of Missouri. The tests used in the study were: The Iowa Placement Examination in Foreign Languages Aptitude, the Cooperative Vocabulary Test, and the ACE Psychological examination provided measures of the psychological and linguistic factors.[110]

The results showed a positive and in most cases a substantial relationship between the measure of the psychological and linguistic factors and shorthand achievement at the three instructional levels. However, no single measure or combination of measures was high enough for prediction use.[111]

Byers approached the problem of shorthand prediction by constructing aptitude tests designed to measure: Phonetic Perception, Retention Ability, Observation Aptitude, Pattern from Parts, and Hand Dexterity. The tests were administered to three groups of students--college, junior college and business school, and high school. The Dickinson's Semester Shorthand Achievement Test was the criterion measure of shorthand achievement. It consisted of seven letters, each two and a half minutes in length, which were dictated at progressive speeds.[112]

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[110]Mary Jane Lang, "The Relationship Between Certain Psychological Tests and Achievement in Shorthand at Three Instructional Levels" (unpublished Doctor's dissertation, The University of Missouri, 1960).

[111]Ibid.

[112]Edward E. Byers, "Construction of Tests Predictive of Success in First-Year Shorthand" (unpublished Doctor's dissertation, Boston University, 1958).

Listed below are the multiple and subtest correlations between the Aptitude Tests and shorthand achievement.

	multiple correlation	subtest correlation
College Group (128 students)	.76	
Phonetic Perception		.36
Retention Ability		.44
Observation Aptitude		.18
Pattern from Parts		.28
Hand Dexterity		.68
Junior College and Business College (142 students)	.59	
Phonetic Perception		.52
Retention Ability		.27
Observation Aptitude		.37
Pattern from Parts		.31
Hand Dexterity		.27
High School Group (137 students)	.62	
Phonetic Perception		.49
Retention Ability		.24
Observation Aptitude		.32
Pattern from Parts		.46
Hand Dexterity		.47[113]

The results of the study showed a significant relationship between the Aptitude Tests and shorthand achievement for the College Group and a substantial relationship for the Junior and Business College Group as well as for the High School Group. Byers believed that the aptitude tests together with other factors such as motivation and intelligence could be useful in predicting group performance for each sample population. For the College Group, the combined Aptitude Tests

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[113] Ibid., p. 76.

and the other factors could be useful in individual prediction of first-year shorthand success.

As was indicated above, Byers was able to show a multiple correlation of .76 between proposed aptitude tests and results on the semester shorthand accomplishment test. However, he believes some teachers are consistently more successful than others and that high correlations probably depend as much on the type and quality of the teaching as they do on any intrinsic relationship existing between the learning involved in shorthand and the various types of activities represented in aptitude tests.[114]

In an attempt to evaluate the Byers Aptitude Tests, Wright administered the tests to prospective shorthand students. The results of the tests were compared with student achievement in shorthand after a year of shorthand instruction. She obtained a correlation of .3737 between the Byers Test and shorthand achievement and a correlation of .6822 between the Phonetic perception subtests of the Byers test with shorthand achievement. The highest Phonetic subtest obtained by Byers was .52. None of the correlations obtained by Wright were high enough to be considered useful as predictors of shorthand success.[115]

Although this part of the present study is concerned with the prediction of shorthand achievement, it is worthwhile to review relevant prediction

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[114] Ibid.

[115] Ellen M. Wright, "A Summary of Recent (1940-1962) Selected Findings in Shorthand Prognosis with Specific Reference to the Use of the Byers First-Year Shorthand Aptitude Tests at the High School in Southington, Connecticut" (unpublished Master's thesis, Central Connecticut State College, 1963).

studies of general college achievement. Of special importance to this study are the following investigations which have used the same tests as predictors. Weeks studied the predictive efficiency of the ACE Test, Form A, and the SCAT, Level 1. These tests were given to 122 new students at Eastern Michigan College. In comparing test scores and college grades, it was found that the SCAT total score had a higher correlation (.42) than did the ACE Test total score (.19). On the basis of this study, SCAT had a general superiority over the ACE Test as a predictor of college grades.[116]

The predictive validity of five different aptitude tests was compared by Joula. The tests used in the analysis were the College Qualifications Test (CQT); the School and College Ability Test (SCAT); the Ohio State Psychological Examination (OSP); and the Scholastic Aptitude Test (SAT).[117] The tests were given to 910 entering freshmen at Michigan State University. Correlation coefficients between test scores and first-quarter grade point averages indicated little difference in the predictive value of the tests. The correlation coefficients between the GPA and the tests were as follows:

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[116]James S. Weeks, "The Predictive Validity of ACE and SCAT," Personnel and Guidance Journal, XXXVIII (September, 1959), pp. 52-54.

[117]Arvo E. Joula, "Predictive Validity of Five College Level Academic Aptitude Tests at One Institution," Personnel and Guidance Journal, XXXIX (April, 1960), pp. 637-641.

PREDICTIVE ABILITY OF SELECTED APTITUDE TESTS

	men	women
ACE	0.50	0.62
CQT	0.59	0.65
SCAT	0.56	0.68
SAT	0.63	0.68
OSP	0.62	0.65[118]

The School and College Achievement Test and high school grades were the subject of a study at Alma College by Lugh and Bierley.[119] In comparing SCAT scores and college grade point averages for one semester, their study revealed coefficients of .54 and .59 for men entering in 1956 and 1957 respectively. Coefficients for the women for the same years were .51 and .67. The high school grade point of the men and college grades showed a correlation of .58 for men entering in 1956 and .53 for those starting the following year. High school grade point and college average showed correlations of .65 (1956) and .68 (1957) for women. Multiple correlations were determined by using SCAT results and high school grade point as predictors and first semester grades as the criterion. The multiple correlation proved to be significantly higher than the zero-order correlations previously mentioned. For men entering in 1956 the R was .67 while for women entering in the same year the coefficient was .68.[120]

The only study which was found reporting the use of the SCAT as a predictor of success or failure in shorthand was conducted by Carter. She

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[118] Ibid., p. 638.

[119] Henry L. Lugh and Robert Bierley, "The School and College Ability Test and High School Grades as Predictors of College Achievement," Educational and Psychological Measurement, XIX (Winter, 1959), pp. 625-626.

[120] Ibid.

compared final grades received by 103 beginning shorthand students with English grades, Differential Aptitude Verbal Test Scores, SCAT Verbal Test Scores, and I. Q. Ratings. The correlations for each of the variables used in the study follow:

English	.720
Differential Aptitude	.585
SCAT	.531
I. Q.	.627[121]

Carder concluded that the scores of the DAT verbal and SCAT Verbal Test would not be valid for shorthand prognosis. The I. Q. ratings could be of some benefit for shorthand prognosis, but the best combination would be the I. Q. ratings and tenth-grade English grades.[122]

Other investigators have found English aptitude as being correlated with achievement in shorthand. For example, Cheney and Goodish reviewed shorthand diagnostic studies and concluded that the greatest efficiency of the various methods was accorded to English, spelling, and general scholastic average derived from the Differential Aptitude Test Battery, to predict accomplishment in shorthand.[123] Selden also listed both English grades and the results of language or English aptitude standardized testing as important criteria for shorthand

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[121]Mary Lou Carter, "The Possibility of Using Tenth-Grade English Grades, School and College Ability Verbal Test Scores, Differential Aptitude Verbal Test Scores, and I. Q. Ratings as Predictors of Success or Failure in Beginning Shorthand" (unpublished Master's thesis, Southern Illinois University, 1965), p. 27.

[122]Ibid.

[123]Truman M. Cheney and Naomi Goodish, "Analysis Between Certain Variables and Achievement in Beginning Shorthand," Journal of Business Education, XXXVIII (May, 1963), p. 318.

prognosis.[124] Finally, Anderson concluded from her analysis of research in shorthand and transcription that English ability measurement is listed as among the best measures yet selected.[125]

One of the stated purposes of the studies conducted by Coleman,[126] McKenna,[127] and Varah,[128] respectively, was to discover possible predictors of shorthand achievement. Coleman investigated the relationship between student performance on the MSU Test Battery and final grades in beginning shorthand. The findings revealed that none of the correlations between the subtests of the Entrance Test Battery and achievement in beginning shorthand yielded sufficient control for the accurate prediction of shorthand success. During the "t" test phase of the study, Coleman discovered that those students who received a terminal grade of A and D differed significantly as to their performance on the College Qualifications portion of the Entrance Test Battery which was represented by the total score for the Verbal, Informational, and Numerical subtests.[129]

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[124]William Selden, "Criteria for Selection of Stenographic Students," Journal of Business Education, XXVII (December, 1961), p. 106.

[125]Ruth I. Anderson, "Research in Shorthand and Transcription, Part II," Journal of Business Education, XXIII (February, 1948), p. 20.

[126]Brendan G. Coleman, "The Effect of a Tape-Laboratory Instructional Approach Upon Achievement in Beginning Collegiate Shorthand Classes" (unpublished Doctor's dissertation, Michigan State University, 1964).

[127]McKenna, op. cit.

[128]Leonard J. Varah, "Effect of Academic Motivation and Other Selected Criteria on Achievement of First and Second Semester Shorthand Students" (unpublished Doctor's dissertation, Michigan State University, 1966).

[129]Ibid.

In her study, McKenna replicated the portion of Coleman's study in which the subscores of the MSU Test Battery were used as predictors of achievement in beginning shorthand. The scores of the subtests on the MSU Test Battery were also analyzed to determine if a relationship exists between the aptitudes as indicated by the scores and success or failure in shorthand when taught by a language-arts or science-type approach. This phase of the study was reviewed in an earlier section of this chapter.[130] McKenna lists the following findings with respect to prognosis:

> That performance on the Michigan State University Entrance Test Battery does not provide an accurate measure for predicting individual success in beginning shorthand at MSU. The English subtest was the best single predictor with a correlation in the combined sections of .61 and a coefficient of determination of .37 indicating that 37 percent of achievement in shorthand is accounted for by whatever is measured by the English test.[131]

In the continuing search for more effective predictors of shorthand success, the more recent writers have turned to evaluating such factors as temperament, interest, motivation, and other personality variables. These investigations give much support to Eysenck's statement made years ago.

> The works of Alexander, Holziner, Vernone, Braddock, and others show with surprising unanimity that there is a factor common to all scholastic subjects which cannot be identified with 'g', 'v', 'k' or any other ability factor. . . . It appears to be resultant on all noncognitive factors in so far as these influence success at school or college.[132]

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[130] McKenna, loc. cit.

[131] Ibid., p. 88.

[132] H. J. Eysenck, "Student Selection by Means of Psychological Tests," The British Journal of Educational Psychology, XVII (February, 1947), pp. 20-39.

Among those who have studied personality variables are Varah and Powell. In his own words Varah describes the purpose of his dissertation:

> To determine the predictive value, if any, of the Michigan M-Scales, a test of academic motivation, total score or subscore for predicting achievement of eleventh grade girls in first and second semester of Gregg Shorthand when used individually or in combination with the total score or a subscore of an estimate of mental ability. This predictive value was then compared with the predictive value of academic grade point average, ninth grade English grades, and tenth grade English grades to determine the most accurate predictor of shorthand achievement.[133]

The data for the study came from the first and second semester shorthand classes of eight senior high schools in Central and Southern Michigan. The following information was compiled for each student: (1) an estimate of mental ability, (2) grades for ninth and tenth-grade English and overall academic grade point average, and (3) a motivation score as measured by the Michigan M-Scales. Shorthand achievement was measured by grades at the end of the first and second semester and by a shorthand examination at the end of the first and second semester.. The major findings of the study were:

> 1. Academic motivation as measured by the Michigan M-Scales is a factor in learning in first semester Gregg Shorthand but is not a factor in learning in second semester Gregg Shorthand.
>
> 2. The Michigan M-Scales when used in combination with an estimate of mental ability did significantly increase the precision of prediction by an estimate of mental ability in predicting the achievement of eleventh grade girls in first semester Gregg Shorthand.
>
> 3. The word rating list, a subtest of the Michigan M-Scales, was found to be a consistently significant predictor of shorthand achievement for both first and second semester of Gregg Shorthand.

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[133]Varah, op. cit.; Abstract.

It was concluded that the academic self-concept of the student as measured by the word rating list is a factor in learning in first and second semester of Gregg Shorthand.

4. The best single predictors of first semester Gregg Shorthand were: grade point average, ninth grade English grades, tenth grade English grades and estimate of mental ability.[134]

Powell made a study of shorthand dropouts and continuants. Her report analyzed the following factors: National test scores, personal factor ratings by teachers, English grades, foreign language grades, typewriting grades, shorthand grades, attendance, part-time work activities of the students, educational and vocational plans, reasons students gave for dropping shorthand, and teachers' opinions of the reason students dropped shorthand.[135]

Powell found that differences do exist between shorthand dropouts and continuants as indicated by the teaching program of a particular school. In each case the scores of the continuants were higher than those of the dropouts. The areas of differences in the testing program are as follows:

1. Of all the tests, the Science Research Associates Reading Record was the most significantly different. The dropouts-failures received a significantly lower score here than did the continuants.

2. The total score from the Reading Record has the greatest degree of statistical significance of any of the test scores used in the study with the dropouts-discontinuants receiving the lower scores.

3. Other Reading Record test scores of marked statistical significance were the sentence meaning score and the vocabulary score.

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[134]Varah, op. cit., pp. 35-36.

[135]Georgia Faye Powell, "An Analysis of Shorthand Dropouts at Ottowa Township High School" (unpublished Master's thesis, Illinois State Normal University, 1961).

4. The national test score from the Science Research Associates Primary Mental Abilities Tests having the greatest statistical significance for shorthand success was the verbal meaning score.

5. The correctness in writing score on the Iowa Tests of Educational Development was the one found to have the greatest statistical significance from that group of tests.

6. Eight of the fourteen dropout means were below the national means, while twelve of the fourteen continuant means were above the national means.[136]

Of particular interest to the present investigation were the following additional conclusions:

Students continuing shorthand tend to rate higher than the dropouts on all personality factors used in the study. The three factors of greatest significance were industry, initiative, and responsibility.

Average grades for the continuants tend to be higher than those of the discontinuants.[137]

Summary

A review of studies related to the prognosis of shorthand achievement indicated that there was a distinct superiority in multi-variable prediction in comparison to the use of a single factor. Studies have consistently indicated that high school grade point average is the best single predictor of shorthand success. Further, the studies mentioned in this chapter have shown the range of coefficients of correlation to be from .381 to .7974 between high school GPA and shorthand grades.

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[136] Powell, op. cit., p. 78.

[137] Ibid., pp. 79-80.

Several conclusions may be drawn from the evidence presented in this chapter:

1. The use of several variables produces higher correlation coefficients than do single predictors.

2. High school grade point average, English grades, foreign language grades and/or aptitude scores are the three most effective predictors of success in shorthand.

3. At the present time the maximum coefficients of correlation that can be expected in multi-variable prediction is approximately .75.

4. Greater accuracy in prediction is largely dependent upon greater refinement of grading practices.

This review of the literature indicates that much study has been given to the teaching and learning of shorthand. The research on methodology has focused upon the two main methods of shorthand teaching--the manual and the functional methods. The writers have shown the differences and similarities which exist between the two methods. The emerging trend appears to be a recognition that there are more points of similarity than there are of differences.

This chapter has also reviewed the research on shorthand prognosis. While many of the studies showed contradictory results, a number of investigators found that a battery of tests including general scholastic average, grades in English, and intelligence test scores to be among the best measures yet found to predict success or failure in shorthand. Further research is necessary to find better predictors of shorthand achievement.

It was found that comparatively limited study has been given to shorthand homework and to the psychological factors thought to influence success in shorthand. This study, therefore, was undertaken to investigate homework involving the use of the Gregg Shorthand Workbook and its effect on shorthand achievement, and to investigate the effect of selected cognitive and affective factors within the learner and their relationship to shorthand learning and achievement.

CHAPTER III

METHODS AND PROCEDURES

In Chapter I attention is called to the fact that many methods of teaching shorthand have been advocated, but today almost all teachers use either the functional (language-arts) or the manual (science-type) method or a combination of both.

This study examined two methods of shorthand homework practice at the college level. The primary purpose was to investigate the effect of using the Gregg Shorthand Workbook in addition to the conventional homework practice. The workbook pertains to the science-type method while the conventional homework is typically a language-arts method. The secondary purpose was to discover whether selected psychological tests could be used to differentiate students who would be successful in shorthand with each of the two main methods of homework practice.

This experiment was conducted during the two academic years 1963-1964 and 1964-1965 with beginning classes of college shorthand. During the first year, experimental procedures were used (1) to compare the shorthand achievement of students using the workbook for supplementary homework practice with the shorthand achievement of students using the conventional homework practice only and (2) to investigate selected cognitive and noncognitive variables relating to the

shorthand achievement of students using the workbook for supplementary homework practice and of students using the conventional homework practice only.

The second year involved further investigation of the psychological factors relating to shorthand achievement regardless of the type of homework used.

I. Description of the Study

Experimental Design

The experimental design followed was the Posttest-Only Control Group Design. Regarding this design, Campbell and Stanley say:

> While the pretest is a concept deeply embedded in the thinking of research workers in education and psychology, it is not actually essential to true experimental designs. For psychological reasons it is difficult to give up "knowing for sure" that the experimental and control groups were "equal" before the differential experimental treatment. Nonetheless, the most adequate all-purpose assurance of lack of initial biases between groups is randomization. Within the limits of confidence stated by the tests of significance, randomization can suffice without the pretest.[138]

Selection of the Sample for the First Year

Seventy-four students enrolled in beginning shorthand from four selected colleges constituted the sample for the first year of the study. The names of the colleges appear in the Appendix. Three of the colleges provided one section each of beginning shorthand, and one of the colleges provided two sections of beginning shorthand. An experimental and a control group for each of the five

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[138]Donald T. Campbell and Julian C. Stanley, "Experimental and Quasi-Experimental Designs for Research on Teaching," Handbook of Research on Teaching, ed. N. L. Gage (Chicago: Rand McNally & Company, 1963), p. 176.

sections was determined through random selection. The teacher of each section placed the names of her students in a container from which the names were drawn to make up the experimental and the control group in the section. Combined there were 39 students in the experimental group and 35 students in the control group.

Procedural Plan of Study

To achieve the primary and secondary purposes of the study, it was organized into two parts. Part I covers the research conducted during the year, 1963-1964; Part II covers the research conducted during the two years, 1963-1965.

Procedures for Achieving Primary Purpose

As stated at the beginning of the chapter, the primary purpose was to investigate the effect of using the Gregg Shorthand Workbook in addition to the conventional homework practice. Five sections of beginning shorthand classes were taught by experienced teachers and met for fifty minutes each day, five days a week, for the academic year, 1963-1964. The chairman of the department from each college gave approval for the teacher and students from her respective college to participate in the study.

Each of the five teachers had been asked to divide her section of beginning shorthand students into subsections by the random method described above. Both subsections were taught together and both used the conventional homework. The addition of the workbook for one subsection constituted the experimental variable.

The workbooks and the directions outlining the specific procedures to be followed were mailed to each teacher on September 18, 1963. On May 18,

1964, the shorthand dictation tests which were used as the criterion measure were sent to each teacher with instructions for administration. All workbooks, tests, and student papers were returned to the investigator at the close of the school year. A copy of the materials sent to the teachers is included in the Appendix. This material constituted the data for Part I of the study.

Procedures for Achieving Secondary Purposes

The secondary purpose of the study was first to discover whether selected psychological tests could be used to differentiate students who would be successful with each of the two chief methods of homework practice and second to determine the extent, if any, to which learning and achievement in shorthand were affected by selected ability and personality factors regardless of the type of homework used.

During the year 1963-1964, each teacher involved in the study administered the following tests: Dictation Tests; School and College Ability Test (Verbal); The Test of Critical Thinking; The Rokeach Dogmatism Scale; and subtests of the Edwards Personal Preference Schedule. These tests are described in the section entitled "Instruments Used." The test results were forwarded to the experimenter who then scored them and analyzed the data. The findings are reported in Chapter V.

Since the study of the psychological factors were indicative but inconclusive, it was decided to repeat this phase of the study using larger numbers. During the school year of 1964-1965, 148 students from three additional colleges (list appears in the Appendix) participated in the experiment, thus making a total

of 222 cases in the combined portion of the investigation. During the second year, identical procedures were used in the administration and scoring of the psychological tests.

Rationale for Use of Workbook by Experimental Group

As a result of teacher interest, the Gregg Publishing Division of McGraw-Hill Publishing Company has published the Gregg Shorthand Workbooks, Volume I and Volume II. Workbooks for the experimental groups were supplied complimentary by McGraw-Hill. The lessons in the workbook are correlated with the shorthand text, Gregg Shorthand for Colleges, Volumes I and II. Each of the 70 lessons contained in Volume I of the workbook consists of evolutionary drills and transcription builders of various types. The evolutionary drills are a science-type orientated approach to shorthand learning, and the transcription section is related to the transcription aspect of shorthand teaching and learning. The science-type approach appears to be related to the Connectionist's theory of learning, and the language-arts approach may be related to the Gestalt psychology. The evolutionary drills in the workbook were selected for homework practice for the reason that they represent the science-type approach to shorthand teaching, and the problem under study is science-type versus language-arts.

Psychologists and the inventors of Gregg shorthand agree on the Gestalt principle that skill is best learned and practiced in the largest feasible wholes and subwholes.[139] Opinions differ, however, as to what constitutes the

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[139]John Alvin Dickinson, "The Role of Practice in Shorthand Skill Development as Related to Selected Classical Theories of Learning" (unpublished Doctor's dissertation, University of Oklahoma, 1966), pp. 135-136.

"whole" in both reading and writing of shorthand. Several writers discuss the part-whole principle as it relates to the functional and the manual methods of shorthand teaching.

According to Lamb the manual approach (science-type) is a parts method for words and sentences are constructed by putting the parts together according to rule. Only after the initial emphasis upon the parts making up the word or outline is the learner able to transfer his attention to the meaning of the word and its relation to the meaning of the sentence.[140]

The functional method (language-arts) is a combination parts and whole method. The basic importance of spelling to the success of the method makes it a parts method, and the consistent emphasis upon meaning from contextual material relates it to the whole method of teaching other language skills.

The viewpoint held by Leslie, however, is that the individual symbol of the shorthand alphabet, which is used for building up words, represents a whole in itself. Later these wholes become subwholes as the learner begins to recognize combinations of symbols.[141]

Wheeler believed that behavior follows laws that do not permit learning by parts, and the "parts method" is actually an illusion. If a task is too long or difficult to be learned by the "unmodified" whole method, a mediating method

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[140]Marion M. Lamb, Your First Year of Teaching Shorthand and Transcription (2d ed.; Cincinnati, Ohio: South-Western Publishing Company, 1961), pp. 45-49.

[141]Leslie, op. cit., pp. 438-440.

must be used. Yet all material presented for learning should be as coherent and logical in form as possible.[142]

A unique application of the S-R and the Gestalt theories to the learning of shorthand has been developed by Christensen. He writes:

> The traditional approach in shorthand classes is S-R with a stimulus (teacher dictation, for example) causing a response (written outline) in the shorthand notebook. The words and phrases placed on the chalkboard and rapidly noted by some of the students are a kind of stimulus-response situation.
>
> Gestalt psychology, however, relies upon the difficult concepts of figure, ground, perception, insight, and field. The earlier S-R example approached by Gestalt would show the shorthand teacher formulating the chalkboard outlines letter by letter and phrase by phrase into one whole (perceptual field). The students, seeing the parts fit together, with an assumption by the teacher that the whole is more than the sum of its parts should tend to remember the formulation better than S-R where the outline (stimulus) precedes that rapid reading and dictating. Gestalt, therefore, with insight (ability to perceive the whole) occurs in a creative situation where shorthand students are asked to formulate whole (outlines) in a composition experience of shorthand outlines flowing from the brain. To interpret further the Gestalt analysis, one perceives the figure as the outline under consideration and the ground as the extraneous outlines already said (reading) or dictated (writing) during the reading or writing sections of the class period. Finally, a brief description about closure may complete the Gestalt argument with the word appreciate as an example. If an individual sees a partial outline of a star on a piece of paper, he tends to fill in the remaining portions with his concept of a star (principle of closure). The same applies to shorthand where the "dot in a circle--ia" is not filled in by the student during the dictation. The student tends to fill in the "dot" in his mind during the summary reading of the dictated matter before typewritten transcription. The Gestalt in the final analysis is correlated with the previous shorthand reading, practice sessions, chalkboard drill, grammar exercises,

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[142]John Alvin Dickinson, "The Role of Practice in Shorthand Skill Development as Related to Selected Classical Theories of Learning" (unpublished Doctor's dissertation, University of Oklahoma, 1966), p. 136, citing The Science of Psychology, pp. 270-271.

and typewriting skill to produce a transcription perceptual field of "appreciate" within the context of the transcription.[143]

Homework Assignments for Experimental and Control Groups

The homework preparation for the experimental and for the control group in each section was identical except that the experimental group completed the evolutionary drills in the workbook as supplementary homework practice. The conventional homework assignment included reading and writing (copying) large amounts of shorthand from Gregg Shorthand for Colleges, Volume 1. Thus, the workbook constituted the only difference between the homework assignments for the two groups.

II. Instruments Used

Dictation Tests

A series of dictation tests was the criterion used to determine shorthand achievement. The tests were three minutes in length and were taken from "The Business Teacher." Four speed tests were administered, each consisting of a business letter dictated at 60, 80, 100, and 120 words per minute, respectively. The students were encouraged to take as many letters as possible, but they transcribed on the typewriter only the letter representing their highest speed. To pass a test, students were required to transcribe within a minimum of 95 percent accuracy. Errors of mistranscribed words, spelling, punctuation, etc. were assessed

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[143]G. Jay Christensen, "Atmosphere for Learning: Chaos or Creativity," Business Education Forum, XVIII (April, 1964), pp. 23, 29.

a penalty of one point each. The achievement scores were recorded as correct words transcribed and were determined by subtracting the number of errors from the total number of standard words in the letter. Thus, the total number of standard words in a letter dictated at 60 was 180; at 80, 240 words; at 100, 300 words; and at 120, 360 words.

The criterion test was considered to be a valid instrument for the following reasons.

1. The use of a speed range in the dictation tests provides opportunity for the student's ability to take dictation to be assessed.

2. The three-minute dictation test compares with the letter length typically found in the business office. Green found in his study of business dictation that three-fourths of the extra company letters contained fewer than 175 words.[144]

3. The Gregg Publishing Division of McGraw-Hill Book Company accepts one test at a given speed for award purposes.

4. As this test was concerned with measuring final achievement of beginning shorthand students, the criterion test used was terminal.

Achievement and Psychological Tests Used

In order to achieve Part II of the primary purposes of this study, it was necessary to obtain measurements of the academic achievement, critical

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[144]H. H. Green, "The Nature of Business Dictation" (unpublished Doctor's dissertation, University of Pittsburgh, 1951), p. 86.

thinking, and of the personality characteristics--dogmatism, order, change, and consistency--for all students in the study. The following instruments were selected to measure the designated characteristics. Each of these tests will be discussed in relation to the purpose of the instrument and of other distinguishing characteristics.

The School and College Achievement Test.--This test was specifically designed to replace the American Council on Education Psychological Examination as a measure of the capacity of students to achieve academically.[145] The verbal reasoning subtest, which was used in this study, consists of a "series of verbal analogies items which probably measure a combination of the 'verbal ability' and 'deductive reasoning' factors."[146]

Since the workbook emphasizes word construction through rules, it would be expected that the student ranking high on the School and College Achievement Test would learn shorthand more easily by using the workbook than by using the conventional homework.

The Test of Critical Thinking, Form G.--The Test of Critical Thinking, Form G, was developed as part of the Cooperative Study of Evaluation in General Education, under the sponsorship of the American Council on Education, Committee on Measurement and Evaluation.[147] Critical Thinking is defined for

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[145]Elizabeth Hagen and Robert L. Thorndike, Measurement and Evaluation in Psychology and Education (2d ed.; New York: John Wiley & Sons, Inc., 1961), p. 572.

[146]John B. Carroll, The Fifth Mental Measurement Yearbook, ed. Oscar Krisen Buros (Highland Park: Gryphon Press, 1959), p. 670.

[147]Paul L. Dressel and Lewis B. Mayhew, General Education: Explorations in Evaluation (Washington, D. C.: American Council on Education, 1954) pp. 176-177.

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the purposes of this study as the ability of a student to carry on types of mental activity more complicated than simple recall and restatement of ideas, facts, principles, etc., as given in a textbook or presented by the lecturer. For the purposes of the Test of Critical Thinking, critical thinking was defined as the ability to particularize.[148]

The test consists of fifty-two objective-type questions, which were built from the definition that "an attitude is an emotional tendency, organized through experience, to act for or against something."[149] The test involves several important types of thinking. According to Lehmann, some of the more important aspects were:

1. The ability to define and select information from a problem.

2. The ability to judge the validity of the information and draw appropriate conclusions.

3. The competence to recognize stated and unstated assumptions.[150]

Finally, the test may be said to measure the problem solving aspect of critical thinking and to test the subject's capability to solve problems in a highly verbalized way.

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[148]This is the definition accepted by the Committee on Measurement and Evaluation in preparation of the items for the Test of Critical Thinking. See: Paul L. Dressel and Lewis B. Mayhew, General Education: Explorations in Evaluation (Washington, D. C.: American Council on Education, 1954), pp. 176-177.

[149]Ibid., p. 211.

[150]Irvin J. Lehmann, Stanley O. Ikenberry, and Paul L. Dressel, Critical Thinking, Attitudes, and Values in Higher Education (East Lansing, Michigan: Michigan State University Publications, 1958), p. 12.

If a student scored high on critical thinking, he might do better on the workbook as it is essentially problem solving. Conversely, if a student scored low on critical thinking, he might do better on the conventional homework as it represents the language-arts emphasis.

The Rokeach Dogmatism Scale, Form D.--The Rokeach Dogmatism Scale was used in an attempt to learn whether rigid or dogmatic learners do better with the addition of the science-type evolutionary drills as provided in the workbook homework practice.

This test consists of statements in which subjects were asked to agree or disagree along a six-point continuum. High scorers were considered dogmatic in their thinking, unreceptive to new ideas, inflexible. Low scorers were considered flexible, adaptive, and receptive to new ideas. It would appear that low scorers on this test might do better on the conventional homework, as it assumes acceptance of the material; whereas the workbook homework lends itself to analysis and problem solving.

Rokeach also makes an experimental distinction between dogmatic thinking and rigid thinking. While both terms indicate resistance to change, rigidity refers to resistance to change of single beliefs (or sets of habits) and dogmatism refers to resistance to change of systems of beliefs. For example, one would ordinarily say that a person ties his shoes rigidly, not dogmatically. Conversely, one would speak of a dogmatic rather than a rigid theorist, or Freudian.

The Edwards Personal Preference Schedule.--The subtests, change, order, and consistency were selected to discover whether the person open to change might do better with the language-arts; and the one who is orderly and

consistent might function better using the science-type approach.

This test was designed primarily as an instrument for research and counseling purposes, to provide quick and convenient measures of a number of relatively independent normal personality variables, three of which were selected for use in this investigation and are described below:

> Change: To do new and different things, to travel to meet new people, to experience novelty and change in daily routine, to experiment and to try new things, to eat in new and different places, to try different jobs, to move about the country and live in different places, to participate in new fads and fashions.
>
> Order: To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when making a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run smoothly without change.
>
> Consistency: Scores on the consistency variable are based upon a comparison of the number of identical choices made in two sets of the same 15 items. . . . The probability of 9 or more identical choices occurring by chance is approximately .30. The probability of 10 or more identical choices occurring by chance is approximately .15, and the probability of 11 or more identical choices occurring by chance is approximately .06. Eleven or more identical choices may be taken as a significant departure from chance expectancy. Thus, if the consistency score for a subject is 11 or higher, we may regard this as evidence that the subject is not making his choices on the basis of chance alone.[151]

In addition to the above personality characteristics, the Edwards Personal Preference Schedule provides a measure of consistency which was also used in this study.[152]

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[151]Allen L. Edwards, Edwards Personal Preference Schedule Manual (New York: The Psychological Corporation, 1959), pp. 11, 15.

[152]Ibid., p. 15.

A high score on change would appear to indicate better performance on the conventional homework than on the workbook homework. In writing the evolutionary drills, the student's attention is focused on individual outlines instead of on contextual writing as followed in the conventional homework. The evolutionary drills direct attention to the formation of the shorthand outlines and how they are written. In contrast, the conventional homework practice stresses automatization in writing shorthand.

Typically, a person ranking high in order might be characterized as detailed, highly organized, and perhaps leaning toward "perfectionism." Such a person could be expected to perform better on the workbook than on the conventional homework.

III. Statistical Procedures

In connection with this investigation, three hypotheses were posed. Stated in the null, those hypotheses were:

1. There will be no significant difference in shorthand achievement between students using the evolutionary drills from the Gregg Shorthand Workbook for supplementary homework practice and those using the conventional homework practice only.

2. Student performance on the School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference Schedule will not significantly differentiate between students who will learn shorthand more effectively using the conventional homework only from those who will learn shorthand more effectively

using the workbook for supplementary homework practice.

3. There will be no significant difference in shorthand achievement between students ranking in the top quartile and those ranking in the lowest quartile on each of the following tests as well as on the battery of tests (regardless of whether the workbook or the conventional-type homework was used): The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference Schedule.

To test the first hypothesis, the analysis of variance was used. To test the second and third hypotheses, simple and multiple correlations and regression analyses were used. The results of the statistical analysis and their implications will be discussed in Chapter IV.

CHAPTER IV

ANALYSIS OF THE DATA

This chapter presents the results of the statistical comparisons which were made to test the three hypotheses of the study. It reports the findings related to shorthand learning and achievement in the experimental and in the control group. It also includes the findings using selected achievement and psychological tests to discover whether characteristics within the learner effect shorthand achievement with respect to the type of homework used as well as well as when homework is not considered.

The statistical techniques of analysis of variance and of simple and multiple correlation and regression analysis were used.[153] Three specific null hypotheses were tested. The formulas used appear in the Appendix. The results of testing each hypothesis will be presented separately.

HYPOTHESIS I

> There will be no significant difference in shorthand achievement (as measured by the correct words on the Dictation Test) between students using the Gregg Shorthand Workbook for supplementary homework preparation and those using the conventional-type homework preparation only.

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[153]William L. Ruble, and others, "One-Way Analysis of Variance with Unequal Number of Replications Permitted (Unequal Routine," MSU Agricultural Experiment Station, Stat. Series Description No. 13, January, 1966.

The independent or treatment variable was the use or the nonuse of the workbook and the dependent or criterion variable was achievement in shorthand. Achievement was defined as the number of correct words transcribed by each participant on the Dictation Test which was given at the end of the spring term.

Table 1 shows the means and the standard deviations for the experimental and control group.

TABLE 1

MEANS AND STANDARD DEVIATIONS

ON THE DICTATION TEST

Group	N	M	SD
Workbook	39	220.87	50.99
Nonworkbook	35	228.57	51.56

Table 2 gives the results of the analysis of variance. In order to show significance at the five percent level, the F-ratio for any independent variable in this analysis would have to equal or exceed 3.98. The F-ratio of variance between groups was .42. Therefore, the null hypothesis that there would be no significant difference between the achievement of the workbook and nonworkbook group could not be rejected.

TABLE 2

ANALYSIS OF VARIANCE SCORES

ON THE DICTATION TESTS

Source	df	SS	MS	F	p
Between groups	1	1,093.56	1,093.56	.42	.53
Within groups	72	189,218.93	2,628.04		
Total	73	190,312.49			

HYPOTHESIS II

There will be no significant difference between the achievement of the experimental and of the control group on selected achievement and psychological tests.

The following tests were used:

Critical Thinking	CT
Rokeach Dogmatism Scale	RD
School and College Achievement Test	SCAT
Edwards Personal Preference Schedule-Order	ORD
Edwards Personal Preference Schedule-Change	CHG
Edwards Personal Preference Schedule-Consistency	CON
Dictation Test	DT

Table 3 gives the means and standard deviations for the experimental

and control group on the Test of Critical Thinking.

TABLE 3

MEANS AND STANDARD DEVIATIONS
ON TEST OF CRITICAL THINKING

Group	N	M	SD
Workbook	39	27.95	8.44
Nonworkbook	35	30.06	7.57

Results of the analysis of variance for the Test of Critical Thinking, Table 4, revealed an F-statistic of variance between the groups of 1.27. Thus, the hypothesis that there is no significant difference between the groups could not be rejected.

TABLE 4

ANALYSIS OF VARIANCE
OF TEST OF CRITICAL THINKING

Source	df	SS	MS	F	p
Between groups	1	82.00	82.00	1.27	.26
Within groups	72	4,653.78	64.64		
Total	73	4,735.78			

Table value at .05 level of confidence 3.98

Table 5 presents the means and standard deviations on the Rokeach Dogmatism Scale. Although the means are essentially the same, the standard deviations show some difference which would indicate that the nonworkbook group is more homogeneous than the workbook group.

TABLE 5

MEANS AND STANDARD DEVIATIONS
ON ROKEACH DOGMATISM SCALE

Group	N	M	SD
Workbook	39	175.03	23.34
Nonworkbook	35	175.26	17.73

The analysis of variance for the Rokeach Dogmatism Scale, Table 6, shows an F-ratio of only .002 which would indicate that the groups do not differ on the characteristic of dogmatism. Again, the null hypothesis failed to be rejected.

TABLE 6

ANALYSIS OF VARIANCE
OF ROKEACH DOGMATISM SCALE

Source	df	SS	MS	F	p
Between groups	1	.989	.989	.002	.91
Within groups	72	31,385..660	435.912		
Total	73	31,386.649			

Table 7 shows the means and standard deviations of the School and College Achievement Test for the experimental and the control group.

TABLE 7

MEANS AND STANDARD DEVIATIONS
OF SCHOOL AND COLLEGE ACHIEVEMENT TEST

Group	N	M	SD
Workbook	39	34.72	10.57
Nonworkbook	35	35.71	9.18

Table 8 gives the analysis of variance for the School and College Achievement Test for the experimental and the control group. The F-ratio of .19 indicates that the data between groups provides insufficient evidence for the rejection of the hypothesis.

TABLE 8

ANALYSIS OF VARIANCE
OF SCHOOL AND COLLEGE ACHIEVEMENT TEST

Source	df	SS	MS	F	p
Between groups	1	18.311	18.31	.19	.67
Within groups	72	7,107.040	98.71		
Total	73	7,125.351			

Table 9 shows the means and standard deviations for the subtest "Order" on the Edwards Personal Preference Schedule.

TABLE 9

MEANS AND STANDARD DEVIATIONS ON EDWARDS PERSONAL PREFERENCE SCHEDULE (ORDER SUBTEST)

Group	N	M	SD
Workbook	39	13.54	5.71
Nonworkbook	35	14.31	11.85

The analysis of variance for the subtest "Order" of the Edwards Personal Preference Schedule is presented in Table 10. The F-ratio of .133 indicates practically no correlation between groups. The evidence does not justify the rejection of the hypothesis.

TABLE 10

ANALYSIS OF VARIANCE OF EDWARDS PERSONAL PREFERENCE SCHEDULE (ORDER SUBTEST)

Source	df	SS	MS	F	p
Between groups	1	11.103	11.10	.133	.72
Within groups	72	6,013.235	83.52		
Total	73	6,024.338			

Table value of F at the .05 level of significance 3.98

Table 11 shows the means and standard deviations for the subtest "Change" on the Edwards Personal Preference Schedule.

TABLE 11

MEANS AND STANDARD DEVIATIONS OF EDWARDS PERSONAL PREFERENCE SCHEDULE (CHANGE SUBTEST)

Group	N	M	SD
Workbook	39	18.615	5.23
Nonworkbook	35	18.057	3.94

Table 12 gives the analysis of variance for the subtest "Change" on the Edwards Personal Preference Schedule. Considering the small F-ratio of .26, the hypothesis of a difference between groups failed to be rejected.

TABLE 12

ANALYSIS OF VARIANCE OF EDWARDS PERSONAL PREFERENCE SCHEDULE (CHANGE SUBTEST)

Source	df	SS	MS	F	p
Between groups	1	5.748	5.75	.26	.61
Within groups	72	1,567.116	21.77		
Total	73	1,572.864			

In addition to the two subtests of order and change, the Edwards Personal Preference Schedule also includes a consistency variable from which a consistency score can be obtained to determine whether a uniform pattern of answers was followed by the individual being tested. This score provides an additional measure by which the results can be judged for reliability.

Table 13 gives the means and standard deviations for the "Consistency" variable of the Edwards Personal Preference Schedule.

TABLE 13

MEANS AND STANDARD DEVIATIONS OF EDWARDS PERSONAL PREFERENCE SCHEDULE (CONSISTENCY SUBTEST)

Group	N	M	SD
Workbook	39	11.87	1.74
Nonworkbook	35	11.91	1.58

Table 14 gives the analysis of variance of the "Consistency" variable on the Edwards Personal Preference Schedule. The obtained F-ratio of .012 is so low as to indicate no difference between groups. Therefore, the null hypothesis failed to be rejected.

TABLE 14

ANALYSIS OF VARIANCE ON EDWARDS

PERSONAL PREFERENCE SCHEDULE (CONSISTENCY SUBTEST)

Source	df	SS	MS	F	p
Between groups	1	.033	.033	.012	.88
Within groups	72	199.102	2.77		
Total	73	199.135			

HYPOTHESIS III

There will be no significant difference in shorthand achievement between students ranking in the top quarter and those ranking in the lowest quarter (regardless of the use or nonuse of the workbook) on the following tests: School and College Ability Test (verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subscales of the Edwards Personal Preference Schedule.

To reject this hypothesis it would be necessary to show that the multiple correlation is significantly greater than zero at the .05 level of confidence or that linear combinations of different psychological variables will predict the Dictation Test scores significantly better than chance.

Analysis of Simple Correlations

The product moment correlation coefficients were computed between each of the six tests and the shorthand criterion of achievement. These correlations and the intercorrelations of the individual variables are shown in Table 15.

From this information it can be seen that only two of the variables are correlated significantly with shorthand achievement. Critical Thinking and School and College Ability Test Verbal have low positive correlations that are significantly greater than zero at the .01 level. However, the coefficient of determination (R^2) for these tests indicates that the proportion of variance attributable to similar factors in each of the tests and the criterion was less than eight percent.

The highest correlation, .65, was found between School and College Ability Test Verbal and Critical Thinking. This may be expected as both tests apparently measure some form of achievement.

TABLE 15

INTERCORRELATIONS OF PSYCHOLOGICAL TESTS

SCORES AND DICTATION TEST SCORES

ACH	1.00						
CRT	.21	1.00					
RD	- .03	- .21	1.00				
SCAT	.27	.65	- .15	1.00			
ORD	- .01	- .00	- .04	.02	1.00		
CHG	- .04	.04	.12	- .08	- .15	1.00	
CON	.03	.01	.10	- .05	.04	.08	1.00
	ACH	CT	RD	SCAT	ORD	CHG	CON

Analysis of Multiple Correlations

The coefficient of multiple correlation is considered to be the measurement of correlation between the shorthand criterion and various combinations of

factors taken collectively. Table 16 gives the multiple correlation coefficient, the coefficients of determination, and the Standard Error of Estimate.

TABLE 16

MULTIPLE CORRELATIONS OBTAINED WITH PSYCHOLOGICAL AND ACHIEVEMENT TESTS AND THE CRITERION MEASURE

Variables Deleted	Variables Included	R	R^2	S. Est.
None	CRT, SCAT, ORD CHG, RD, CON	.28	.08	42.27
ORD	CRT, RD, CHG SCAT, CON	.28	.08	42.17
CHG	CRT, RD, CON SCAT	.28	.08	42.08
RD	CRT, SCAT CON	.27	.08	41.99
CRT	SCAT, CON	.27	.07	41.94
CON	SCAT	.27	.07	41.89

The first column in Table 16 shows the variables deleted, and the second column indicates the specific tests included in the multiple correlation. The multiple correlation which included all six tests revealed a correlation of .28

and the resulting low coefficient of determination of less than eight percent. Of interest is the fact that the School and College Ability Test Verbal alone correlated .27 with the criterion measure. This would suggest that the use of the other tests would add nothing to the strength of the correlation.

Although the achievement test appeared to be relatively independent of the other measures taken singly, a regression analysis was run to see if it were related to a linear combination of the variables. An analysis of variance for the overall regression is given in Table 17. Although the results are statistically significant beyond the .01 level, the multiple correlation coefficient was only .28 which would, therefore, account for only about 7.6 percent of the variance. This leaves approximately 92 percent of the variance not accounted for in the correlation.

TABLE 17

ANALYSIS OF VARIANCE

FOR THE OVERALL REGRESSION

Source	df	SS	MS	F	p
Regression (about Mean)	6	31,822.09	5,303.7	2.9689	.01
Error	215	384,086.117	1,786.4		

It was shown that the workbook and nonworkbook group did not differ with respect to the Dictation Test and further that the achievement and

psychological tests did not account for a sufficient percentage of the variance to be useful.

Stated positively, both the workbook and the nonworkbook type of homework proved to be equally effective in bringing about achievement in shorthand. The findings do not support the theory that the psychological and achievement tests will significantly differentiate between students who will learn shorthand more successfully using the workbook or the nonworkbook type of homework or between students who will learn shorthand more effectively regardless of the type of homework used.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. Nature of the Study

This study was concerned with the two most common methods of shorthand teaching: the manual approach representing the science-type and the functional approach representing the language arts. Specifically, it sought to determine the effect of adding shorthand workbook practice (which represents the science-type) to the conventional-type (which represents the language arts) of homework practice. It also sought to isolate factors within the learner which may affect achievement in shorthand as related to homework practice as well as when homework practice is not considered a factor.

Need for the Study

Since there is great need to prepare more secretaries, more efficiently and as quickly as possible, it is essential that the best possible methods be discovered. A search of the literature shows that considerable attention has been given to shorthand methodology. Comparatively few studies, however, have been concerned with homework practice or with materials used in homework practice. Neither was there any research reported using selected tests to discover what, if any, variables within the learner might affect shorthand achievement. The tests used in this study were: The School and College Ability Test (Verbal);

the Test of Critical Thinking; Rokeach Dogmatism Scale; and the subtests--order, change, and consistency--of the Edwards Personal Preference Schedule. It, therefore, seemed worthwhile to test the effect on shorthand achievement of adding the Gregg Shorthand Workbook to the conventional-type practice.

Delimitations of the Study

This study was concerned only with shorthand homework practice by students taking beginning shorthand in selected liberal arts colleges and the effect of such practice on shorthand achievement. The only tests used were the School and College Ability Test (Verbal), the Test of Critical Thinking, Rokeach Dogmatism Scale, selected subtests of the Edwards Personal Preference Schedule, and the Criterion Test for determining shorthand achievement.

Hypotheses Tested

The null hypotheses tested in connection with this investigation were:

1. There will be no significant difference in shorthand achievement between students using the evolutionary drills from the Gregg Shorthand Workbook for supplementary homework practice and those using the conventional-type practice only.

2. Student performance on the School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference Schedule will not significantly differentiate between students who will learn shorthand more effectively using the conventional-type practice only from those who will learn shorthand more effectively using the workbook for supplementary practice.

3. There will be no significant difference in shorthand achievement between students ranking in the top quartile and those ranking in the lowest quartile on each of the following tests as well as on the battery of tests (regardless of whether they use the workbook or the conventional-type homework): The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference Schedule.

II. Summary of the Procedures

Design of the Investigation

The experimental design followed was the Posttest-Only Control Group Design. For each of the five sections of beginning shorthand, a control and an experimental group were determined through random selection which was used to create the essential equivalence of capability necessary to conduct an investigation into the effect upon achievement of adding workbook practice to conventional homework practice.

Definition of the Population

The sample comprising the first part of this study consisted of 74 students enrolled in five classes of shorthand at four colleges. Three of the colleges represented were on the West Coast and one college was in Michigan. The sample comprising the second part of the study consisted of 222 students from seven colleges representing a cross-section of the United States.

Homework Practice and Materials

The evolutionary drills from the Gregg Shorthand Workbook which represent the science-type teaching were used by the experimental group in addition to the conventional homework used by the control group. The conventional homework practice lends itself to the language-arts type of teaching.

Collection of the Data

Criterion Test.--During the final two weeks of the year, three-minute dictation tests were administered to all classes. The tests which were used to determine shorthand achievement were scored on a 95 percent accuracy basis.

Psychological Tests.--In order to test the second and third hypotheses, selected psychological tests were used. Student scores on these tests were correlated with achievement in shorthand as measured by the correct words transcribed on the dictation test.

III. Findings

Terminal Performance of the Two Sections

1. There was no significant difference in achievement between students using the evolutionary drills from the Gregg Shorthand Workbook for supplementary homework practice and those using the conventional homework practice only.

2. Student performance on each of the following tests--The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and selected subtests of the Edwards Personal Preference

Schedule--did not differentiate between students who learn shorthand more effectively using the conventional homework practice only from those who learn shorthand more effectively using the workbook for supplementary homework practice.

Terminal Performance of Combined Groups

There was no significant difference in shorthand achievement between students ranking in the top quartile and those ranking in the lowest quartile on each of the following tests as well as on the battery of tests (regardless of whether they used the workbook or the conventional-type homework): The School and College Ability Test (Verbal), the Rokeach Dogmatism Scale, the Test of Critical Thinking, and the selected subtests--order, change, and consistency--of the Edwards Personal Preference Schedule.

At the beginning of the study some of the questions raised were: Will the student with science-type orientation be more successful when instructed by the "manual" method and the language-arts orientated student do better under the "functional" method of teaching? Or does the key to shorthand achievement lie within the teacher? This study attempted to answer the first question and the data has been presented.

While the original design of the study did not propose to answer the second question, careful examination of the data concerning two specific teachers appeared to suggest certain implications. Therefore, a depth study concerning these two teachers and their methods was made. The results of the study appear in Appendix A.

IV. Conclusions

The following conclusions were based upon the findings of this study which sought to discover what effect, if any, would result from the addition of the science-type homework to the conventional homework or whether psychological factors within the learner may be related to success in shorthand with different methods of teaching.

1. That adding science-type (workbook practice) to the conventional homework does not significantly affect achievement.

2. That the psychological tests used in this study, either singly or as a battery, were of no significant value in differentiating which students would learn shorthand more efficiently by either of the methods--science-type or language-arts.

3. That the factors determining shorthand success were not isolated as pertaining to the method or to the learner.

While the conclusions are pertinent to this study, it would appear that they are as applicable for other collegiate institutions as for the colleges included in this study, as applicable to high schools as to colleges, and as applicable to the Jubilee as to the Simplified edition of Gregg shorthand.

V. Recommendations

Since the tests did not differentiate between students who would learn shorthand more effectively using the science-type method from those who would learn shorthand effectively using the language-arts method, it is recommended

that further study be given to this problem using tests that would measure other aspects of the personality, i.e. rigidity, creativity, and level of aspiration.

It is also recommended that further study be given to the problem of whether personality factors within the teacher might be related to success with differing methods of shorthand teaching.

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APPENDIX A

DEPTH INVESTIGATION OF TWO TEACHERS AND THEIR RESULTS

DEPTH INVESTIGATION OF TWO TEACHERS AND THEIR RESULTS

The review of literature shows that research on methodology in shorthand instruction has been extensive. Much study has been given to determining which of the two main methods is the more effective, the functional or the manual method. The evidence indicates that the superiority of either the science-type approach or the language-arts approach has not been emperically demonstrated.

The findings of the present investigation show that there was no significant difference between the achievement of students using the workbook for supplementary homework practice and the achievement of students who used the conventional-type homework practice only. The selected achievement and psychological tests which were used did not differentiate the students who learned shorthand effectively using one method of homework practice from those who learned shorthand effectively using the other method.

After considering these findings and believing that further exploration might be rewarding, the writer decided to investigate in depth the instructional methods of two specific teachers at her own college. These teachers were selected as it appeared that one represented as nearly as possible the "pure form" of the science-type and the other represented the language-arts method of teaching. The difference in method followed by the teachers was easily distinguishable. The writer had observed that one teacher used the science-type approach and the

other teacher followed the language-arts approach. This observation was substantiated by a critical look at the teaching methods.

A Critical Look at Teaching Methods

The method adopted by the teacher is determined largely by the view held of the nature of shorthand learning--whether it is learned most efficiently by the science-type approach, the language-arts approach, or by a combination approach.

Recognizing the conflicting opinions relating to methodology in the teaching of Gregg shorthand theory, Leslie and Zoubek published the 1949 and the 1955 shorthand textbook in two forms: Gregg Shorthand Manual Simplified (called Basic Manual) which is an inductive-deductive presentation emphasizing the principles of shorthand outline construction, and the Gregg Shorthand Manual Simplified: Functional Method (called the Functional Manual). The Basic Manual is intended for the learner who believes that shorthand is a science-type learning; the Functional Manual is for the teacher who considers shorthand a language art.

To check the validity of the researcher's opinion of the method followed by each teacher, a questionnaire was developed and sent to each instructor for completion. A summary of the responses of teacher A and teacher B appears on pages 122-124.

The questionnaire and the teachers' responses on the instrument are given in full on the following pages. Although it is recognized that the majority of teachers today use a combination of methods, the questionnaire responses clearly indicate that for the most part one teacher followed the manual approach

SUMMARY OF RESPONSES ON QUESTIONNAIRE

Teacher A	Teacher B
THEORY	
Explained rules or principles	Did not explain rules or principles
Gave weekly brief form tests	Gave weekly brief form tests
Checked outlines and transcripts on brief form tests	Checked transcripts only on brief form tests
Gave word lists three or four times weekly	Gave word list tests once a quarter
Checked shorthand outlines and transcripts on word list tests	Checked transcripts only but not for grading
Required 100% accuracy on shorthand outlines of word list tests	No required standard (used for psychological feedback only)
Required 100% accuracy on transcripts of word list tests	No required standard (used for psychological feedback only)
HOMEWORK ASSIGNMENTS	
On word list tests--	
Read and spell each word	Read word only
On connected material--	
Read and write lesson once	Read and write lesson once
Write first letter three times	
Practice difficult words (third quarter)	

SUMMARY OF RESPONSES ON QUESTIONNAIRE (Continued)

Teacher A	Teacher B
On workbooks--	
Practiced evolutionary and transcription drills	Practiced evolutionary and transcription drills
INTRODUCTION OF WRITING	
Started with eighth lesson	Started with eighteenth lesson
DICTATION TESTS	
Introduced third quarter	Introduced third quarter
Used practiced material before starting new material	Used practiced material before starting new material
Introduced new-matter dictation before completion of manual	Introduced new-matter dictation before completion of manual
Used three-minute tests to establish speed	Used three-minute tests to establish speed
Required several dictation tests for each speed	Required one dictation test for each speed
Graded transcript only	Graded transcript only
Required 98% accuracy on transcript	Required 95% accuracy on transcript

SUMMARY OF RESPONSES ON QUESTIONNAIRE (Continued)

Teacher A		Teacher B	
FACTORS AND WEIGHT ASSIGNED EACH FACTOR CONSIDERED IN FINAL SHORTHAND GRADE			
Ability to read and spell book outlines	50%	Workbook	33%
Brief form tests	20%	Brief form tests	33%
Word list tests	10%	Transcripts	34%
Transcription--			
Shorthand outlines	10%		
Transcripts	10%		

while the other teacher used the functional approach to a very great extent.

A Comparison of the Results of Two Teaching Methods

In Chapter I two distinct approaches to the teaching of shorthand are described: the language-arts and the science-type approach.

If there is anything to the theory that a person teaches best what he believes, would not the science-type teacher get better results using the science-type approach and the language-arts teacher obtain better results following the language-arts approach? This idea seemed worthy of further study.

In the context of this depth investigation of methodology which grew out of the original study, the writer made the following research hypotheses:

1. There would be no significant difference in achievement between the class taught by the manual method and the class taught by the functional method. (This hypothesis was predicated upon the belief that each teacher was using the method most acceptable to her belief about how shorthand is learned.)

2. In the class taught by the manual method (science-type), the subsection adding the workbook would be superior in achievement to the subsection following the conventional homework only. (This hypothesis was predicated upon the belief that the workbook lends itself readily to the science-type method, which is apparently most acceptable to the teacher of this section.)

3. In the class taught by the functional method (language-arts), the subsection using the conventional homework only would be superior in achievement to the subsection adding the workbook homework. (This hypothesis was predicated upon the belief that the conventional-type homework lends itself to the language-

arts method, which is apparently most acceptable to the teacher of this section.)

4. In the class taught by the manual method (science-type), the subsection adding the workbook would be superior in achievement to the subsection adding the workbook in the class taught by the functional (language-arts) method. (This hypothesis was predicated upon the belief that the workbook lends itself readily to science-type teaching.)

5. In the class taught by the functional method (language-arts), the subsection using the conventional homework only would be superior in achievement to the subsection using the conventional homework only in the class taught by the manual method (science-type). (This hypothesis was predicated upon the belief that conventional-type homework lends itself readily to language-arts teaching.)

6. There would be no significant difference in achievement between the subsection adding the workbook homework in the class taught by the manual method (science-type) from the subsection using the conventional homework only in the class taught by the functional method (language-arts). (This hypothesis was predicated upon the belief that in each instance the subsection mentioned would represent the method of teaching shorthand most acceptable to each teacher.)

7. There would be no significant difference in achievement between the subsection using the conventional homework only in the class taught by the manual method (science-type) and the subsection adding the workbook homework in the class taught by the functional method (language-arts). (This hypothesis was predicated upon the belief that in each instance the subsection mentioned would

represent the method of teaching shorthand not wholly acceptable to each teacher.)

Description of Class Sections

The classes selected for study were included in the original experiment as were also the two teachers. As the teachers represented pole views of the methods under consideration, it appeared advantageous to capitalize on this unique opportunity.

Section I was taught largely by the manual or science-type approach. The rules for outline construction were presented as soon as the students were familiar with the alphabet and the joinings. Frequent theory tests were given, and both the shorthand outlines and the transcript were checked.

Section II was taught largely by the functional or language-arts approach. Students were taught automatization of responses without knowledge that there are rules covering the construction of the shorthand outlines. Only an occasional theory test was given, and the transcript only was checked.

Both instructors were experienced and were judged to be effective teachers. With respect to homework practice, the students constituting each of the class sections were divided into subsections by randomization as described in Chapter III. One subsection of each class used the workbook for supplementary homework practice, the science-type approach; and the other subsection followed the conventional homework practice only, the language-arts approach.

Experimental Results of the Two Classes

Earlier in this Appendix seven research hypotheses were proposed.

For the purpose of testing, these hypotheses are now taken in the null and supporting data presented.

The statistical comparisons of the data in this Appendix are based on the Mann-Whitney U Test. This particular procedure is used because it is especially designed for comparisons of data using small numbers. Regarding it, Siegel says:

> When at least ordinal measurement has been achieved, the Mann-Whitney U Test may be used to test whether two independent groups have been drawn from the same population. This is one of the most powerful of the non-parametric tests, and it is a most useful alternative to the parametric t test when the researcher wishes to avoid the t test's assumptions, . . .[1]

Tables 18-24, appearing on pages 129-138, summarize the results of the Mann-Whitrey U Tests. Both inter- and intra-group comparisons were made from the data derived from the two classes involving teaching method and homework practice. Each table is accompanied by a simple diagram with an arrow indicating the comparison shown.

> Hypothesis 1: There would be no significant difference in achievement between the class taught by the manual method and the class taught by the functional method.

Table 18 presents the achievement of the two classes. One class was taught by the manual method, the other by the functional method. As is apparent, the mean (264.63) of the class instructed by the manual method is greater than the mean (209.50) of the class instructed by the functional method. This difference is statistically significant at the .002 level. The hypothesis was rejected.

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[1]Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, Inc., 1956), p. 116.

TABLE 18

A COMPARISON OF THE ACHIEVEMENT OF THE CLASS TAUGHT BY THE MANUAL METHOD WITH THAT OF THE CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teacher	Manual		Functional
Type of Homework	Conventional Workbook	⟷	Conventional Workbook

Manual	Functional
345	282
299	236
299	233
291	230
238	230
238	230
236	229
171	177
	171
	171
	163
	162

$N_1 = 8$
$M = 264.63$
$U = 9$
$= .002$

$N_2 = 12$
$M = 209.50$

Hypothesis 2: There would be no significant difference in achievement between the homework subsections in the class taught by the manual method.

Table 19 reveals the results of the two types of homework practice in the class taught by the manual or science-type method. With $N_1 = 4$, $N_2 = 4$, and $U = 1$, the table value for $U \leq 1$ has a probability of occurrence under H_o of $p = .029$. The null hypothesis is rejected at the .05 level. The conclusion is that the shorthand achievement of students using the workbook (science-type method) is significantly higher than the achievement of students using the conventional homework in the shorthand class taught by the manual (science-type) method.

Hypothesis 3: There would be no significant difference in achievement between the homework subsections in the class taught by the functional method.

Table 20 presents the results of the two types of homework practice in the class taught by the language-arts method. With $N_1 = 5$, $N_2 = 7$, and $U = 6$, the table value for $U \leq 6$ has a probability of occurrence under the null hypothesis of .037. Thus, the difference between the subsections is significant at better than the .05 level. The hypothesis was rejected.

It can be concluded that the shorthand achievement of the students using the workbook for supplementary homework was below that of those who used the conventional homework practice only. In other words, in the class taught by the language-arts method it appeared that the addition of the workbook tended to detract from shorthand achievement.

Hypothesis 4: There would be no significant difference in achievement between the subsection adding the workbook in the class taught by

TABLE 19

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTION USING THE WORKBOOK WITH THE SUBSECTION USING THE CONVENTIONAL HOMEWORK IN THE CLASS TAUGHT BY THE MANUAL METHOD

Type of Teacher	Manual	Functional
Type of Homework	Conventional ↕ Workbook	Conventional / Workbook

Workbook	Conventional
345	291
299	238
299	236
238	171
$N_1 = 4$	$N_2 = 4$
$M = 295$	$M = 234$
$U = 1$	
$p = .029$	

TABLE 20

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTION USING THE WORKBOOK WITH THE SUBSECTION USING THE CONVENTIONAL HOMEWORK IN CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teacher	Manual	Functional
Type of Homework	Conventional	Conventional ↕ Workbook
	Workbook	

Workbook	Conventional
230	282
230	236
177	233
171	229
162	171
	163
$N_1 = 5$	$N_2 = 7$
$M = 194$	$M = 220.6$
$U = 6$	
$p = .037$	

the manual method and the subsection adding the workbook in the class taught by the functional method.

Table 21 compares the results of the subsection using the workbook under the manual method with the results of the subsection adding the workbook under the functional method. With a mean of 295.25 in the class taught by the manual method and of 194.00 in the class taught by the functional method and with a critical U of 0, the null hypothesis was rejected at the .004 level.

Hypothesis 5: There would be no significant difference in achievement between the subsection using the conventional homework only in the class taught by the manual method and the subsection using the conventional homework only in the class taught by the functional method.

Table 22 compares the results of the subsection using the conventional homework under the manual method with the results of the subsection using the conventional homework under the functional method. A $U \leq 13$, when $N_1 = 4$ and $N_2 = 7$, has a probability of occurrence under H_o of $p = .464$. Thus, the data do not give evidence which justify rejecting the null hypothesis at the .05 level of significance.

Hypothesis 6: There would be no significant difference in achievement between the subsection adding the workbook homework in the class taught by the manual method from the subsection using the conventional homework only in the class taught by the functional method.

Table 23 shows a comparison of the results of the subsection using the workbook homework in the class taught by the manual method with the results of the subsection using the conventional homework in the class taught by the functional method. A $U \leq 1$, when $N_1 = 4$ and $N_2 = 7$, has a probability of occurrence under H_o of $p = .012$. Thus, the null hypothesis can be rejected at the .05 level and almost at the .01 level of confidence.

TABLE 21

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTION USING THE WORKBOOK IN CLASS TAUGHT BY THE MANUAL METHOD WITH THE SUBSECTION USING THE WORKBOOK IN CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teacher	Manual		Functional
Type of Homework	Conventional		Conventional
	Workbook	⟷	Workbook

Workbook	Workbook
345	230
299	230
299	177
238	171
	162
$N_1 = 4$	$N_2 = 5$
$M = 295.25$	$M = 194.00$
$U = 0$	
$p = .004$	

TABLE 22

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTIONS USING CONVENTIONAL HOMEWORK IN CLASS TAUGHT BY MANUAL METHOD WITH THE CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teacher	Manual		Functional
Type of Homework	Conventional	⟷	Conventional
	Workbook		Workbook

Conventional	Conventional
291	282
238	236
236	233
171	230
	229
	171
	163
$N_1 = 4$	$N_2 = 7$
$M = 234.00$	$M = 220.57$
$U = 13$	
$p = .464$	

TABLE 23

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTION USING THE WORKBOOK IN THE CLASS TAUGHT BY THE MANUAL METHOD WITH THE SUBSECTION USING THE CONVENTIONAL HOMEWORK IN THE CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teaching	Manual	Functional
Type of Homework	Conventional	Conventional
	Workbook	Workbook

Workbook	Conventional
345	282
299	236
299	233
238	230
	229
	171
	163
$N_1 = 4$	$N_2 = 7$
$M = 295$	$M = 220.6$
$U = 1$	
$p = .012$	

Hypothesis 7: There would be no significant difference in achievement between the subsection using the conventional homework only in the class taught by the manual method and the subsection adding the workbook in the class taught by the functional method.

Table 24 shows a comparison of the results of the subsection using the conventional homework in the class taught by the manual method with the results of the subsection using the workbook in the class taught by the functional method. This inter-group comparison shows a mean of 234 for the conventional homework group and a mean of 194 for the workbook group. The difference between means of the subsections permits the rejection of the null hypothesis at the .05 level and almost at the .01 level of confidence.

A Study of the Psychological Characteristics of Two Teachers

Further investigation of the teaching method led to the study of certain inherent characteristics of the teacher with the resulting hypothesis: There is a distinctive personality pattern which differentiates the teacher who is more successful with the science-type method from the teacher who is more successful using the language-arts method.

In an effort to develop this study, answers to the following questions were sought:

1. Is there a distinctive personality pattern which differentiates the teacher who is more successful with the science-type method than with the language-arts method?

2. Is there a distinctive personality pattern which differentiates the teacher who is more successful with the language-arts method than the science-type method?

TABLE 24

A COMPARISON OF THE ACHIEVEMENT OF THE SUBSECTION USING THE CONVENTIONAL HOMEWORK IN THE CLASS TAUGHT BY THE MANUAL METHOD WITH THE SUBSECTION USING THE WORKBOOK IN THE CLASS TAUGHT BY THE FUNCTIONAL METHOD

Type of Teacher	Manual		Functional
Type of Homework	Conventional	↖ ↘	Conventional
	Workbook		Workbook

Conventional	Workbook
291	230
238	230
236	177
171	171
	162
$N_1 = 4$	$N_2 = 5$
$M = 234$	$M = 194$
$U = 1$	
$p = .016$	

To achieve the greatest success in shorthand learning and teaching, it would be desirable if the teacher could use the method which is best suited to her and if students could be placed in the class with the teacher who uses the method under which they would learn the most readily.

The two teachers with whom the study is concerned agreed to take selected achievement and psychological tests so that certain of their personality characteristics could be assessed. These were the same tests which had previously been administered to their students. The results are given in Table 25.

TABLE 25

COMPARISONS OF TEACHERS ON
SELECTED ACHIEVEMENT AND PSYCHOLOGICAL TESTS

	Science-Type Teacher	Language-Arts Teacher
School and College Ability Test (Verbal)	55	55
Consistency	14	13
Order	16	23
Change	18	24
Rokeach Dogmatism Scale	157	122
Critical Thinking	46	32

Findings from Tests of Two Teachers

The results of the tests taken by the two teachers revealed the same scores on the School and College Ability Test (Verbal) and essentially the same on the "Consistency Subtest" of the Edwards Personal Preference Schedule.

However, the results on the other test variables showed marked differences between the two teachers. The subtest measuring "Order" revealed that the teacher who favored the language-arts approach scored somewhat higher on order than the teacher using the science-type approach. This was contrary to what might have been expected. The scores also indicate that the science-type teacher was less open to change but more dogmatic than the language-arts teacher. On the other hand, the tests indicate that the language-arts teacher was less critical and, therefore, more free to permit variations.

These scores appeared to lend partial support to the hypothesis that a distinct personality pattern distinguishes the science-type teacher from the language-arts teacher. Although only two teachers were involved in this depth study, the discernible differences clearly indicate that there are definite personality factors which incline teachers toward a preference for a specific teaching method. It was concluded, therefore, that if it were possible to match teachers and students to the method suited to their personality, greater results might be achieved by each group. Certainly there should be further research in this area.

APPENDIX B

INSTRUCTIONS TO PARTICIPANTS

Walla Walla College, September 18, 1963

To: Participating Teachers

From: Evelyn Rittenhouse

GENERAL COMMENTS

First let me say a great big THANK YOU for your willingness to participate in this study. The purpose of the study is to investigate through scientific experimentation the relative merit of using workbooks for homework practice for beginning classes in college shorthand and to determine the extent to which learning and achievement in each of these two groups (workbook and nonworkbook) is affected by certain factors in the learner as revealed through tests.

Four liberal arts colleges will be cooperating in the study with a total of five shorthand classes for the entire year. All of the students will be asked to prepare the shorthand lessons from the shorthand text: and half of them will be asked to use, in addition, the Gregg Workbooks for supplementary homework.

Only Volume 1 of the Gregg Shorthand Workbook will be used in this study. It is important that you or a reader check to see that the workbooks are completed daily. However, you or a reader are not expected to grade the workbooks. Students may be given the opportunity to see the workbooks, but they should be returned so that they can be available to me if needed.

Obviously each of you will have a personal reaction to this study (tests, workbook practice, etc.). I would encourage you to be as objective as possible. No student should be able to say, "Miss Smith doesn't like those old workbooks any better than I do!"

DETERMINATION OF GROUPS FOR HOMEWORK PRACTICE

It is very important that you choose the two groups (workbook; nonworkbook) as follows:

1. List each student's name on a small slip of paper and place all names in a box.

2. Draw a name from the box for the workbook group (experimental group).

3. Shake the box after each name is drawn so that the names will be well mixed.

4. Draw the next name for the nonworkbook group (control group).

5. Continue drawing the names in this order until all have been taken from the box.

6. If your class is uneven in number, it will follow that either the workbook or nonworkbook group will also be uneven in number.

This method of determining the two homework groups is involved. However, in order for the names to be as completely randomized as possible, it is essential that you follow the steps as outlined.

TESTS: SCHOOL AND COLLEGE ACHIEVEMENT TEST, ROKEACH DOGMATISM, CRITICAL THINKING, EDWARDS PERSONAL PREFERENCE SCHEDULE SUBTESTS

Your entire shorthand class will take these four tests, and they should be given the first two weeks of school or as soon after as possible. Please follow the same order for giving the tests as outlined above.

Students should use answer sheets and should not write in test booklets. Answer sheets and tests will be in the mail to you as soon as possible. Each

teacher should familiarize herself with the tests before administering them.

It is important that students understand the general nature of the test and what is expected in the way of an answer. Also be sure the students understand how to use the answer sheets. Directions for administering each test are given on the front of the booklet. Be sure to follow directions including the time schedule.

Do not hold all four tests until completed, but return each test and answer sheets to me immediately after administering. Also return unused tests and answer sheets.

Comments regarding specific tests:

The suggestion was made that these four tests be given outside class. However, if you find it would be easier to use the class period, feel free to do so.

Critical Thinking: Since this is a long test and the time limit is 50 minutes, not all students will complete it. Some students, probably all, will find it difficult. Some will find it confusing. Encourage them to do their best and not to worry.

Edwards Personal Preference Schedule: As the title of this test suggests, it is personal in nature and tests both cognitive and affective factors. Students should be encouraged to give their reaction honestly without fear. The results of the tests will be kept confidential.

Please emphasize to the class that the four tests in this study are handled through Michigan State University, and the individual teachers are responsible only for administering them.

DIRECTIONS FOR ADMINISTERING DICTATION TESTS

Before the speed tests are dictated, the words underlined on the tests are to be previewed. Tests are provided for speeds of 60-120 words per minute. It is suggested that you begin dictating with the highest speed of which anyone in your class is capable and work down. Please dictate all punctuation and paragraphs. A short rest period should follow the dictation of each test. Students will transcribe the test on the typewriter. Please follow the Gregg Awards Department directions as given for checking the speed tests. All papers should have the student's name, name of college, date, and speed of dictation. When you have completed checking the tests, please send the tests (papers) to me.

The maximum time allowed for transcribing the three-minute shorthand speed tests should be:

60 words a minute	27 minutes
80 words a minute	27 minutes
100 words a minute	36 minutes
120 words a minute	36 minutes

Directions for Correcting Shorthand Speed Tests:

The rules outlined in the Gregg Shorthand Awards booklet should be followed.

Please: Keep track of all expenses such as stationery, postage, et cetera. Your college will be reimbursed. Announce that in the interest of business education research and particularly shorthand research, this study is being conducted through Michigan State University. This shorthand class along with

other college classes were asked to participate in the study. Student cooperation will be greatly appreciated. My name should not be mentioned in relation to the study. Stress the fact that this research will have no bearing on their shorthand grades.

APPENDIX C

DICTATION MATERIAL

DICTATION MATERIAL USED IN EXPERIMENT

Three-Minute Test at 60 Words a Minute

Gentlemen: It is my understanding that you are planning to move your business to our/ city. In the past few years this has become known as a city where there are many/ opportunities for business success. We are not satisfied with the improvements/ already made. Our planning committee is working all the time to meet, even better, (1) the needs of our businessmen and their families. We want this city to be a finer/ place ten years from now than it is today. We make a special effort to keep our/ factories entirely separate from sections where our citizens build their homes.

I believe/ that our city is the perfect place for your business. Next time you are in town, won't you please (2) let me show you two buildings that I think will interest you? I have been in the real/ estate business for many years and have been able to obtain fine locations for/ many of our leading businessmen.

Please write or telephone me before you arrive/ so that Mr. Johnson or I can be free to show you around. Cordially yours, (3)

Three-Minute Test at 80 Words a Minute

Dear John: The secretary has just sent me a list of the members of our organization whose dues have not/ been paid for this year. Your name is on that list. Therefore, I am requesting that you check to see whether you have/ a receipt dated 1959. It is possible that we made a mistake and did not credit you/ when your dues came in.

If you find, when you examine your records, that you have not paid the dues for this year, we should (1) appreciate it if you would send them in as soon as possible. You understand, of course, that we officers/ must follow the rules of our organization--and that means that anyone who is six months behind in dues must/ be dropped from our membership roll. Naturally, we do not want this to happen to you.

There is another very/ good reason, too, for having all dues paid up in the near future. You know how important it is for us (2) to present a fine report at the convention, which is to be held in Chicago during the first week in/ December. Programs for this convention are now being printed and I will send you one as soon as copies are available.

Our next meeting will be held on November 18, at eight o'clock, in our club rooms. We hope that you/ will be able to attend, for this is one of the most important meetings of the entire year. Sincerely yours, (3)

Three-Minute Test at 100 Words a Minute

Dear Mr. Hill: If you knew where to find an advertising man who could make real money for your agency, would you be interested in interviewing him?

I am such a man. I have had many years of experience in advertising work and I can plan a campaign/ without supervision. You will never find me watching the clock when copy must be written or a deadline must be met.

A great deal of my/ past experience has been in the field of food

packaging and promotion. I can take a food product, plan its presentation, and supervise getting it on the market. During the past two years, I have done all these things for several nationally advertised products. These foods/ were unknown before I took over the accounts.

I learned advertising from the ground up in several of the best agencies in the country./ I started as a clerk with a small firm in Chicago and advanced to the position of assistant manager before I left them. Eight years ago, I joined the staff of the New York office of Young and Company. For the past two years, I have handled small accounts for them and (2) have recently directed a national food campaign that has already increased the sales of this advertiser's product over fifty per cent.

Now I am looking for an opportunity on the West Coast with an agency such as yours. In spite of handling a great deal of/ the business end of advertising, I still want to write successful copy. I want to write the kind of copy that a firm like yours will appreciate.

May I have fifteen minutes of your time for an interview? My telephone number is Park 2211. Very truly yours, (3)

Three-Minute Test at 120 Words a Minute

Dear Miss Bates: We are returning your book manuscript with appreciation for the opportunity of reading it. We regret that we do not believe it to be/ suitable for publication in its present form. We like the manuscript very much in some regards. But there are a number of problems that you will have to overcome/ before we or any other publisher will accept the manuscript.

We think you have a fine subject for your book, for there is a great deal of interest today/ in the personality problems of office workers. We think, too, that your approach to identifying and solving the problems is both sound and interesting. One (1) person who looked over your manuscript told us that your solutions are definitely in line with modern thought. We like especially your use of case studies, a writing/ device that adds considerably to the appeal of your work. We believe that the chapter organization of your manuscript is well planned. If you do revise/ your copy, we suggest that these features be retained.

Our principal suggestion for improving the manuscript is that you cut down the length of your sentences. Most of/ them are very, very long. Many of them are very complicated. We believe that you would be well advised to go straight through the manuscript, trying to reduce the (2) length of the sentences so that they average no more than fourteen words each. We do not recommend the short sentences used by most newspapers, but we do recommend/ sentences much shorter than the ones that are in your present manuscript.

We should like to suggest that you include in the book some charts or scales that readers can use/ to measure their own personality and find how they can improve it.

If you decide to revise your material, we shall be very happy to go over it again. We do have a genuine interest in publishing a book on this subject, and yours is the most promising manuscript we have seen. Very truly yours, (3)

APPENDIX D

STUDENT SCORES ON SELECTED TESTS

STUDENTS' SCORES ON SELECTED TESTS
NON-WORKBOOK

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
1	355	39	142	42	25	18	12
2	300	45	159	46	17	22	12
3	295	26	193	29	13	11	13
4	293	41	187	53	5	16	13
5	293	29	160	45	14	21	10
6	292	25	183	31	20	21	13
7	291	33	212	38	15	13	12
8	285	34	216	38	11	24	11
9	282	16	157	22	15	15	11
10	238	21	179	17	7	21	13
11	238	40	171	32	11	20	15
12	237	36	197	46	10	15	12
13	237	26	210	32	15	11	11
14	236	39	164	25	12	17	13
15	236	26	172	28	12	22	12
16	234	35	159	54	13	11	8
17	233	26	164	37	7	14	14
18	233	34	172	36	8	24	8
19	232	38	165	37	77	14	14
20	232	31	169	42	1	15	12
21	230	28	167	36	16	23	14
22	229	26	190	41	10	14	13
23	229	32	170	31	12	17	12
24	179	27	192	40	15	19	11
25	179	36	191	42	15	19	9
26	179	39	183	48	20	20	12
27	177	37	160	45	10	22	12
28	173	31	161	37	6	19	13
29	171	26	153	32	15	21	11
30	171	21	173	27	13	23	12
31	171	25	172	38	15	17	11
32	171	27	182	37	7	20	12
33	163	27	146	23	16	22	11
34	153	12	182	25	12	19	11
35	153	18	181	18	11	12	14

STUDENTS' SCORES ON SELECTED TESTS
WORKBOOK

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
1	345	32	183	35	11	19	11
2	299	29	166	43	18	16	14
3	299	15	168	33	10	18	14
4	294	40	190	51	11	7	11
5	294	39	176	53	16	13	14
6	293	23	177	49	13	18	12
7	293	33	108	35	14	26	12
8	292	44	165	56	12	16	10
9	292	25	183	31	20	21	13
10	238	20	179	22	15	19	13
11	237	29	207	54	4	22	11
12	237	27	148	27	15	16	12
13	236	22	156	46	17	12	11
14	235	40	150	45	8	19	10
15	233	35	169	33	17	14	10
16	232	26	189	42	5	24	14
17	232	35	190	43	10	21	10
18	231	32	178	32	5	25	13
19	231	24	131	19	18	17	9
20	230	31	177	32	16	24	14
21	230	20	147	28	16	22	13
22	230	29	190	32	18	15	12
23	230	40	162	27	13	24	12
24	228	12	215	23	9	22	10
25	179	21	159	32	37	22	10
26	177	37	173	26	12	25	13
27	175	28	154	21	5	25	12
28	171	32	158	31	19	27	12
29	171	32	174	40	21	12	9
30	171	32	195	29	10	25	9
31	171	20	223	20	17	21	12
32	171	24	181	25	17	14	14
33	171	27	172	41	10	20	10
34	171	42	184	44	11	24	15
35	166	26	193	31	14	10	14
36	162	10	229	16	8	13	9
37	153	14	191	24	13	21	12
38	153	27	179	31	13	9	13
39	150	17	212	24	16	18	12

STUDENTS' SCORES ON SELECTED TESTS

*Non-Workbook (Conventional)
**Workbook (Manual)

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
*1	355	39	142	42	25	18	12
2	354	27	176	35	13	14	7
**3	345	32	183	35	11	19	11
4	343	28	169	48	14	11	12
*5	300	45	159	46	17	22	12
6	300	31	163	36	15	17	13
7	300	26	163	40	2	21	15
8	299	20	179	46	19	17	13
**9	299	29	166	43	18	16	14
**10	299	15	168	33	10	18	14
11	298	33	158	48	10	18	14
*12	295	26	193	29	13	11	13
**13	294	40	190	51	11	7	11
**14	294	39	176	53	16	13	14
**15	293	23	177	49	13	18	12
*16	293	29	160	45	14	21	10
*17	293	41	187	53	5	16	13
**18	293	33	108	35	14	26	12
**19	292	44	165	56	12	16	10
*20	292	25	183	31	20	21	13
**21	292	25	183	31	20	21	13
*22	291	33	212	38	15	13	12
23	286	25	145	35	14	14	10
24	286	45	168	38	11	17	12
25	285	19	160	26	15	21	11
26	285	24	139	28	9	20	14
27	285	30	180	48	9	13	13
*28	285	34	216	38	11	24	11
*29	282	16	157	22	15	15	11
30	240	28	125	50	18	16	8
31	240	28	125	50	18	16	8
32	240	40	172	51	15	21	11
33	240	29	146	27	14	20	10
34	240	33	213	47	19	17	12
35	239	25	185	29	12	24	12
*36	238	21	179	17	7	21	13

STUDENTS' SCORES ON SELECTED TESTS

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
*37	238	40	171	32	11	20	15
**38	238	20	179	22	15	19	13
39	238	28	169	33	17	12	12
40	238	34	158	33	13	22	13
41	238	30	166	31	14	16	11
42	238	41	159	36	11	25	11
43	238	15	149	22	15	24	10
44	238	24	170	31	13	13	10
45	238	27	167	31	12	21	12
46	238	30	141	30	15	19	14
*47	237	36	197	46	10	15	12
*48	237	26	210	32	15	11	11
**49	237	27	148	27	15	16	12
**50	237	29	207	54	4	22	11
51	237	32	192	33	14	13	12
52	237	26	147	30	18	16	12
53	237	28	170	34	16	16	12
54	237	21	189	23	9	24	12
55	237	27	160	49	14	17	12
56	237	36	155	36	23	25	11
57	237	21	182	22	13	11	13
58	237	32	177	33	8	17	13
*59	236	39	164	25	12	17	13
*60	236	26	172	28	12	22	12
**61	236	22	156	46	17	12	11
62	236	29	200	44	16	16	10
63	236	35	180	36	14	12	9
64	236	15	195	17	6	26	11
65	236	27	193	35	15	15	13
66	235	38	171	38	5	19	10
67	235	39	145	40	13	19	12
68	235	28	155	26	13	14	11
69	235	20	174	28	7	20	10
70	235	21	204	27	10	17	9
71	235	37	204	47	12	14	12
72	235	33	177	31	11	25	9
73	235	23	227	29	11	9	12
74	235	31	181	37	12	19	12

STUDENTS' SCORES ON SELECTED TESTS

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
**75	235	40	150	45	8	19	10
76	234	33	158	49	17	9	13
77	234	24	176	49	18	15	9
78	234	41	171	52	7	26	12
79	234	42	168	45	18	16	11
80	234	38	172	36	11	22	12
81	234	20	159	25	19	17	10
82	234	43	148	35	3	21	12
83	234	40	153	49	13	12	13
84	234	12	174	40	6	18	12
85	234	46	171	45	5	18	13
*86	234	35	159	54	13	11	8
87	234	30	138	44	9	24	10
*88	233	34	172	36	8	24	8
*89	233	26	164	37	7	14	14
**90	233	35	169	33	17	14	10
91	233	39	160	46	9	23	9
92	233	27	217	18	10	20	9
93	233	25	185	33	17	15	13
94	233	36	188	43	12	26	10
95	233	39	177	47	19	14	14
96	232	24	170	32	21	19	13
97	232	22	187	41	9	14	11
98	232	38	131	56	13	20	11
99	232	32	193	37	10	19	10
100	232	20	213	40	11	18	14
**101	232	26	189	42	5	24	14
102	232	22	190	32	10	25	11
103	232	21	182	47	11	17	11
*104	232	38	165	37	77	14	14
**105	232	35	190	43	10	21	10
*106	232	31	169	42	1	15	12
107	231	33	194	36	15	26	11
108	231	32	154	28	9	25	12
109	231	26	184	25	11	17	11
110	231	17	197	28	22	18	10
111	231	37	128	52	15	15	8
112	231	37	181	49	25	12	13

STUDENTS' SCORES ON SELECTED TESTS

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
**113	231	32	178	32	5	25	13
**114	231	24	131	19	18	17	9
115	230	39	139	59	7	25	12
116	230	40	149	51	9	16	11
117	230	36	175	38	14	20	10
**118	230	31	177	32	16	24	14
**119	230	40	162	27	13	24	12
**120	230	20	147	28	16	22	13
**121	230	29	190	32	18	15	12
*122	230	28	167	36	16	23	14
*123	229	32	170	31	12	17	12
*124	229	26	190	41	10	14	13
125	229	25	186	36	13	14	11
126	229	23	156	19	10	16	12
127	229	31	172	27	11	8	13
128	229	29	181	46	12	21	11
**129	228	12	215	23	9	22	10
130	228	16	171	30	14	18	11
131	228	21	174	29	8	21	9
132	228	36	189	39	12	10	9
133	228	20	196	30	14	11	7
134	228	17	172	15	18	13	12
135	228	17	199	35	22	14	13
136	228	19	196	19	8	11	12
137	228	25	222	42	10	23	9
138	180	27	187	38	20	16	8
139	180	40	185	39	6	17	12
140	180	40	129	46	10	16	13
*141	179	36	191	42	15	19	9
*142	179	39	183	38	20	20	12
*143	179	27	192	40	15	19	11
**144	179	21	159	32	37	22	10
145	179	32	126	45	15	22	12
146	179	34	160	44	15	16	14
147	179	36	192	43	10	13	10
148	179	31	168	44	10	20	11
149	178	29	157	29	14	13	13
150	178	31	162	43	10	25	13

STUDENTS' SCORES ON SELECTED TESTS

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
151	178	31	163	33	8	17	11
152	178	36	135	46	10	18	11
153	178	29	186	40	7	8	10
154	178	25	177	32	12	22	11
155	178	22	170	26	12	22	12
*156	177	37	160	45	10	22	12
**157	177	37	173	26	12	25	13
158	177	29	188	45	14	16	13
159	177	17	144	23	13	22	12
160	177	32	178	43	21	11	7
161	177	29	179	31	10	8	12
162	177	46	202	38	15	15	11
163	177	24	151	27	21	17	13
164	177	18	159	29	9	3	6
165	177	34	130	41	12	23	11
166	177	42	156	56	11	20	8
167	176	25	140	27	11	18	13
168	176	27	177	26	20	8	12
169	176	24	143	28	10	15	12
170	176	36	167	48	16	14	12
171	176	15	183	19	12	20	14
172	176	35	170	41	13	20	12
173	175	16	196	28	12	24	14
174	175	44	148	55	12	15	12
175	175	19	193	17	16	16	10
176	175	36	165	44	14	19	13
177	175	36	191	45	15	18	8
178	175	31	148	43	21	13	14
**179	175	28	154	21	5	25	12
180	174	29	178	32	15	23	11
181	173	21	182	16	12	24	9
182	173	25	139	34	20	17	13
183	173	17	161	20	15	19	15
*184	173	31	161	37	16	19	13
185	172	43	154	42	9	17	10
186	171	23	211	29	15	17	12
187	171	21	145	29	9	23	11

STUDENTS' SCORES ON SELECTED TESTS

Student	Sh. Ach.	CT	RD	SCA	ORD	CHG	CON
188	171	21	221	23	11	21	10
189	171	20	172	21	13	19	11
190	171	19	180	26	17	16	11
191	171	23	139	25	18	13	13
192	171	34	162	42	11	24	12
193	171	20	164	31	18	23	13
194	171	18	145	32	6	22	14
195	171	34	151	36	11	10	11
*196	171	26	153	32	15	21	11
**197	171	32	195	29	10	25	9
**198	171	20	223	20	17	21	12
**199	171	24	181	25	17	14	14
**200	171	27	172	40	10	20	10
**201	171	32	174	40	21	12	9
**202	171	32	158	31	19	27	12
*203	171	21	173	27	13	23	12
*204	171	25	172	38	15	17	11
*205	171	27	182	37	7	20	12
**206	171	42	184	44	11	24	15
207	170	18	159	23	8	25	14
208	169	18	189	17	15	17	11
209	168	19	130	27	6	16	14
**210	166	26	193	31	14	10	14
211	166	15	184	30	16	15	8
212	165	18	185	25	12	10	6
*213	163	27	146	23	16	22	11
214	162	21	233	24	19	17	13
**215	162	10	229	16	8	13	9
216	157	20	174	24	10	14	12
217	155	19	162	14	22	22	12
*218	153	12	182	25	12	19	11
*219	153	18	181	18	11	12	14
**220	153	14	191	24	13	21	12
**221	153	27	179	31	13	9	13
**222	150	17	212	24	16	18	12

APPENDIX E

COMPUTER DATA

STATISTICAL FORMULAS

The F-Test:

$$F = \frac{\text{mean square for "between" groups}}{\text{mean square for "within" groups}} \qquad (15.5)^*$$

Analysis of Variance:

The "Between" Sum of Squares

$$\sum x^2 = \left[\sum \frac{(\Sigma X)^2}{n}\right] - \frac{(\Sigma X_T)^2}{N} \qquad (15.3)^*$$

The "Within" Sum of Squares

$$\sum x^2 = \sum X^2 - \frac{(\Sigma X)^2}{n} \qquad (15.4)^*$$

The Person r:

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}} \qquad (8.4)^*$$

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*N. M. Downie and R. H. Heath, Basic Statistical Methods (New York: Harper and Row, Publishers, 1959), pp. 85, 161-163.

```
SEQUENCE          , 043141                          AT 1124-02        DATE 07/11/66
JOB,240974,SHOR TP,3.RITTENHOUSE,EVELYN
SCOPE 6.1015
EQUIP,20=(LS2)
LOAD,20
RUN,3,100,,1


ADDITIONS TO LOAD AND GO TAPE STARTED AT          1124 - 07

UNEQ1

LOAD AND GO TAPE READY AT                         1124 - 26


LOAD,25
RUN,3,5000,2,1

EXECUTION STARTED AT       1124 - 50
```

U N E Q I — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 50 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.00 SECONDS

```
D,8,74 1
LX(1)=WKB, ACH,CRT,DOG,SCAT,ORD,CHG,CON
2...8=AOV(1)•
FORMAT (5X,F1.0,F3.0,F2.0,F3.0,4F2.0)
```

1ST RAW OBSERVATIONS

1	2	3	4	5	6
1.00000000	293.00000000	23.00000000	177.00000000	49.00000000	13.00000000

7	8
18.00000000	12.00000000

1ST TRANSFORMED OBSERVATION (FROM RAW OBSERV. NO. 1)

ACH	CRT	DOG	SCAT	ORD	CHG
2	3	4	5	6	7
293.00000000	23.00000000	177.00000000	49.00000000	13.00000000	18.00000000

CON	WKB
8	1
12.00000000	1.00000000

TOTAL RAW OBSERVATIONS=	74
TOTAL OBSERVATIONS DROPPED=	0
TOTAL OBSERVATIONS IN PROBLEM=	74

SUMS OF 74 RAW OBSERVATIONS

WKB	ACH	CRT	DOG	SCAT	ORD
1	2	3	4	5	6
39.00000000	16614.00000000	2142.00000000	12960.00000000	2604.00000000	1029.00000000

CHG	CON
7	8
1358.00000000	881.00000000

UNEQ1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 1.15 SECONDS

STATISTICS FOR EACH CATEGORY

DEPENDENT VARIABLE IS X(2) ACH

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	16614.000000	74	224.51351351		3920380.000000	51.058989	190312.486450
CATEGORY							
0.000000	8000.000000	35	228.57142857	4.057915	1918956.000000	51.559381	90384.571442
1.000000	8614.000000	39	220.87179487	-3.641719	2001424.000000	50.999061	98834.358948

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

ANALYSIS OF VARIANCE TABLE

DEPENDENT VARIABLE IS X(2) ACH

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	1093.55608335	1	1093.55608335	0.41611	0.53
WITHIN CATEGORIES	189218.93036652	72	2628.04069954		
TOTAL	190312.48645020	73			

U N E Q 1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

S T A T I S T I C S F O R E A C H C A T E G O R Y

DEPENDENT VARIABLE IS X(3) CRT

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	2142.000000	74	28.94594595		66738.000000	8.054424	4735.783783
CATEGORY							
0.000000	1052.000000	35	30.05714286	1.111197	33570.000000	7.572951	1949.885715
1.000000	1090.000000	39	27.94871795	-0.997228	33168.000000	8.435354	2703.897436

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

A N A L Y S I S O F V A R I A N C E T A B L E

DEPENDENT VARIABLE IS (X 3) CRT

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	82.00063360	1	82.00063360	1.26866	0.26
WITHIN CATEGORIES	4653.78314936	72	64.63587707		
TOTAL	4735.78378296	73			

U N E Q 1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

S T A T I S T I C S F O R E A C H C A T E G O R Y

DEPENDENT VARIABLE IS X(4) DOG

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	12960.000000	74	175.13513513		2301138.000000	20.735334	31386.648682
CATEGORY							
0.000000	6134.000000	35	175.25714286	0.122008	1085710.000000	17.725593	10682.685730
1.000000	6826.000000	39	175.02564102	-0.109494	1215428.000000	23.341275	20702.974365

CURRENT TIME 1124 - 51 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

A N A L Y S I S O F V A R I A N C E T A B L E

DEPENDENT VARIABLE IS X(4) DOG

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	0.98857540	1	0.98857540	0.00227	0.91
WITHIN CATEGORIES	31385.66010618	72	435.91194592		
TOTAL	31386.64868164	73			

UNEQ1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

STATISTICS FOR EACH CATEGORY

DEPENDENT VARIABLE IS X(5) SCAT

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEV IATIONS FROM THE MEANS
(OVERALL)	2604.000000	74	35.18918919		98758.000000	9.879653	7125.351353
CATEGORY							
0.000000	1250.000000	35	35.71428571	0.525097	47508.000000	9.179810	2865.142859
1.000000	1354.000000	39	34.71794872	-0.471240	51250.000000	10.565457	4241.897436

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

ANALYSIS OF VARIANCE TABLE

DEPENDENT VARIABLE IS X(5) SCAT

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	18.31105828	1	18.31105828	0.18551	0.67
WITHIN CATEGORIES	7107.04029441	72	98.70889298		
TOTAL	7125.35135269	73			

UNEQ1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

STATISTICS FOR EACH CATEGORY

DEPENDENT VARIABLE IS X(6) ORD

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	1029.000000	74	13.90540541		20333.000000	9.084337	6024.337838
CATEGORY							
0.000000	501.000000	35	14.31428571	0.408880	11945.000000	11.848980	4773.542857
1.000000	528.000000	39	13.53846154	-0.366944	8388.000000	5.711697	1239.692308

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

ANALYSIS OF VARIANCE TABLE

DEPENDENT VARIABLE IS X(6) ORD

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	11.10267300	1	11.10267300	0.13294	0.72
WITHIN CATEGORIES	6013.23516464	72	83.51715506		
TOTAL	6024.33783770	73			

UNEQ1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

STATISTICS FOR EACH CATEGORY

DEPENDENT VARIABLE IS X(7) CHG

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	1358.000000	74	18.35135135		26494.000000	4.641777	1572.864865
CATEGORY							
0.000000	632.000000	35	18.05714286	-0.294208	11940.000000	3.940311	527.885715
1.000000	726.000000	39	18.61538462	0.264033	14554.000000	5.229549	1039.230769

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

ANALYSIS OF VARIANCE TABLE

DEPENDENT VARIABLE IS X(7) CHG

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	5.74838135	1	5.74838135	0.26411	0.61
WITHIN CATEGORIES	1567.11648396	72	21.76550672		
TOTAL	1572.86486530	73			

U N E Q 1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

STATISTICS FOR EACH CATEGORY

DEPENDENT VARIABLE IS X(8) CON

	SUM	FREQ	MEAN	MEAN INCREMENT	SUM OF SQUARES	STANDARD DEVIATION	SUM OF SQUARED DEVIATIONS FROM THE MEANS
(OVERALL)	880.000000	74	11.89189189		10664.000000	1.651629	199.135135
CATEGORY							
0.000000	417.000000	35	11.91428571	0.022394	5053.000000	1.578745	84.742857
1.000000	463.000000	39	11.87179487	-0.020097	5611.000000	1.734776	114.358974

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

ANALYSIS OF VARIANCE TABLE

DEPENDENT VARIABLE IS X(8) CON

SOURCE OF VARIANCE	SUM OF SQUARES	DEGS. OF FREEDOM	MEAN SQUARE	F STATISTIC	APPROX. SIGNIFICANCE PROBABILITY OF F STAT.
BETWEEN CATEGORIES	0.03330363	1	0.03330363	0.01204	0.88
WITHIN CATEGORIES	199.10183154	72	2.76530322		
TOTAL	199.13513517	73			

U N E Q 1 — ONE-WAY ANALYSIS OF VARIANCE, UNEQUAL SUBCLASSES

CURRENT TIME 1124 - 52 DATE 07/11/66
ELAPSED SINCE LAST CURRENT TIME 0.06 SECONDS

END OF RUN

END JOB SEQUENCE 043141 DATE 07/11/66 TIME 1124 - 57 ELAPSED TIME 00 HRS 00 MIN 55 SEC

TIMING DETAIL (MIN - SEC)

TOTAL	EXECUTE	LOADER	OTHER
55.099	21.637	24.748	08.714

```
SEQUENCE        , 043677                                    AT 2111-10    DATE 07/13/66
JOB,240974,SHOR TP,3.RITTENHOUSE,EVELYN
SCOPE 6.1015
EQUIP,20=(LS2)
LOAD,20
RUN,3,100,,1


ADDITIONS TO LOAD AND GO TAPE STARTED AT        2111 - 16


LSDEL


LOAD AND GO TAPE READY AT                       2111 - 34



LOAD,25
RUN,3,5000,2,1

EXECUTION STARTED AT    2112 - 06
```

CURRENT TIME 2112 - 06 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.00 SECONDS

D,7,222

TIME POST PL
CURRENT 2112 - 06
ELAPSED 0.10 SECONDS

LX(I)=ACH,CRT,DOG,SCAT,ORD,CHG,CON
SSCP(1...7)*

TIME POST PL
CURRENT 2112 - 06
ELAPSED 0.05 SECONDS

(6X,F3.0,F2.0,F3.0,4F2.0)

1ST RAW OBSERVATION

1	2	3	4	5	6
236.00000000	29.00000000	200.00000000	44.00000000	16.00000000	16.00000000

7
10.00000000

1ST TRANSFORMED OBSERVATION (FROM RAW OBSERV. NO. 1)

ACH 1	CRT 2	DOG 3	SCAT 4	ORD 5	CHG 6
236.00000000	29.00000000	200.00000000	44.00000000	16.00000000	16.00000000

CON 7
10.00000000

TOTAL RAW OBSERVATIONS= 222
TOTAL OBSERVATIONS DROPPED= 0
TOTAL OBSERVATIONS IN PROBLEM= 222

SUMS OF 222 RAW OBSERVATIONS

1	2	3	4	5	6
48410.00000000	6334.00000000	38291.00000000	7801.00000000	2947.00000000	3959.00000000

7
2565.00000000

T A B L E A - - STATISTICS ON TRANSFORMED VARIABLES

LABEL	VAR NO	MEAN	STANDARD DEVIATION	SUM	SUM OF SQUARES	SUM OF SQUARED DEVIATIONS FROM THE MEAN
ACH	1	218.06306306	43.38135206	48410.00000000	10972342.00000000	415909.11711121
CRT	2	28.53153153	8.03309875	6334.00000000	194980.00000000	14261.27927923
DOG	3	172.48198198	21.69903431	38291.00000000	6708565.00000000	104057.42792702
SCAT	4	35.13963964	9.92931379	7801.00000000	295913.00000000	21788.67117071
ORD	5	13.27477477	6.30098704	2947.00000000	47895.00000000	8774.23873854
CHG	6	17.83333333	4.63745978	3959.00000000	75355.00000000	4752.83333325
CON	7	11.55405405	1.75778984	2565.00000000	30319.00000000	682.85135135

SIMPLE CORRELATIONS

ACH	1	1.00000						
CRT	2	0.20828	1.00000					
DOG	3	-0.02805	-0.20821	1.00000				
SCAT	4	0.26830	0.65389	-0.14781	1.00000			
ORD	5	-0.00773	-0.00424	-0.04396	-0.02231	1.00000		
CHG	6	-0.03501	0.04150	-0.12254	-0.08145	-0.15498	1.00000	
CON	7	0.03152	0.01238	-0.10229	-0.04567	0.04012	0.07577	1.00000
		1	2	3	4	5	6	7
		ACH	CRT	DOG	SCAT	ORD	CHG	CON

I=P(/2...7)EVERY,MINSIG=.05•

TIME POST PL
CURRENT 2112 - 09
ELAPSED 3.54 SECONDS

(UNRESTRICTED LEAST SQUARES)

OLS MATRIX INVERTED
EPS FOR PIVOT= 7.0-021
ABS VAL LAST PIV=5.4-003

CURRENT TIME 2112 - 10 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.08 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE—X(1) ACH

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	31822.99956417	6	5303.83326066	2.9689	0.01
ERROR	384086.11754608	215	1786.44705838		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0765	0.2766	0.0507	0.2253	42.26638213

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	156.99663715	38.72343352			4.0543	16.4374	0.00		
CRT	2	0.33267203	0.47624737	0.06160	0.08819	0.6985	0.4879	0.49	0.04759	0.07442
DOG	3	0.04157119	0.13585116	0.02079	0.06795	0.3060	0.0936	0.75	0.02086	0.07611
SCAT	4	1.01073577	0.38388559	0.23134	0.08787	2.6329	6.9322	0.01	0.17674	0.04674
ORD	5	-0.04406170	0.45875838	-0.00640	0.06663	-0.0960	0.0092	0.89	-0.00655	0.07647
CHG	6	-0.19270981	0.63466338	-0.02060	0.06785	-0.3036	0.0922	0.76	-0.02070	0.07612
CON	7	1.11728562	1.63437029	0.04527	0.06622	0.6836	0.4673	0.50	0.04657	0.07451

OLS MATRIX INVERTED
EPS FOR PIVOT= 6.0-021
ABS VAL LAST PIV=5.7-003

CURRENT TIME 2112 - 10 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.27 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE--X(1) ACH

VARIABLE DELETED BY CRITERION 1 WAS X(5) ORD

VARIABLES STILL IN FOLLOW

CONSTANT	CRT	DOG	SCAT	CHG	CON
0	2	3	4	6	7

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	31806.52004242	5	6361.30400848	3.5773	0.00
ERROR	384102.59706879	216	1778.25276423		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0765	0.2765	0.0551	0.2347	

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	156.13370182	37.58021533			4.1547	17.2614	0.00		
CRT	2	0.33159933	0.47502318	0.06140	0.08796	0.6981	0.4873	0.49	0.04744	0.07439
DOG	3	0.04238604	0.13527467	0.02120	0.06766	0.3133	0.0982	0.75	0.02131	0.07605
SCAT	4	1.01252798	0.38255141	0.23175	0.08756	2.6468	7.0054	0.01	0.17724	0.04652
CHG	6	-0.18237787	0.62404413	-0.01950	0.06671	-0.2923	0.0854	0.76	-0.01988	0.07611
CON	7	1.11043569	1.62906435	0.04499	0.06601	0.6816	0.4646	0.50	0.04633	0.07449

OLS MATRIX INVERTED
EPS FOR PIVOT= 5.0-021
ABS VAL LAST PIV=6.5-003

CURRENT TIME 2112 - 10 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.28 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE--X(1) ACH

VARIABLE DELETED BY CRITERION 1 WAS X(6) CHG

VARIABLES STILL IN FOLLOW

CONSTANT	CRT	DOG	SCAT	CON
0	2	3	4	7

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	31654.63774109	4	7913.65943527	4.4691	0.00
ERROR	384254.47937012	217	1770.75796947		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0761	0.2759	0.0591	0.2431	42.08037511

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	152.25936169	35.09011921			4.3391	18.8277	0.00		
CRT	2	0.31696289	0.47137924	0.05869	0.08729	0.6724	0.4521	0.51	0.04560	0.07418
DOG	3	0.04689752	0.13410747	0.02346	0.06708	0.3497	0.1223	0.72	0.02373	0.07559
SCAT	4	1.02845692	0.37784995	0.23540	0.08648	2.7219	7.4086	0.01	0.18170	0.04457
CON	7	1.08461335	1.62323489	0.04395	0.06577	0.6682	0.4465	0.51	0.04531	0.07421

OLS MATRIX INVERTED
EPS FOR PIVOT= 4.0-021
ABS VAL LAST PIV=2.2-002

CURRENT TIME 2112 - 10 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.26 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE—X(1) ACH

VARIABLE DELETED BY CRITERION 1 WAS X(3) DOG

VARIABLES STILL IN FOLLOW

CONSTANT	CRT	SCAT	CON
0	2	4	7

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	31438.09028149	3	10479.36342716	5.9419	0.00
ERROR	384471.02683258	218	1763.62856346		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0756	0.2749	0.0629	0.2507	41.99557790

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	161.81121531	21.98384871			7.3605	54.1764	0.00		
CRT	2	0.29322113	0.46552451	0.05430	0.08620	0.6299	0.3967	0.54	0.04262	0.07391
SCAT	4	1.02539396	0.37698721	0.23470	0.08629	2.7200	7.3982	0.01	0.18117	0.04422
CON	7	1.02594516	1.61128849	0.04157	0.06529	0.6367	0.4054	0.53	0.04308	0.07387

OLS MATRIX INVERTED
EPS FOR PIVOT= 3.0-021
ABS VAL LAST PIV=2.2-002

CURRENT TIME 2112 - 11 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.24 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE—X(1) ACH

VARIABLE DELETED BY CRITERION 1 WAS X(2) CRT

VARIABLES STILL IN FOLLOW

CONSTANT	SCAT	CON
0	4	7

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	30738.38920355	2	15369.19460177	8.7386	0.00
ERROR	385170.72791290	219	1758.77044708		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0739	0.2719	0.0654	0.2558	41.93769721

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	164.05496485	21.66342117			7.5729	57.3488	0.00		
SCAT	4	1.18097082	0.28440857	0.27031	0.06510	4.1524	17.2422	0.00	0.27016	0.00099
CON	7	1.08266839	1.60655263	0.04387	0.06510	0.6739	0.4542	0.51	0.04549	0.07199

OLS MATRIX INVERTED
EPS FOR PIVOT= 2.0-021
ABS VAL LAST PIV=7.4-002

CURRENT TIME 2112 - 11 DATE 07/13/66
ELAPSED SINCE LAST CURRENT TIME 0.22 SECONDS

(UNRESTRICTED LEAST SQUARES)

DEPENDENT VARIABLE--X(1) ACH

VARIABLE DELETED BY CRITERION 1 WAS X(7) CON

VARIABLES STILL IN FOLLOW

CONSTANT 0 SCAT 4

SIGNIFICANCE CRITERION MET.

RESULTS REQUESTED EVERY ITERATION.

AOV FOR OVERALL REGRESSION

	SUM OF SQUARES	DEG OF FREEDOM	MEAN SQUARE	F	SIG
REGRESSION (ABOUT MEAN)	29939.64050674	1	29939.64050674	17.0654	0.00
ERROR	385969.47660828	220	1754.40671185		
TOTAL (ABOUT MEAN)	415909.11711121	221			

OBSERVATIONS	MULTIPLE CORR COEFS				S
	R2	R	R BAR 2	R BAR	STANDARD ERROR OF ESTIMATE
222	0.0720	0.2683	0.0678	0.2603	41.88563849

	VAR	REGRESSION COEFFICIENTS	STD. ERRORS OF COEFFICIENTS	BETA WEIGHTS	STD. ERRORS OF BETAS	TB	FB	SIG	PARTIAL CORR COEFS	R2 DELETES
CONSTANT	0	176.87178931	10.35989379			17.0727	291.4785	0.00		
SCAT	4	1.17221674	0.28375908	0.26830	0.06495	4.1310	17.0654	0.00	0.26830	0.00000

END OF RUN

END OF JOB CARD TERM.

```
END JOB SEQUENCE 043677 DATE 07/13/66    TIME    2112 - 13    ELAPSED TIME 00 HRS  01 MIN  03 SEC

TIMING DETAIL (MIN - SEC)
      TOTAL          EXECUTE          LOADER          OTHER
  01 - 02.855        23.419           32.005          07.431
```

APPENDIX F

TEACHER QUESTIONNAIRE

TEACHER QUESTIONNAIRE

Research indicates that teachers using a wide variety of methods have been successful teaching shorthand. Please fill out this questionnaire according to the practice which you follow in teaching beginning college shorthand. Complete each question by a check mark or write on the blank line the procedure which you use.

1. Do you usually explain the rule or principle of shorthand theory?

   Yes ____A____

   No ____B____

2. How often do you give brief form tests?

   not given _____

   once a day _____

   once a week ____A B____

   once a month _____

   once a quarter _____

   other (explain or indicate) _____

3. If you give brief form tests, how do you grade them?

   check shorthand outlines and transcript ____A B____

   check transcript only _____

4. How often do you give word list tests?

not given	A	(first 6 weeks - none)
once a day	A	(6-36 weeks: about 3 or 4 a week)
once a week		
once a month		
once a quarter	B	
other (explain or indicate)		

5. If you give word list tests, how do you grade them?

check shorthand outlines and transcript	A
check transcript only	B

6. If you give word list tests, what accuracy standard do you require on word list test shorthand "outlines"?

none	
95%	
98%	
100%	A
other (explain or indicate)	B "Word list tests are not included in final grade and are only given for teacher satisfaction as to how students can write isolated words."

7. If you give word list tests, what accuracy standard to you require on word list tests (longhand or typed) "transcript"?

none _____

95% _____

98% _____

100% A

other (explain or indicate) B "Word list tests are not graded or recorded; only perused by teacher."

8. What homework assignment do you make with regard to the word list at the beginning of each lesson?

copy each word a given number of times _____

ignore the words _____

read and spell each word A (B "read only")

9. What homework assignment do you make with regard to the connected material in each lesson?

read and write all the connected material in the lesson once

_____

A "Practice first letter three times; 1st and 2nd quarters."

B "Practice lesson once."

read and write a portion of the lesson repeatedly _____

read and practice any difficult words in the lesson A

10. What parts of the workbook do you assign for homework practice?

do not use workbooks _____

evolutionary drills _____

transcription drills _____

evolutionary and transcription drills A B

11. When do you introduce writing?

first day _____

first week _____

second week A (After 7 lessons)

third week B (Lesson 18)

other (explain or indicate) _____

12. What do you consider an "acceptable" shorthand outline?

an outline which can be transcribed accurately A B

an outline which is theoretically (like the book) correct? _____

other (explain or indicate) _____

13. Do you ever test on rules in any way?

verbatim statement _____

knowledge of rule but not verbatim _____

ability to exemplify _____

do not test on rules A B

14. When do you begin dictation tests?

A "three minute (new matter) third quarter"

B "March or April of first year--three minute timings on new, unpreviewed material"

15. When do you introduce new-matter dictation?

before completing the Manual A B

after completing the Manual _____

16. Do you dictate practiced material for tests before moving into new-matter dictation tests?

yes A B

no _____

explain _____

17. What length dictation tests do you require for establishing a speed"

3 minutes A B

5 minutes _____

other (explain or indicate) _____

18. How many tests must students pass before advancing to the next dictation speed level?

one _____

two _____

three _____

other (explain or indicate) A "no given number--teacher dictates two or three different speeds. The students transcribe their best take and are graded according to a set scale. Every take (the best of a series) is graded."

19. How do you grade dictation tests?

check shorthand outlines and transcript _____

check transcript only A B

other (explain or indicate) _____

20. What accuracy standard on transcription tests do you require on the transcript?

95% B

98% A

100% _____

other (explain or indicate) _____

21. If you grade shorthand outlines on a transcription test, what accuracy standard do you require on the shorthand outlines?

95% _____

98% _____

100% _____

other (explain or indicate) A B "Do not grade shorthand outlines"

22. If you grade both the shorthand outlines and the transcript on a test, how much weight do you give each of these factors?

Explain briefly:

shorthand outlines _____

transcript A only

B "95% or better in terms of actual words transcribed"

23. Would you "pass" a student on a test if he passed the transcription portion but failed the correct shorthand outlines portion?

yes A

no _____

other (explain or indicate) B "shorthand outlines not graded"

24. What factors do you consider in the final grade for first-semester shorthand?

		Percent
A	Ability to spell book outlines	50
	Brief form tests	20
	Word lists (when given)	10
	Ability to write (limited at first)	10
	Transcription (limited at first)	10

		Percent
B	Brief forms	33
	Workbooks	33
	Longhand transcripts (3-minute transcription from plate material, later from notebook shorthand)	34

25. What weight or approximate percentage of the final semester grade does each of the above factors receive? (Please return to question 24 and indicate the percentage beside each factor.)

APPENDIX G

PARTICIPATING COLLEGES

PARTICIPATING COLLEGES IN

RESEARCHER'S EXPERIMENT

1. Andrews University, Berrien Springs, Michigan

2. Atlantic Union College, South Lancaster, Massachusetts

3. La Sierra College, Arlington, California

4. Pacific Union College, Angwin, California

5. Southern Missionary College, Collegedale, Tennessee

6. Union College, Lincoln, Nebraska

7. Walla Walla College, College Place, Washington