To the Graduate Council:

I am submitting herewith a dissertation written by Karen Lee Woodall entitled "An Error Analysis of Selected Abbreviations, Derivatives, and Principles in the Shorthand Notes of Beginning Stenograph Machine Shorthand Students." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Curriculum and Instruction.

George A. Wagoner, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

AN ERROR ANALYSIS OF SELECTED ABBREVIATIONS, DERIVATIVES, AND PRINCIPLES IN THE SHORTHAND NOTES OF BEGINNING STENOGRAPH MACHINE SHORTHAND STUDENTS

A Dissertation

Presented for the

Doctor of Education

Degree

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Karen Lee Woodall

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Dedicated to

Professor George A. Wagoner

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ABSTRACT

The problem of this study was to determine the error rates for selected abbreviations, derivatives, and principles of Stenograph machine shorthand. Sub-problems were to determine which abbreviations, derivatives, and principles were perceived by machine shorthand teachers to be the most difficult for their students to learn; to compare teachers' perceptions of difficulty with error rates obtained from students' machine shorthand notes; and to determine what types and patterns of errors occurred in students' machine shorthand notes.

Checklists sent to 100 machine shorthand teachers provided data on which abbreviations, derivatives, and principles teachers perceived the most difficult for their students to learn. Two word lists and new-matter letters, dictated to 152 beginning machine shorthand students by their teachers, provided data on rates, types, and patterns of errors for 17 selected abbreviations and derivatives and 28 selected principles.

Major conclusions and recommendations were:

1. Of the abbreviations and derivatives, more than half of the forms written for enclosure and usually were errors. Of the principles, two-thirds or more of the forms written for -T omitted in past tense of KT ending, -SHS for SHUS, INT for INTER/ENT for ENTER, and -FM for SM ending were errors.

2. Of the abbreviations and derivatives, usually, usual, and enclosure were perceived by teachers to be the most difficult for their students to learn. Of the principles, -FM for SM ending, -NGS for NKSHUN,

long vowels, -BGS for KSHUN, and -H omitted in TH ending were perceived to be the most difficult.

3. The correlations of error rates with perceived difficulty showed a substantial relationship for abbreviations and derivatives but a negligible relationship for principles.

4. The error types with the highest percentages of errors were too many letters or strokes for abbreviations and derivatives, prefix principles, and suffix principles; too few letters or strokes for general principles; and substitution for vowel principles.

5. Based on the most frequently occurring error patterns, the principles W for silent W in WR beginning, K for COM, and -L for LY should be eliminated. For the principle I for Y ending, short I should be written for "Y" in all words ending in "Y."

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CHAPTER I

INTRODUCTION OF STUDY

Stenograph machine shorthand shares, with all other systems of shorthand, four universal components in its instructional process--the student, the particular shorthand system, the teaching methodology, and the instructional materials. While the student and the shorthand system enter the educational process with their own strengths and weaknesses, the individual teacher can do much to improve learning success by altering teaching methods and by supplementing or altering instructional materials. In some cases, too, certain principles of a shorthand system may be changed to improve learning success if research shows the changes are warranted.

To develop more successful teaching strategies, more useful instructional materials, and more easily learned shorthand theory, however, symptoms of learning difficulties experienced by students should be analyzed. Some of the primary symptoms of learning difficulties often indicated by a study of students' shorthand notes are:

1. Hesitancy in formulating written outlines.
2. Failure to employ consistently the principles of word construction.
3. Failure to automatize the reading/writing of brief forms.
4. Failure to write outlines precisely enough that they are easily read and transcribed.
5. Inability to distinguish sounds in words and word elements and to reproduce them in shorthand.[1]

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[1]Don Reese and E. Ray Smith, Shorthand: A Textbook Analysis (Cincinnati: South-Western Publishing Company, 1976), pp. 1-4.

This study was undertaken, therefore, since virtually no research had been done on shorthand learning problems experienced by students of Stenograph machine shorthand.

Statement of Problem

The problem of this study was to determine the error rates for selected abbreviations, derivatives, and principles of Stenograph machine shorthand. Sub-problems were:

1. to determine which selected abbreviations, derivatives, and principles were perceived by machine shorthand teachers to be the most difficult for their students to learn;

2. to compare teachers' perceptions of difficulty for selected abbreviations, derivatives, and principles with error rates obtained from students' machine shorthand notes;

3. to determine what types of errors occurred in students' machine shorthand notes for the selected abbreviations, derivatives, and principles; and

4. to determine what, if any, patterns of errors occurred in students' machine shorthand notes for the selected abbreviations, derivatives, and principles.

Analysis of Problem

Answers to the following questions were needed:

1. How frequently did errors occur in the students' machine shorthand notes for each of the selected abbreviations, derivatives, and principles?

2. Which abbreviations, derivatives, and principles did machine shorthand teachers perceive to be the most difficult for their students to learn?

3. What, if any, was the correlation between teachers' perceptions of difficulty for selected abbreviations, derivatives, and principles and error rates obtained from students' machine shorthand notes?

4. How frequently were the errors made on abbreviations, derivatives, and principles caused by errors of: substitution? too many theory pattern letters or strokes? too few theory pattern letters or strokes? omission of forms? other errors?

5. What, if any, error patterns were found in the students' machine shorthand notes for each of the selected abbreviations, derivatives, and principles?

Assumptions

The following assumptions were made:

1. All students in this study were assumed to have been given an adequate opportunity through classroom instruction to learn all abbreviations, derivatives, and principles listed through Lesson 68 of Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1.[2]

2. The machine shorthand teachers answering the checklist on the difficulty of selected abbreviations, derivatives, and principles were

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[2]John R. Bianco, Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 (Skokie, Ill.: Stenograph, 1976).

assumed to be competent evaluators of the difficulty their students experienced in learning those selected abbreviations, derivatives, and principles.

3. The higher the error rate for a particular abbreviation, derivative, or principle, the more difficulty the students were assumed to have had in learning the abbreviation, derivative, or principle.

Limitations of Study

This study was restricted by the following limitations:

1. The study was limited to those students using the Stenograph theory text and Stenograph's Computer-Compatible Touch Shorthand Dictionary/Handbook.[3]

2. The use of words which illustrated principles and had only one theory pattern given in the Stenograph dictionary limited the study in the choice of words for the word lists and the dictation material. In addition, only those abbreviations and derivatives presented in the Stenograph theory text through Lesson 68 were included in the word lists and the dictation material.

3. The study was limited to an evaluation of individual student machine shorthand notes and not to an evaluation of the teaching effectiveness of individual instructors whose classes participated in this study.

4. The study was limited to an evaluation of the students' machine shorthand notes only. Although the students' longhand transcripts were

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[3]Judy C. Fox, ed., Stenograph's Computer-Compatible Touch Shorthand Dictionary/Handbook (Skokie, Ill.: Stenograph, 1977).

returned for analysis, the transcripts were judged to be too poor to provide adequate data.

5. The use of only those machine shorthand teachers and students who were willing to participate in the study limited it in the makeup of its population.

Importance of Study

Shorthand research on symbol theory skill over the past two decades has indicated that students who write a higher percentage of theoretically correct outlines generally are faster writers and more accurate transcribers than students who write a much lower percentage of correct outlines. Pullis,[4] for example, checked the accuracy of symbol shorthand outlines written from dictation and the transcripts of the outlines and found 69 percent of shorthand speed achievement was directly associated with shorthand outline accuracy, while 87 percent of the student's ability to transcribe outlines was directly associated with the accuracy of the outlines. Since Pullis was only one of several researchers who had discovered the significance of symbol shorthand theory accuracy and its effects on dictation and transcription achievement, teachers of symbol shorthand began placing increased emphasis on theory.

Though no such research on theory errors has been done in machine shorthand, the importance of accuracy of machine shorthand writing is

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[4]Joe Milton Pullis, "The Relationship Between Competency in Shorthand and Achievement in Shorthand Dictation" (unpublished Doctoral dissertation, North Texas State University, Denton, 1966).

theorized to be as important as accuracy in symbol shorthand writing because of the similarities between teaching methodologies for both types of shorthand. This view of similarities in teaching methodologies is held by Flood,[5] for example, who stated, "Certain of the techniques used to develop skill in manual [symbol] shorthand could be applied to the teaching and development of skill in machine shorthand."

Consequently, to increase the accuracy of writing by machine shorthand students, the determination of frequently occurring theory errors through this study could result in the development of more successful teaching strategies, supplemental or improved textbook reinforcement material, or shorthand system changes on troublesome theory to decrease or eliminate errors.

Definition of Terms

The following terms are defined as they were used in this study:

Abbreviation--a word written in machine shorthand, not necessarily according to principles, but in a shortened form for brevity of writing.

Checklist--a survey instrument, consisting of a listing of selected abbreviations, derivatives, and principles, which was completed by machine shorthand teachers to indicate their perceptions of the difficulty experienced by their students in learning each selected abbreviation, derivative, and principle.

Derivative--a word which originated from an abbreviation and was

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[5]Hazel A. Flood, Brass Tacks of Skill Building in Shorthand (New York: Prentice-Hall Inc., 1951), p. 99.

created by adding a stroke or strokes to the beginning or ending of that abbreviation.

Dictation material--two sets of letters, each set composed of one warmup letter dictated to beginning machine shorthand students at 60 words per minute and one new-matter letter dictated at 50 words per minute, which were used to obtain machine shorthand notes on selected abbreviations, derivatives, and principles.

Error pattern--an incorrectly written machine shorthand form converted to represent the theory pattern of a selected abbreviation, derivative, or principle.

Error rate--the percentage of incorrectly written machine shorthand forms for each selected abbreviation, derivative, and principle.

Final consonants--those letters used to end words or syllables which were located to the right of the center asterisk on the shorthand machine keyboard and which printed on the right of the shorthand machine tape.

Form--a stroke or combination of strokes printed on the shorthand machine tape.

Initial consonants--those letters used to begin words or syllables which were located to the left of the center asterisk on the shorthand machine keyboard and which printed on the left of the shorthand machine tape.

Notes--the shorthand forms written on individual shorthand machine tapes by each of the students during dictation of the word lists and the dictation material.

Perceived difficulty--the percentage of teachers who perceived each selected abbreviation, derivative, and principle as difficult.

Principle--a rule created so a particular combination of sounds could be written in as few strokes as possible to represent a word.

Stenograph dictionary--Stenograph Computer-Compatible Touch Shorthand Dictionary/Handbook.

Stenograph dictation text--Stenograph Computer-Compatible Touch Shorthand Revised Beginning Skill Development and Transcription: Book 2.[6]

Stenograph theory text--Stenograph Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1.

Stroke--one depression of a key or keys on the shorthand machine keyboard which advanced the tape and represented a letter of the alphabet, a syllable, a word, a phrase, a number, or a punctuation mark.

Theory pattern--the entry in the Stenograph dictionary which showed the stroke or combination of strokes used to write the form of a word in machine shorthand.

Word lists--two sets of 49 words dictated to beginning machine shorthand students at the rate of one word every 12 seconds to obtain machine shorthand notes on selected abbreviations, derivatives, and principles.

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[6]Judy C. Fox, Stenograph's Computer-Compatible Touch Shorthand Revised Beginning Skill Development and Transcription: Book 2 (Skokie, Ill.: Stenograph, 1977).

Procedures

While Chapter IV contains a more detailed explanation of the procedures followed in this study to select the samples, construct and administer the instruments, and analyze the data, the following paragraphs provide an overview of those procedures.

Selection of Samples

The population of this study consisted of teachers who taught machine shorthand at high schools, vocational schools, private business schools, community colleges, and universities throughout the United States and their students. Of this population, 100 teachers were sent checklists on which they were to designate the selected abbreviations, derivatives, and principles that were the most difficult for their students to learn.

Based on the responses received from the checklist mailing, phone calls were made to determine which teachers and their students met preestablished criteria and were willing to participate further in the study.

Of those phoned, 12 teachers representing 11 schools agreed to dictate specially constructed word lists and dictation material to their students. The machine shorthand notes of the 152 students in those 12 classes were then analyzed to determine rates, types, and patterns of errors for selected abbreviations, derivatives, and principles.

Construction and Administration of Checklist

Based on an analysis of the principles of Stenograph machine shorthand given in the Stenograph theory text, dictation text, and dictionary, a complete list of principles for the system was compiled. After a review by two authorities in Stenograph machine shorthand, the list of principles was revised and used to develop the principles section of the checklist on which teachers' perceptions of difficulty were recorded.

The abbreviations and derivatives to be included in the checklist were chosen after the theory text had been analyzed to determine what abbreviations and derivatives were presented in the text. In addition, selected findings on brief forms and derivatives from Gregg shorthand studies by Dow,[7] Smith,[8] and Patrick[9] were used to determine which machine shorthand abbreviations and derivatives were also high-error brief forms and derivatives in Gregg shorthand. These abbreviations and derivatives were selected for inclusion in the checklist.

Copies of the finalized checklist were then sent to machine shorthand teachers who were instructed to check those selected abbreviations, derivatives, and principles which caused their students the most

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[7]Alice Staples Dow, "An Error Analysis of Brief Forms in Dictation Test Notes of Second-Quarter Shorthand Students" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1954).

[8]Edgar Ray Smith, "An Error Analysis of Thirty-One Selected Brief Forms in Dictation Notes of Second-Semester High School Students" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1960).

[9]Alfred L. Patrick, "An Error Analysis of Selected Brief Forms and Principles in Shorthand Notes of Beginning Gregg Diamond Jubilee Shorthand Students" (unpublished Doctoral dissertation, The University of Tennessee, Knoxville, 1965).

difficulty. After completion, the checklists were returned by mail for analysis.

Construction and Administration of Word Lists and Dictation Material

Using the revised list of principles and the list of abbreviations and derivatives selected for use in the checklist, two word lists were developed, each containing 49 words. Each of the 49 test words was either an abbreviation, a derivative, or a word illustrating a particular principle.

The lists of abbreviations, derivatives, and principles were also used to develop two sets of dictation material, each set composed of a warmup letter to be dictated at 60 words per minute and a new-matter letter to be dictated at 50 words per minute. All letters ranged in syllabic intensity from 1.57 to 1.59. Each new-matter letter also contained 49 test words, each word being either an abbreviation, a derivative, or a word illustrating a particular principle.

Teachers dictated one of the word lists and one of the sets of dictation material during one class period and collected all the students' notes and the longhand transcripts of the new-matter letter. Three to five days later the other word list and set of dictation material were dictated, and those notes and transcripts were collected. All students' notes and transcripts were then returned by mail for analysis.

Analysis of Results

The response to checklist items on each selected abbreviation, derivative, and principle were tabulated; and the totals were ranked

for abbreviations and derivatives and for principles. Perceived difficulty was then determined by dividing the total number of responses for each abbreviation, derivative, and principle by the total number of checklists which provided useable data. The perceived difficulty was later compared with error rates for corresponding abbreviations, derivatives, and principles in machine shorthand notes.

Forms written in the students' machine shorthand notes for each test word were then circled; and the portions of the circled forms which tested the selected abbreviations, derivatives, and principles were checked for accuracy. Error rates were then determined by dividing the total number of errors on each abbreviation, derivative, and principle by the total number of students whose notes were checked. The errors made on each abbreviation, derivative, and principle were also classified by error type; and tabulations and percentages for the error types were determined. Lastly, tabulations and percentages of occurrence were determined for the most frequently occurring error patterns made for each selected abbreviation, derivative, and principle.

Organization of Study

Chapter I introduces and states the problem of the study, presents an analysis of the problem, lists assumptions and limitations, asserts the importance of the study, defines terms used, and describes the procedures.

Chapter II provides a history of the shorthand machine and its shorthand system; discusses the theoretical basis of the shorthand machine's keyboard layout; and explains the application of STENO-CAT, one of Stenograph's computer-assisted transcription systems.

Chapter III presents a review of literature related to this study.

Chapter IV details the procedures followed in the compilation of the principles list; the construction and administration of the checklist, the word lists, and the dictation material; the selection of teachers and students to participate in this study; the evaluation of the accuracy of machine shorthand notes obtained from the administration of the word lists and the dictation material; and the treatment of data obtained from checklists and machine shorthand notes.

Chapter V presents the data obtained from the checklists, the word lists, and the new-matter letters.

Chapter VI presents a procedures review and lists major findings, conclusions and recommendations, comparisons to the Patrick study, and recommendations for further study.

A bibliography and six appendixes follow Chapter VI.

CHAPTER II

EVOLUTION OF MACHINE AND KEYBOARD

From 1868 to the mid-1940's the United States issued patents to forty-six inventive individuals who had refined their shorthand machines to practical degrees of usefulness.[1] The earliest of these machines were similar in construction to the typewriter, which had just been invented by Christopher Sholes in 1867.[2] In addition, the first shorthand machines were developed in an age predominated by the usage of Pitman shorthand, which had been published by Issac Pitman in 1837, some forty years before the shorthand machine's invention.[3] Still another circumstance occurring during the early refinement of the shorthand machine was the introduction of John Robert Gregg's shorthand system to the United States in 1893, a system which began gaining much popularity in the 1930's.[4]

The first part of this chapter relates the evolution of the shorthand machine and its keyboard by discussing the achievements of major contributors who participated in the shorthand machine's development. The middle part of the chapter then presents the theory behind the keyboard designation and the letter forms. Finally, the chapter ends with

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[1]"The People and Their Machines," Celebrating Our Heritage (Arlington: National Shorthand Reporters Association, 1976), p. 25.

[2]S. J. Wanous, A Chronology of Business Education in the United States (Reston, Va.: National Business Education Association, 1977), p. 6.

[3]Ibid., pp. 3-4.

[4]Ibid., p. 9.

a description of the computer-assisted transcription capabilities of Stenograph's STENO-CAT system.

Major Contributors to Machine and Keyboard Development

The following part of this chapter describes the historical contributions of inventors of the shorthand machine and its shorthand system. Besides presenting the achievements of individual inventors, the offerings made by several business corporations toward the shorthand machine's development are also discussed.

Zachos, Bartholomew, Carpenter, and Kehoe

John Zachos of New York City was credited with having invented the first shorthand machine in 1876. His machine had eighteen shuttle bars on which type had been fitted for each bar. These bars, which could be depressed either singly or in simultaneous combination, came into contact with a plunger that caused an impression to be made for reading.[5]

Although Zachos was credited with its invention in the United States, Miles Bartholomew was the individual who, in 1879, obtained a patent on the first American shorthand machine. Bartholomew's machine, the Stenograph, consisted of ten type bars which could be depressed singly or in any combination by the five fingers of either hand per stroke to produce a letter of the alphabet or a space between words. The type bars, when depressed, controlled five needles which made their record by punching holes into a half-inch-wide paper tape. Since only

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[5] Ibid., p. 6.

five needles were available for punching, a reciprocating action of the hands was necessary; for example, the left hand stroked one letter or space while the right hand waited to stroke the next letter or space. This reciprocating action of the hands doubled the speed at which recording could be achieved.

In 1882 Bartholomew improved his machine by replacing the needles with type bars and an inked ribbon that permitted the printing of five dashes instead of the punching of five holes. He also devised a system of abbreviations for commonly used words; such as, "BZ" for "business." In 1886 he further refined his machine by adding a spring and gears which moved the paper along automatically as the keys were struck. Before that time, power from the keystroke was used to move the paper and ribbon forward.

Patents for several improvements to the Bartholomew machine were granted to W. M. Carpenter of St. Louis in 1888. Carpenter doubled the number of characters that could be printed on the paper tape by increasing the number of keys on the machine. He also refined some mechanical features of the original machine.

The last of the letter-per-stroke machines, the Syllabograph, was patented in 1907. This machine, devised by William Kehoe of Washington, D.C., was similar to Bartholomew's machine in that it, too, printed five dots in addition to five dashes. Therefore, his machine's dots and dashes doubled the number of characters that could be printed. Kehoe's system of writing also eliminated spacing between words.[6]

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[6]Joseph A. Miller, "American Shorthand Machines and Their Inventors," The National Shorthand Reporter, 3:335-337, April, 1942.

Anderson

While Kehoe's Syllabograph was one of the last letter-per-stroke machines patented, George Anderson's Shorthand Typewriter was one of the first word-per-stroke machines patented. Anderson's machine, which was patented in 1885, was based on the three principles that all modern shorthand machines are based on. These principles included (1) the printing of English characters only, (2) the use on the keyboard of only those letters which occurred most frequently in English, and (3) the fixed location on the paper tape for each key so that depression of one or more keys could be performed in one stroke.

The keyboard of Anderson's 1885 machine consisted of thirteen keys. Ten of the keys were operated by the four fingers and thumb of each hand, while the eleventh key was controlled by the knuckle of either thumb. The twelfth and thirteenth keys were depressed by the base of the appropriate thumb. Figure 2.1 shows the arrangment of that keyboard.

Anderson, a Pitman writer, not only used many Pitmanic abbreviations and phrases with the keyboard shown in Figure 2.1, he also used the keyboard to show proper Pitmanic position. The "1," when printed with other symbols, indicated first position; the "3," third position. Outlines formed without these figures were written in second position. In addition, the dot was used to represent "a, an, and," as well as the personal pronoun "I." The dot was also used to indicate when certain letters were to be read in reverse order when those letters occurred in a word in a sequence different from the keyboard sequence.

In 1889 Anderson, who was not completely satisfied with his first keyboard, developed the keyboard arrangement shown in Figure 2.2.

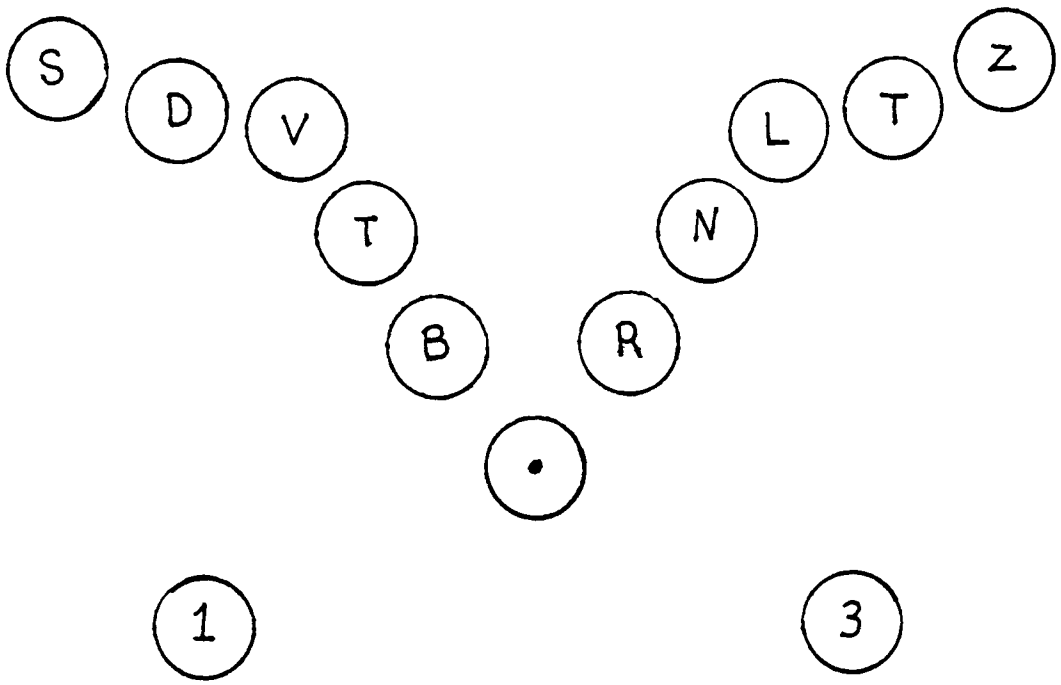

FIGURE 2.1

ANDERSON KEYBOARD FOR 1885 MACHINE

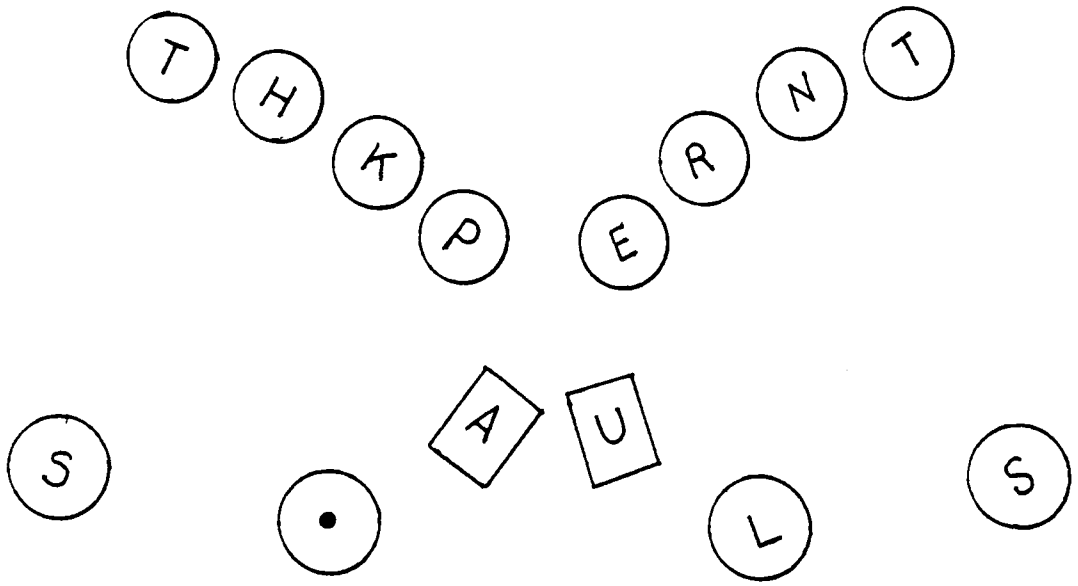

FIGURE 2.2

ANDERSON KEYBOARD FOR 1890 MACHINE

As Figure 2.2 shows, the keys for "1" and "3," used to indicate vowel sounds by position, had been eliminated; and keys for "A," "U," and "E" had been added. Two "S" keys, located on the extreme right and left sides of the keyboard, had been added and were to be operated with the outer edge of the palm of either hand. Keys operated by the knuckle and base of the thumb were removed, and the dot and "L" were moved to new keys which were to be operated by wrist depression.

An unusual, but significant, feature of this machine was the way the letters were printed. Instead of depressing lettered type bars against inked ribbon and paper, this machine used blank type bars to press paper against inked ribbon under which was positioned a type

block bearing the letters of all the keys present on the keyboard.

The significance of Anderson's blank type bars and inked type block of letters appeared in the refinement of the machine he patented in 1897. This machine, having a keyboard much like the present-day Stenograph or Stenotype, was able to provide notes that could be read by any person without any previous training. On this keyboard, eight keys were located on both the left and right sides of the machine. Six of those keys were operated by the second, third, and fourth fingers, while the remaining two shift keys were operated by the little finger and the outer edge of the hand. The thumbs of both hands controlled four keys in the center.

Since the inked type block contained several rows of characters, a great many more letters were made available with the utilization of the shift keys. In addition, the type block was split into three sections so that the initial consonants under the left hand could be shifted independently of the vowels under the thumbs and the final consonants under the right hand. Figure 2.3 shows the appearance of the type block for this machine.

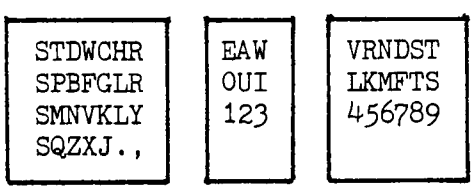

FIGURE 2.3

TYPE BLOCK FOR ANDERSON'S 1897 MACHINE

The operation of the shift keys controlled by the left hand produced the printing of the initial consonants in this way: No depression of the shift keys brought the first line of type into printing position, while the depression of the shift key under the little finger brought the second line of type into position. Depression of the shift key controlled by the outer edge of the hand brought the third line into position, and depression of both shift keys brought the fourth line into position. The right-hand shift keys operated in the same way to print the vowels and final consonants.

Anderson, who became proficient in the use of each keyboard he devised, went on to apply for two more patents in 1908. On one of the keyboards he patented, he controlled all four shift keys with the little fingers and eliminated the use of the outer edges of the hands. On the other keyboard, he operated all four shift keys with the thumbs. Anderson also developed a device which could be attached to the machine to rewind the paper tape after the notes had been recorded. Since his machines did not require combinations of available letters to form unavailable letters, the machines were more difficult to produce and to learn to operate. Therefore, very few of the machines were sold.[7]

Bailey

Another inventor of this era, a man who knew both Anderson and Bartholomew personally, was Arthur Bailey. The machines he developed printed a syllable or word at a stroke and utilized blank type bars and

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[7]Joseph A. Miller, "American Shorthand Machines and Their Inventors," The National Shorthand Reporter, 3:337-340, April, 1942.

an inked type block. The keyboard of his first machine featured four keys on the left side of the machine, which printed initial consonants, and four keys on the right, which printed final consonants. Three keys in the middle printed "1," "2," and "3" to represent vowels and diphthongs. These keys were operated by the thumbs. One final key, the knuckle bar, was controlled by the knuckles at the same time the fingers struck the four keys controlled by either or both of the hands. This key printed a hyphen to indicate shading.

The uniqueness of Bailey's first machine centered, however, on the type of characters that were printed. Arbitrary geometrical characters, as shown in Figure 2.4, represented initial consonants and were produced by the depression of the four keys controlled by the left hand. Depression of the four keys on the right produced the same geometrical characters to represent final consonants.

FIGURE 2.4

CHARACTERS PRINTED BY BAILEY'S MACHINE

Figure 2.5 illustrates what was printed by Bailey's machine when all of the keys, including the knuckle bar and the figure keys, were depressed at the same time.

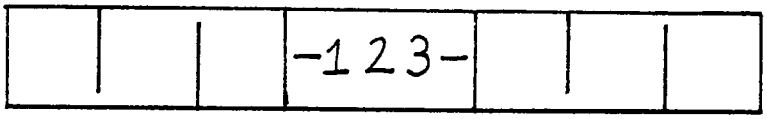

FIGURE 2.5

PRINTING PRODUCED BY BAILEY'S MACHINE
WITH ALL KEYS DEPRESSED

In 1888 Bailey dropped the geometrical characters on the left and right sides of his former model and replaced them with "1," "2," "3," and "4." The knuckle bar was retained, but a diagonal was used to indicate shading instead of a hyphen. Though Bailey obtained a speed of 150 words per minute on this machine, it was never mass produced because the company he had contracted to manufacture the model went out of business before production could begin.[8]

Ireland

Despite the many contributions made by Bailey, Anderson, Bartholomew, and others, none of these contributions was quite as influential in the evolution of the modern shorthand machine as Ward Ireland's contribution, the Stenotype. In 1910 Ireland, who then lived in Dallas, Texas, applied for a patent on his Stenotype, which had the keyboard arrangement shown in Figure 2.6.

Simultaneous depression of all the keys shown in Figure 2.6 printed letters in the fixed sequence of STKPWHRAO*EUFRPBLGTS. Keys for "D" and "S," however, were later added to the right-hand side of the keyboard

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[8] Ibid., p. 340.

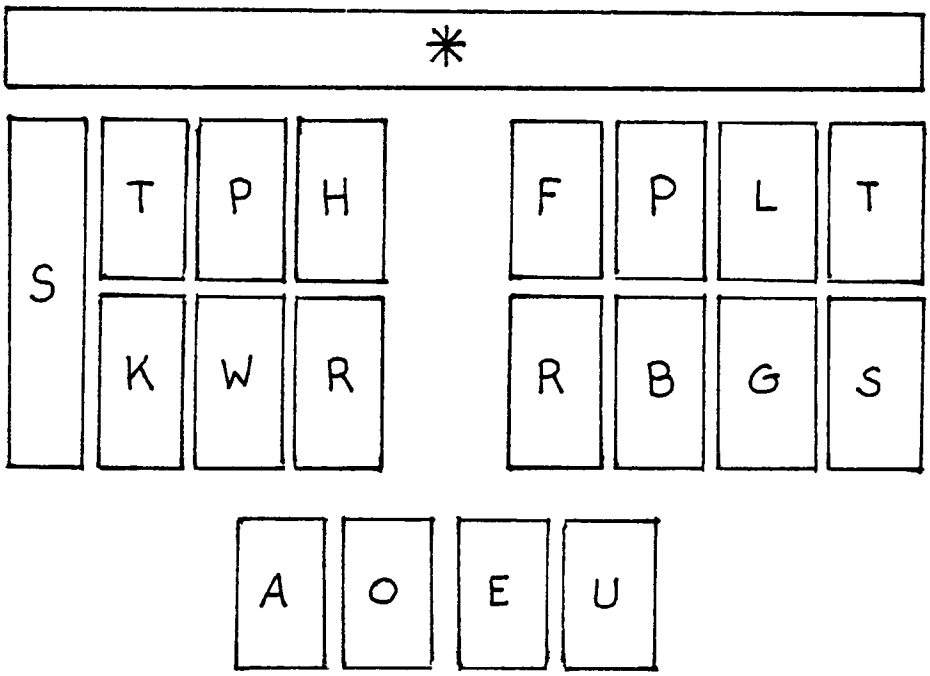

FIGURE 2.6

IRELAND KEYBOARD FOR 1911 STENOTYPE

before the machine was put into production. To print numbers, the asterisk key was struck in combination with STPHAOFPLT so that the resultant "S*" meant "1," "T*" meant "2," and so forth. Along with the keyboard, Ireland also devised a phonetic system of spelling and a series of abbreviations for frequently occurring words.[9]

Ireland, having received his patent, then organized a partnership with R. M. Bowen to finance further developmental work on the first Stenotype, "Old Ironsides," which weighed 54 pounds and was as large as a typewriter of that day. The second Stenotype, an experimental model,

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[9] Ibid., p. 341.

weighed 31 pounds; and the third Stenotype weighed 11½ pounds. The weight of the fourth Stenotype, however, was reduced to 8¼ pounds.

This fourth Stenotype was the one put into production by the Universal Stenotype Company of Dallas. This company, which was formed from the Ireland-Bowen partnership, moved to Owensboro, Kentucky, shortly before the first Stenotypes came out of the factory in 1912. Ireland later assisted the company in its sales efforts by supervising instruction in the principles of Stenotype for teachers who had traveled to the Owensboro plant.

After being renamed The Stenotype Company and moving to Indianapolis, Indiana, in 1913, the company decided to promote the machine by training several machine shorthand writers to participate in the 1914 National Shorthand Reporters Association's (NSRA) speedwriting contests. Nine candidates from machine shorthand classes across the country were chosen for this training directed by Emma Dearborn, the subsequent inventor of Speedwriting, the system based on the handwritten form of machine shorthand. These nine candidates, who ranged in age from fifteen to nineteen years, trained for one year before their competition against thirty experienced reporters who used various forms of symbol shorthand. All nine machine shorthand writers qualified in the 150-words-per-minute event; and top honors were taken by two of them in the 200- and 220-words-per-minute, straight-copy events. Though the 280-words-per-minute, court-testimony event was won by an experienced court reporter who used Pitman symbol shorthand, two of the machine shorthand writers also qualified in the event with accuracy percentages of 95.37 and 97.37.

Although the value of machine shorthand had been shown during these contests, many symbol shorthand writers considered the machines unfair for use in competition. Machine shorthand writers were barred, therefore, from participating in the NSRA contests until 1952.[10]

Two years after the 1914 NSRA contests, the Master Model Stenotype was manufactured by The Stenotype Company. This machine, which weighed only 5 pounds, used folded packs of paper rather than rolls of paper. In addition, a platen cylinder and a ball-bearing clutch were introduced to move the paper tape from its storage tray under the keyboard, through the machine, to a drawer at the back of the machine. A conversion of the asterisk key to a shift key also improved the machine by making possible the printing of actual figures rather than the combinations of a letter and the asterisk.[11]

In 1918 The Stenotype Company went out of business; and Ireland, who had sold his interest a year or so before, moved to St. Louis to open the National Shorthand Machine Company. Though this company survived for only a couple of years, it was able to produce a few of Ireland's newly invented machine.[12] Ireland received a patent for this new machine, the National Shorthand Machine, in 1918. This machine, besides having a keyboard arrangement different from the original Stenotype, also had an attachment which cut the paper roll into special-size

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[10]"The People and Their Machines," Celebrating Our Heritage (Arlington: National Shorthand Reporters Association, 1976), pp. 28-29.

[11]Joseph A. Miller, "American Shorthand Machines and Their Inventors," The National Shorthand Reporter, 3:342, April, 1942.

[12]"The People and Their Machines," op. cit., p. 31.

sheets, marked them with a number and the operator's initials, and stacked them in a pile.[13]

Edwards, Bourquin, Smith, and Bilyeu

Though Ireland's Stenotype keyboard was eventually adopted for use on today's machines, other inventors during Ireland's time were still creating machines with different keyboards and with better, or more unique, mechanical features. One such inventor was Alrah Edwards of St. Louis, Missouri, who, in 1919, patented his Shortwriter. While the Shortwriter had an arrangement of letters on its keyboard different from the Stenotype, it also had the unique feature of a two-color ribbon. When letters were written in the primary color of the ribbon, they were read as they were written. When letters were written in the secondary color, however, they indicated letters not on the keyboard, numbers, marks of punctuation, word beginnings, or word endings.

Still another inventor during Ireland's time was Paul Bourquin of Philadelphia. In 1921 he patented a machine for which the Dictatype Company of Wilmington, Delaware, purchased the manufacturing rights. This machine, known as the Dictatype, had eighteen keys for printing letters and two shift keys. Since each type bar was imprinted with two characters, the shift keys were used to bring the chosen character to the paper for printing in the same way a typist uses typewriter shift keys to type upper- or lower-case letters. The keyboard, without the shift and with the shift, as shown in Figure 2.7, significantly reduced

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[13]Miller, op. cit., pp. 342-343.

the combinations which had to be devised for letters not occurring on the keyboard.

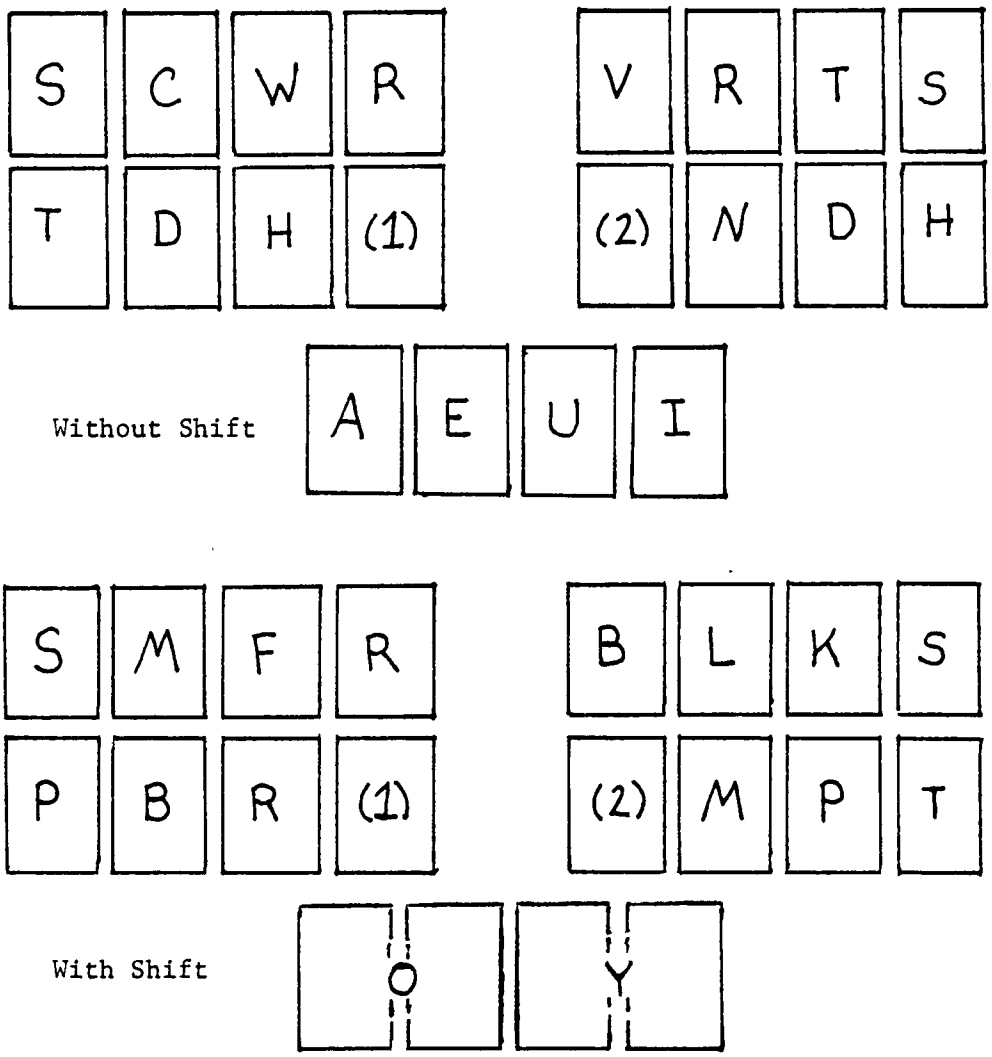

FIGURE 2.7

DICTATYPE KEYBOARD

The shift keys, designated as (1) and (2) in Figure 2.7, could be depressed independently of one another so that either side of the keyboard could be put in shift position. In addition, a simultaneous depression of "A" and "E" with the shift caused an "O" to be printed. In like manner, a depression of the "U" and "I" keys with the shift caused a "Y" to be printed.

The machine invented by Howard Smith of Washington, D.C., however, differed from Bourquin's machine both in keyboard arrangement and in mechanical features. While Bourquin utilized shift keys on his keyboard, Smith chose to use the standard Stenotype arrangement. The Smith Shorthand Typewriter, however, also had several features which made it more convenient for a court reporter to use. One such feature was the placement of the paper tray between the left- and right-hand banks of keys. By splitting the keyboard, the printed notes fell into a tray in the middle of the keyboard and were directly in front of the reporter for easy and immediate read back. The keys of the Smith Shorthand Typewriter were also moved to the end of the machine farthest from the operator's body so that the operator could hold the machine close to his body, either in his lap or hung from a strap around his neck, without putting his hands in an uncomfortable position. Smith also simplified the ribbon mechanism by using a ribbon that moved endlessly in only one direction, rather than employing a ribbon which had to reverse itself periodically.

Still another machine invented during the 1920's was the Machine Reporter. This machine, invented by Thomas Bilyeu of Portland, Oregon, was unique because of its keyboard. Though the machine had three rows

of four keys for both the left and right hands, combinations of letters still had to be used to form letters not presented on the keyboard. Five vowel keys were also included on the keyboard, but the machine was unable to print numbers.[14]

La Salle, Stenograph, Kirkpartrick, Hedman, and Miller

Though the 1920's brought forth the creation of innovative machines by men such as Edwards, Bourquin, Smith, and Bilyeu, that decade had been preceded by the demise of the major manufacturer of machines during that time--The Stenotype Company. Only through the efforts of The Stenotype Supplies Company was the shorthand machine industry able to survive after The Stenotype Company went out of business in 1919. This supplies company kept the industry alive by repairing and reconditioning shorthand machines; selling paper, ribbons, and textbooks; and providing correspondence instruction until 1927 when La Salle of Chicago purchased the manufacturing rights to the Stenotype machine. Under the direction of M. H. Wright, an assistant of La Salle's president, the marketing and manufacture of the Stenotype began again.

Wright's hiring of several of the people who trained for the 1914 NSRA contests proved to be a successful marketing plan in promoting the Stenotype. These employees, as marketing representatives, quickly revitalized the market so that many private schools began teaching Stenotype; and large numbers of teachers began coming to La Salle to be trained. The business died down somewhat during the Depression of 1929,

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[14] Ibid., pp. 343-345.

although La Salle did develop a home study course during that time which was the predecessor of the La Salle Stenotype Institutes.

In 1937, however, M. H. Wright left La Salle to form his own company, Stenographic Machines, Inc., to market an improved machine using Ireland's keyboard. This machine, called the Stenograph after Bartholomew's first successful machine, was manufactured for Wright's company by The Hedman Company of Chicago until 1948 when Stenographic Machines, Inc., moved the manufacturing to its own facilities. Robert Wright, M. H.'s son, also contributed to the success of the Stenograph by handcrafting six models and by later serving as president of the company after his father's death in 1956.[15]

During the 1960's and 1970's, Stenographic Machines, Inc., renamed Stenograph in 1978, began work on the creation of a computer-compatible system of machine shorthand. This new system was to be used for producing computer-translatable notes from which high-speed printers could produce final typed drafts. The Steno-Data Writer, a shorthand machine which recorded notes both on paper and on magnetic tape cassette, was developed for the system; and in 1976 Stenograph began publishing texts for a computer-compatible shorthand system. In the mid-1970's, Stenograph also began marketing its first computer-assisted transcription system, the Stenograph Computer System, which utilized a centrally located IBM computer. This system was replaced in 1977 by STENO-CAT, a similarly operated system which featured a more convenient stand-alone

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[15]"The People and Their Machines," Celebrating Our Heritage (Arlington: National Shorthand Reporters Association, 1976), pp. 31-35.

computer. All the hardware for this system was manufactured by Data General Corporation, except for the Steno-Data Writer, which recorded the notes on paper and cassette, and the Stendodata Reader, which read the notes from the cassette. These pieces of equipment were produced by Stenograph.

During 1980 a new smaller-scale, portable computer-assisted transcription system called Cimarron-CAT was introduced. This system, with hardware by Texas Instruments, was suggested for use in a one-to-four-reporter setting. Also introduced in 1980 was Stenograph's newest machine, the Steno-Lectric. This machine used an electric current to turn the platen, thus permitting the machine operator to use a lighter, less fatiguing touch.[16]

Twenty years before Stenograph's move into computer-assisted transcription, however, and at about the same time Wright was making plans to put the Stenograph into production, Wendell Kirkpartrick was working on his new machine, the Brevitype. This machine, invented in 1940, used a machine system based on ABC shorthand and a keyboard based on the typewriter keyboard. With this new keyboard arrangement, the phonetic spelling of words, and the use of abbreviations, combination of letters to represent unavailable letters was eliminated. Though this machine was introduced in San Diego in 1947, it was not marketed on a broader basis until 1949.

With the production of the Stenograph and the Brevitype well under way, La Salle began redesigning the Stenotype for production in the

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[16]Statement by Chris Ferro, Market Development Manager, Stenograph Corporation, telephone interview, Skokie, Illinois, February 16, 1982.

late 1940's. Wright's company, Stenographic Machines, Inc., was contracted by La Salle to produce a machine which La Salle sold under the Stenotype brand name. This machine was produced, as well as a ribbon-reversing mechanism which was added later.

Also during the late 1940's, The Hedman Company, which manufactured the Stenograph for Wright's company until 1948, began working on its own machine. This machine, called the Stenoprint, was based on the Ireland keyboard arrangement. The Hedman Company's Stenoprint Division started producing this machine in 1967.[17] In 1976, however, The Hedman Company changed the name of its division from "Stenoprint" to "Stenotype" and began manufacturing its machines under the new name. The keyboard of this machine featured some modifications of the Stenoprint's keyboard, as shown in Figure 2.8.

These new Stenotypes featured, as Figure 2.8 shows, an additional key controlled by either thumb and located between the "O" and "E" keys. This cardinal key, when depressed simultaneously with a vowel key or keys, denoted a long vowel sound by printing an asterisk immediately in front of the vowel or vowels stroked. The purpose of this key was to reduce the learning load; and it was promoted as an aid to reading as well as improved accuracy of transcription. The canting, or angling, of the vowel keys was made to allow more comfortable and more accurate thumb operation. Widening of the final "T" and "S" keys, still another keyboard modification, made possible the single-stroke writing of the past tense of words ending in "T" or the plural of words ending in "S."

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[17]"The People and Their Machines," op. cit., pp. 34-35.

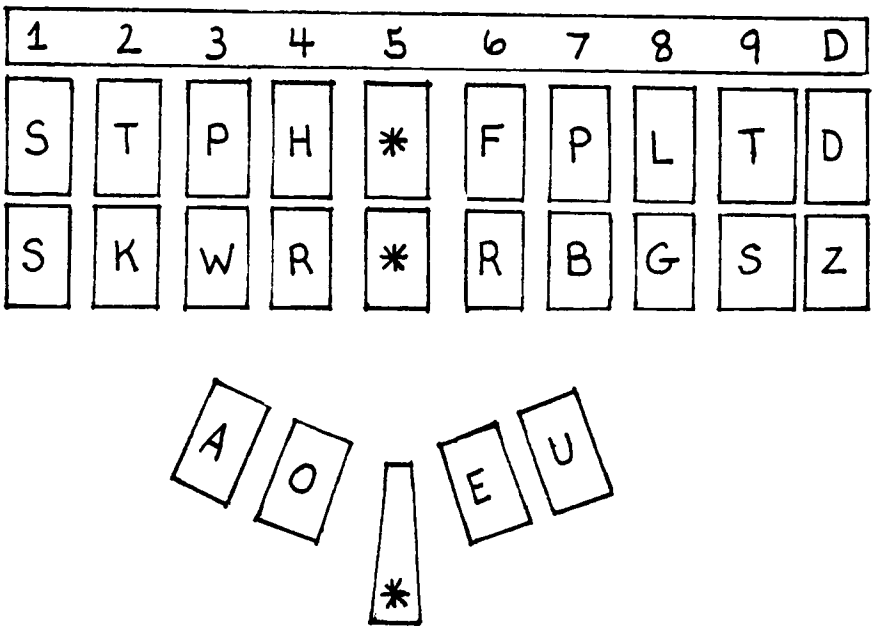

FIGURE 2.8

HEDMAN STENOTYPE KEYBOARD

Because the little finger of the right hand controlled the "T," "S," "D," and "Z," keyboards without widened "T" and "S" keys made impossible the writing of such endings in any less than two strokes. To teach the use of this new keyboard, Hedman Stenotype began publishing texts in 1977 for its new Stenotype system, which was also computer compatible.[18]

Still another company to spring up in competition with La Salle, Stenograph, and Hedman was the Herman Miller Stenotype Corporation. This company was started in the early 1930's by Herman Miller, a former La Salle employee. After he left La Salle in 1930, Miller procured the

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[18]Statement by Clarence Jensen, Vice President, Hedman Stenotype, telephone interview, Chicago, Illinois, February 15, 1982.

services of Marion Postell to devise a system of machine shorthand for the company. Though this system was later made compatible to both the modern-day Hedman Stenotype and Stenograph machines, the company also designed its own machine in the late 1960's which featured wider keys for final "T," final "S," and the asterisk. The wider final "T" and "S" keys reduced writer fatigue by permitting the writing of two-stroke endings, such as "ted," "ses," and "s," in one stroke. In addition, use of the wider asterisk key with the "F" key to identify "V" helped achieve computer compatibility for the system.

In the 1960's the Herman Miller Stenotype Corporation also began working, with the help of Robert Kull, on designing components for its own series of computer-assisted transcription hardware. One piece of equipment for which Kull received patents was the Optical Note Reading Machine. He continued working on the company's computer-assisted transcription system to produce, for the 1980's, a portable microcomputer system with the capability to instantly translate machine notes into readable copy for printing or for video-display viewing.[19]

The shorthand machine, therefore, has evolved greatly since its first days as a crude typewriter-like instrument. Its sophisticated development has led to its inclusion in a system which translates oral discourse from machine shorthand notes into immediately available and readable text. From its invention by John Zachos to its present-day manufacture and marketing by Stenograph Corporation, Hedman Stenotype,

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[19]Statement by Robert White, President, Herman Miller Stenotype Corporation, telephone interview, Los Angeles, California, February 10, 1982.

and Herman Miller Stenotype Corporation, the shorthand machine has gained a creditable reputation in business and legal professions.

Machine Operation and Keyboard Designation

The following part of this chapter presents a list of fundamental principles which underly the operation of the shorthand machine. In addition, an explanation is given on the reasoning used to determine which letters of the alphabet were designated as keys and which key locations those chosen letters were given.

Fundamental Operating Principles

Today's shorthand machine, as its evolution has revealed, operates according to a number of fundamental principles. Some of the most important of these principles have been mentioned before but are collectively listed here:

1. Because utilization of the keyboard is based on the phonetic spelling of words, only those sounds heard by the machine shorthand writer are stroked to represent words.

2. Each finger operates only two keys and the keyboard space between the two keys.

3. Any or all keys of the keyboard representing letters of the alphabet may be depressed simultaneously for printing on the paper tape.

4. Each stroke of the keyboard may represent a letter, a syllable, a word, a phrase, a number, or a punctuation mark.

5. Each stroke of the keyboard automatically advances the paper tape by one line.

6. Although no character or space separates one word from another, words or syllables are printed on separate lines like figures on an adding machine tape; and the operator learns to read one word after another by following the meaning, or sense, of the sentence.

7. The keyboard is arranged in three banks of keys to provide for the normal letter sequence in English words and syllables of initial consonant/vowel/final consonant. The left bank of keys provides consonants preceding vowels, the middle bank of keys provides vowels, and the right bank of keys provides consonants following vowels. Each stroke of the machine has the potential to print this consonant-vowel-consonant pattern.

8. Each character of the keyboard represents itself or, when written simultaneously with one or more other characters, may represent some character not available on the keyboard.

9. Each key of the keyboard, when depressed, prints the resulting symbol in a fixed position on the paper tape.[20]

Keyboard Designation Theory

An application of the principles of machine operation listed in the preceding section provides the basic understanding Ireland and others possessed to develop their keyboard arrangements. By following the consonant-vowel-consonant pattern of syllables and words and by choosing the most frequently occurring letters of the alphabet for key designations, Ireland was able to devise a complete, yet compact,

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[20] Machine Shorthand Preview (Skokie, Ill.: Stenographic Machines, Inc., 1975), pp. 2-15.

keyboard. A modification of the original keyboard, which is the keyboard for the modern Stenograph machine, is shown in Figure 2.9. The hand position for key stroking is also shown.

Seventeen letters of the alphabet are represented on the keyboard of twenty-one keys, and the numerals "1" through "9" are included. The shift bar at the top of the keyboard is used for printing numerals and for spacing.

The seventeen letters given individual key designations were chosen based on their frequency of occurrence in words and syllables of the English language. Words or syllables beginning with the "K" sound, for example, occur more frequently than words or syllables beginning with the "G" sound; consequently, "K" has its own key position on the left side of the keyboard while "G" does not. On the other hand, words or syllables ending with the "G" sound occur more frequently than words or syllables ending with the "K" sound, thus justifying the addition of a key on the right side of the keyboard for "G" but not for "K." Furthermore, the frequency of occurrence of the "S," "R," and "T" sounds at both the beginning and ending of words or syllables justifies the inclusion of separate keys for each sound on both sides of the keyboard.

Initial and final consonant sounds occurring infrequently, and thus not having their own keyboard designations, are represented by certain combinations of consonants already on the keyboard. These combinations are made up of consonants which seldom or never occur normally together. Table 2.1 shows the individual keys and combinations of keys used on the shorthand machine to represent the initial- and final-position forms for all the consonants of the alphabet.

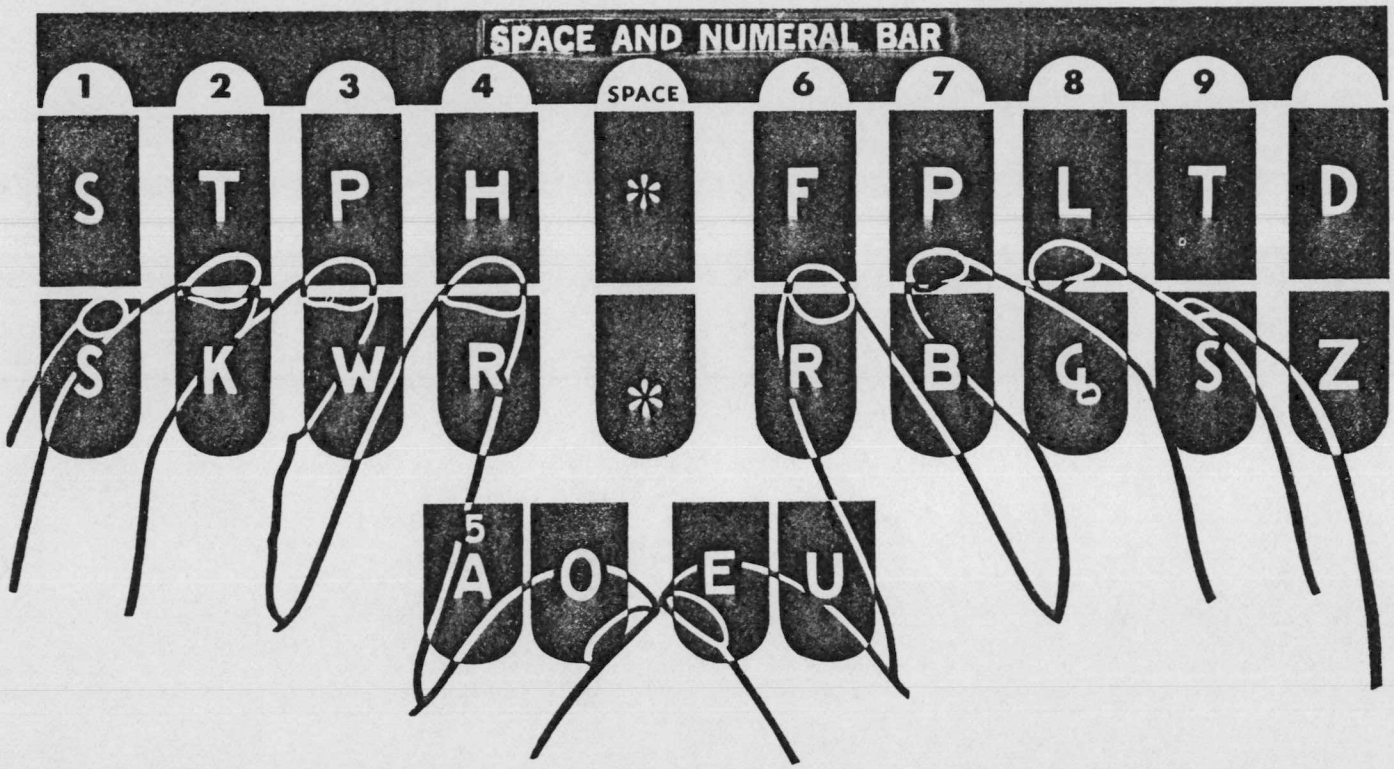

FIGURE 2.9

STENOGRAPH KEYBOARD AND HAND POSITION

Source: Machine Shorthand Preview (Skokie, Ill.: Stenographic Machines, Inc., 1975), p. 1.

TABLE 2.1

STENOGRAPH MACHINE SHORTHAND FORMS
FOR CONSONANTS OF THE ALPHABET

Consonant	Before-Vowel Form	After-Vowel Form
B	PW	B
C	K or S (KR)	BG or S
D	TK	D
F	TP	F
G	TKPW	G
H	H	None
J	SKWR	PBLG
K	K	BG
L	HR	L
M	PH	PL
N	TPH	PB
P	P	P
Q	KW	None
R	R	R
S	S	S
T	T	T
V	SR	F
W	W	None
X	S (KP)	BGS
Y	KWR	EU
Z	S	Z

Source: John R. Bianco, Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 (Skokie, Ill.: Stenograph, 1976), pp. 4-229.

The form, for example, for the infrequently occurring "J" sound at the beginning of words or syllables is shown in Table 2.1 as a combination of "SKWR," while the "J" sound at the ending of words or syllables is represented by a combination of "PBLG." In few, if any, instances do these letters occur together normally in English words.

Table 2.1 also shows that some special cases occur in the writing of other letters of the alphabet. In the case of "C," for example, a

"K" or "S" is written before and after the vowel because "C" does not have a unique phonetic sound of its own. Since "C" is sounded as a "K" or "S" at the beginning and ending of words or syllables, then the forms for those letters are used. When "C" is written as an initial or as a letter standing alone, however, "KR" is stroked on the left side of the keyboard.[21]

Similarly, in the special case of "Q" in final-consonant position, no form is shown because this letter normally never occurs at the end of syllables or words. For "W" in final-consonant position, no form is given either since "W" does not normally produce a unique phonetic sound of its own at the end of words or syllables. Although some words and syllables do end with a "W," the sound produced is formed in combination with vowels. These combinations have the sounds of vowels and are therefore written with the vowel keys.[22]

In the special case of final-consonant "H," no form is provided either since words or syllables normally ending in "H" usually end in a combination of "CH," "SH," or "TH," phonetically unique combinations which have their own forms.[23] Initial-consonant "X," like final-consonant "H," also does not produce a phonetically unique sound. Since an "X" at the beginning of a word or syllable normally has a "Z"

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[21]John R. Bianco, Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 (Skokie, Ill.: Stenograph, 1976), pp. 7, i.

[22]Ibid., pp. 43, 46, 163.

[23]Ibid., pp. 163, 210, 229.

sound, then "S" is the form written. The only exception listed in the Stenograph dictionary, though, is the "X" in "xray," which is written as it sounds: short "E" followed by final-consonant "X."[24] "X" is also written as "KP," however, when "X" is used as an initial or as a letter standing alone.[25]

The final special case, final-consonant "Y," is written as either short- or long-vowel "I" because the phonetic sound normally heard at the end of words or syllables ending in "Y" is short- or long-vowel "I."[26] Table 2.2 presents the forms for short- and long-vowel "I," as well as the forms for the alphabet's other long and short vowels.

TABLE 2.2

STENOGRAPH MACHINE SHORTHAND FORMS
FOR SHORT AND LONG VOWELS

Vowel	Short-Vowel Form	Long-Vowel Form
A	A	AEU
O	O	OE
E	E	AOE
U	U	AOU
I	EU	AOEU

Source: John R. Bianco, Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 (Skokie, Ill.: Stenograph, 1976), pp. 4-87.

[24]Judy C. Fox, ed., Stenograph's Computer-Compatible Touch Shorthand Dictionary/Handbook (Skokie, Ill.: Stenograph, 1977), p. 125.

[25]Bianco, op. cit., p. i.

[26]Ibid., p. 15.

As Table 2.2 shows, the short sounds of the vowels are written as themselves, while the long sounds of the vowels are written as a combination of two or three vowel keys. "I" is an exception, however. Because adding another key for "I" to the vowel bank of keys would create an extra burden on one of the thumbs, writing would be thrown out of balance and reduced speed and accuracy might result.[27] To keep the fingering position balanced, therefore, short "I" is written as a combination of "E" and "U"; and long "I" is written as a combination of all four vowel keys.

While the reasoning behind the choice of key designations and letter combinations has been discussed, final note should also be given to the thought behind the fixed printing positions of the keys. The fixed printing line for the modern-day Stenograph is STKPWHRAO*EUFRPB LGTSDZ.

Those keys controlled by the left hand are printed to the left of the asterisk, and those controlled by the right hand are printed to the right of the asterisk. The order of the consonants on either side of the vowels, however, is what makes the print line so unique. This order of consonants is based on the normal sequence of letters in English words. For example, "S" always precedes "T" on the print line because few, if any, words or syllables begin with a "T" sound followed immediately by an "S" sound before the vowel. Likewise, few, if any, words or syllables begin with an "H" sound immediately followed by a "W," "P,"

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[27] Ibid., p. 23.

"K," "T," or "S" sound. Many words or syllables, however, begin with "SH," "TH," or "WH" sounds.

Combinations of keys used to make forms for missing letters occur through similar use of the fixed-position print line. The combination for initial "N," for instance, is "TPH," as shown in Table 2.1. "TPH" is preceded, therefore, by only initial "S" because few, if any, words or syllables begin with the sound of "TN," "KN," "PN," "WN," "HN," or "RN," though some words or syllables are spelled, but not pronounced, in those ways. Similar reasoning was also used in arranging the final-consonant side of the keyboard.

Computer-Assisted Transcription

The STENO-CAT system, one of Stenograph's several computer-assisted transcription systems, begins with the taking of dictation notes on the Steno-Data Writer. Within the Steno-Data Writer, these notes are produced on both a paper tape and a magnetic tape cassette. This tape cassette is then read by the Stenodata Reader, which transfers the machine notes from the cassette to a disc and enters the disc into the computer. Any special instructions for the transcription of the cassette can also be introduced into the computer at this time by entering the information on a computer keyboard terminal.

After all special instructions have been entered, the shorthand machine operator's personal translation dictionary disc is plugged into the computer and translation of the notes is begun. The translated notes are then displayed on a video screen for proofing and correcting by the operator. As errors are discovered, the operator makes corrections

by entering information on the keyboard terminal. Paper tape machine notes are used during the proofing process as a means of verifying any questionable transcription on the video display. When the correction process has been completed, the operator instructs the computer through the keyboard controls to direct the printer to produce a typed transcript of the dictation.

The components of the STENO-CAT system are the Steno-Data Writer, the Stenodata Reader, the computer and discs, the viewing screen and keyboard terminal, and the printer. The system is also expandable and may be enlarged by adding up to three additional editing stations and disc storage files and one additional printer. Mechanical specifications relevant to several of the components are given below.

1. The Steno-Data Writer requires 110 volts of electrical current or four "D"-cell batteries to operate the cassette-recording mechanism.

2. The computer, which can handle batch processing, has a maximum memory of 64k bytes and operates at a translation speed of 250 pages per hour. Storage capacity for both the dictionary disc and the shorthand notes disc is 10 million characters. In addition, the personal translation dictionary disc contains well over 100,000 words written in the way, or ways, the shorthand machine operator using the disc writes them.

3. The printer prints at a speed of 180 characters per second and can produce up to four copies of 360 pages of transcript per hour.[28]

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[28] STENO-CAT: The Ultimate in Computer-Assisted Transcription (Skokie, Ill.: Stenograph, no date), pp. 2-4.

CHAPTER III

RELATED STUDIES

Of the studies found on machine shorthand, most fitted into these general categories: (1) comparison of interest or achievement between machine and symbol shorthand students, (2) analysis of machine shorthand's place in curriculum, (3) follow-up of machine shorthand graduates, (4) explanation of machine shorthand's vocational application, and (5) teaching techniques in machine shorthand. No machine shorthand studies were found, however, which were directly related to the problem of this study, the analysis of errors in machine shorthand notes.

Those machine shorthand studies within the category of teaching techniques are reviewed in the first part of this chapter. Though they were not directly related to error analysis, these studies were reviewed because they provided a bridge between machine and symbol shorthand for implicating the findings of research in symbol shorthand to machine shorthand. In addition, these studies pointed out many similarities between teaching techniques in symbol shorthand and machine shorthand, particularly in emphasizing the importance of learning to write principles and brief forms, or abbreviations, accurately. These studies on teaching techniques stressed the importance of writing accuracy, a premise used as justification for this study, as explained in Chapter I.

Studies showing relationships between theory mastery, or accuracy of writing, and dictation achievement and transcription accuracy are reviewed in the second and third parts of this chapter. Because no

research had been reported in these two areas for machine shorthand, the studies reviewed were based on Gregg symbol shorthand. These studies on the effects of theory mastery were reviewed because they further justified this study by substantiating the beneficial effects of theory mastery.

The final part of this chapter provides a review of two Gregg shorthand studies in which an analysis of errors in shorthand notes was made. These studies were reviewed because much of the procedure in this study was based on the procedures followed in these Gregg shorthand studies.

Teaching Techniques in Machine Shorthand

The following pair of studies deals with principles of instruction in machine shorthand.

Kahn Study

The problem of the study by Kahn[1] was to develop instructional materials to be used in a high school course in Stenograph machine shorthand.

In the first phase of the study, literature on teaching techniques in symbol shorthand and typewriting were reviewed so that a comprehensive list of teaching principles could be compiled for machine shorthand. Since existing literature offered no such list specifically for machine

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[1]Gilbert Kahn, "The Preparation of Instructional Materials for a Secondary-School Course in Stenograph Machine Shorthand" (unpublished Doctoral dissertation, New York University, New York, 1955).

shorthand, literature on symbol shorthand and typewriting were used because identical elements of recording sounds, as in shorthand, and manipulating keys, as in typewriting, occurred in learning machine shorthand. This list of teaching principles compiled for machine shorthand was then submitted for review and revision by a jury of machine shorthand authorities.

In the second phase of the study, three beginning Stenograph texts used in private business schools were analyzed to determine the adequacy of the practice material provided. To analyze the 58,729 words taken from these materials, the words were categorized according to their ability to provide for the following nine elements: (1) keys, (2) combinations, (3) consonant compounds, (4) abbreviations, (5) phrasing, (6) word-building, (7) spelling, (8) numbers, and (9) punctuation.

After the initial checklist of nine elements was created, two summarizing checklists were developed; and 325 pages of checklists were generated through further analysis. Checklist A evaluated the relationship of each element to itself for continuity of practice in each succeeding lesson, while Checklist B evaluated the relationship of each main element to the other eight within each lesson.

Utilizing the list of machine shorthand teaching principles and the findings of Checklists A and B, 70 lessons containing 45,942 words were developed for one semester's use in a beginning Stenograph machine shorthand class at the high school level. To check the adequacy of usage of the nine elements in the newly devised material, two checklists similar to Checklists A and B were employed. Based on the suggestion of the machine shorthand authorities who reviewed the teaching principles,

each instructional item appeared at least six times in its presentation lesson and at least three times in all remaining lessons.

Some important teaching principles of machine shorthand listed in this study were:

1. The machine shorthand student must learn to hear every sound of a word, if the word is not to be recorded as an abbreviation, so that recording of sounds can be done accurately and rapidly.

2. Enough drill should be provided on words that are often used so the recording of the words becomes automatic.

3. The machine shorthand student must learn to record any word accurately and rapidly.

4. Some dictation at a rate higher than the machine shorthand student can easily record should be regularly provided to build writing speed.

5. Specific principles of machine shorthand theory can be successfully emphasized through the use of word lists.

6. As the machine shorthand student's skill develops, previewing of difficult words should be replaced by postviewing to check the accuracy of the student's forms for difficult words.

7. The machine shorthand student should be provided daily with a brief, intensive review of the principles of machine shorthand.

Griffiths Study

The problem of the study by Griffiths[2] was to determine if students instructed by the intensive method were as successful in learning machine

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[2]William E. Griffiths, "A Comparative Analysis of the Whole and Intensive Methods of Teaching Beginning Touch Shorthand" (unpublished Master's thesis, Bloomsburg State College, Bloomsburg, Penn., 1969).

shorthand theory and in taking and transcribing dictation as students instructed by the whole method. Students in the control group were taught by the whole method, which meant they learned stroking patterns by using longer combinations of letters, emphasized in multiple-stroke words and advanced terminology, at the sacrifice of immediate speed attainment. Students in the experimental group, on the other hand, learned by the intensive method, which meant they learned stroking by stressing an immediate and automatic response to individual letters, shorter combinations of letters, and less advanced terminology.

Both the control and experimental classes were beginning classes of machine shorthand students who were attending Alfred State College in Alfred, New York, during the first quarter of the 1968-1969 academic year. The two classes of students, taught by different teachers, met for five 50-minute sessions per week for ten weeks. Before the experiment began, both classes were given the Turse Shorthand Aptitude Test, a longhand writing speed test, a typewriting speed and accuracy test, and the Regents Scholarship Examination. After statistical analysis of the results of these tests, all students were judged to have a similar ability to learn shorthand.

The final measuring device for evaluating the students at the end of the quarter consisted of four parts: (1) 50 abbreviations dictated one every five seconds, (2) 50 words constructed according to principles and dictated one every six seconds, (3) two minutes of dictation at 40, 50, and 60 words per minute for transcription, and (4) ten minutes of transcription in longhand of shorthand plates. After the data obtained

from these four parts of the measuring device had been evaluated, the t test and the F test were applied as statistical tools.

Major findings from this study were:

1. The abbreviation test, which was evaluated on the basis of writing accuracy, showed a significant difference at the .05 level of confidence in favor of the students taught by the whole method.

2. The theory word test, which was also evaluated on the basis of writing accuracy, showed a significant difference at the .01 level of confidence in favor of the students taught by the whole method.

3. The dictation and transcription test, which was evaluated on the basis of transcription errors, showed no significant difference at the .05 level of confidence at speeds of 40 and 60 words per minute. At 50 words per minute, however, a significant difference at the .05 level of confidence was shown in favor of the students taught by the intensive method.

4. The shorthand plate test showed a significant difference at the .01 level of confidence, based on the number of words transcribed, in favor of the students taught by the whole method. No significant difference occurred, however, based on the number of transcript errors.

Relationship Between Theory Mastery and Dictation Achievement

The following pair of studies deals with the significance of symbol shorthand theory mastery and its effect on shorthand dictation speed achievement.

Goetz Study

The problem of the study by Goetz[3] was to determine the relationship between Gregg shorthand symbol mastery and dictation achievement at selected intervals from 50 to 100 words per minute.

The subjects of this study were 86 beginning Gregg Diamond Jubilee shorthand students in their second semester of shorthand at John F. Kennedy High School in Taylor, Michigan. Based on their dictation achievement, the 86 students were put into three groups. Group A of 31 students took dictation at 50 to 60 words per minute, Group B of 26 students took dictation at 70 to 80 words per minute, and Group C of 29 students took dictation at 90 to 100 words per minute.

Dictation achievement of these students was measured by their passing three dictation tests at each speed, each test being three minutes in length. Transcription was performed in longhand, and 95 percent accuracy was required to achieve passing. In addition, though practice dictation ranged in speeds from 50 to 100 words per minute, no attempt was made to build speed beyond 100 words per minute.

To measure symbol mastery, a word list test consisting of 600 words selected from the shorthand text was compiled. This word list test, which took two days for the students to take, was given once at the beginning of the second semester and once at the end of the semester. The two tests, when used together, showed the students' gains in overall

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[3]Leo G. Goetz, "The Relationship Between Symbol Mastery and Selected Dictation Achievements in Gregg Shorthand" (unpublished Doctoral dissertation, University of North Dakota, Grand Forks, 1966).

symbol mastery. The word list test given at the end of the semester, however, was the only one used to determine the relationship between symbol mastery and dictation speed.

Finally, to measure mastery of specific shorthand symbols, each shorthand stroke was assigned a number. The comma "S," for example, was labeled "1"; long-vowel "A" was labeled "2"; and so forth. In addition, the t test and a correlation coefficient were applied as statistical tools.

Major findings from this study were:

1. The final word list test, which measured symbol mastery, showed significant differences at the .01 level among all group means. The t value between Groups A and B was 7.57; between Groups B and C, 6.26; and between Groups A and C, 12.55.

2. Significant differences among the three groups were found when the correctness of outlines for selected symbols was determined. When comparing Groups A and B, 77 of 95 selected symbols were significant at the .01 level. When comparing Groups B and C, 66 of 95 symbols were significant at the .01 level. Lastly, when comparing Groups A and C, 92 of 95 symbols were significant at the .01 level.

3. None of the three groups had a significant gain in overall symbol mastery.

4. The determination of mean symbol mastery gain within groups showed that Group A had a significant mean gain for 5 of the 95 selected symbols; Group B, 20 of the 95 symbols; and Group C, 14 of the 95 symbols.

5. The relationship between the first and second applications of the word list test was indicated by a correlation coefficient of .89.

6. The relationship between selected dictation speeds and symbol mastery was indicated by a correlation coefficient of .82.

Pullis Study

The problem of the study by Pullis[4] was to determine the relationship between shorthand accuracy and dictation achievement and between shorthand accuracy and intelligence.

The subjects of this study were 135 Gregg shorthand students from North Texas State University who were taking Principles of Shorthand I or II or Intermediate Shorthand-Transcription I or II. Every three weeks, beginning with the ninth week of the semester, a word list test was administered to the students via taped recording. To develop each 200-word test, 40 words were selected from each group of 1,000 words found in the Silverthorn[5] word list of the 4,950 most frequently used words in business communications.

Following dictation of the word list test at the rate of one word every four seconds, the students were required to transcribe the words in longhand. After the notes and transcripts had been checked, each student received a shorthand accuracy score based on the number of

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[4]Joe Milton Pullis, "The Relationship Between Competency in Shorthand and Achievement in Shorthand Dictation" (unpublished Doctoral dissertation, North Texas State University, Denton, 1966).

[5]J. E. Silverthorn, "High-Frequency Business Vocabulary Word List," Word Division Manual (Cincinnati: South-Western Publishing Company, 1958).

shorthand outlines correctly written and a shorthand transcription score based on the number of shorthand outlines correctly transcribed.

In addition, beginning with the twelfth week, three minutes of unpreviewed, new-matter material were dictated weekly via taped recording at speeds from 50 to 140 words per minute. Each student's dictation rate was then based on the student's ability to transcribe the highest speed with 97 percent or greater accuracy. Each student also took the Otis Test of Mental Maturity to provide an intelligence quotient score.

By applying the product-moment correlation coefficient, the t test, and the F test as statistical tools, analyses were performed using the students' IQ scores, their highest shorthand accuracy and transcription scores, and their highest dictation-rate levels.

Major findings from this study were:

1. The relationship between the student's shorthand outline accuracy and his shorthand dictation achievement was indicated by a significant correlation of .8326.

2. The relationship between the student's shorthand outline accuracy and his shorthand transcription ability was indicated by a significant correlation of .9305.

3. The relationship between the student's shorthand transcription ability and his shorthand dictation achievement was indicated by a significant correlation of .8056.

4. No significant relationship existed between the student's IQ and his shorthand outline accuracy, his shorthand dictation achievement, or his shorthand transcription ability.

5. Shorthand dictation achievement increased with shorthand outline accuracy at every dictation-rate level except the 90 level.

6. Shorthand dictation achievement increased with shorthand transcription ability at every dictation-rate level except the 90 and 120 levels.

7. Shorthand transcription ability increased with shorthand outline accuracy at every dictation-rate level.

Relationship Between Theory Mastery and Transcription Accuracy

The following pair of studies deals with the significance of symbol shorthand theory mastery and its effect on the accuracy of transcription.

Klaseus Study

The problem of the study by Klaseus[6] was to determine factors which contribute to the difficulty of transcription materials in Gregg Diamond Jubilee shorthand.

Using the principles of Gregg Diamond Jubilee shorthand, a list of words illustrating all the principles was prepared. The words chosen were limited in vocabulary, and all but 18 of them were found on the Silverthorn high-frequency list. By limiting vocabulary, the difficulty of principles was measured rather than difficulty of vocabulary.

Five letters, each no longer than three minutes in length, were composed using the word list so all principles of Diamond Jubilee

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[6]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, Mankato, Minn., 1964).

shorthand were tested in the letters. These letters, which were dictated at 40 words per minute, were also written according to the Hillestad[7] formula so that no significant differences would exist between the letters.

The letters were next mailed to shorthand teachers at 16 schools using Diamond Jubilee to be dictated, no more than two letters at a time, during one class period and only after all principles had been taught. Shorthand notes and transcripts resulting from the dictation were then returned, and only those words in the notes and transcripts which were used to illustrate theory were checked for error. Finally, all errors were tabulated to show the frequency and type of errors made in the application of each shorthand principle. Statistical tools applied to the tabulated data were percentages and a correlation coefficient.

Major findings and conclusions from this study were:

1. Incorrectly written outlines were transcribed correctly 58.8 percent of the time, while correctly written outlines were transcribed correctly 96.1 percent of the time.

2. The relationship between correct shorthand outlines and correct transcription was indicated by a correlation coefficient of .924, which was significant at the .01 level.

3. The relationship between incorrect shorthand outlines and incorrect transcription was indicated by a correlation coefficient of .538, which was significant at the .01 level.

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[7]Mildred Christine Hillestad, "Factors Which Contribute to the Difficulty of Shorthand Dictation Materials" (unpublished Doctoral dissertation, University of Minnesota, Minneapolis, 1960).

4. Errors of high frequency which resulted in incorrectly written outlines but correct transcription included writing the major vowel when the shorthand dictionary outline omitted it, writing the minor vowel when the shorthand dictionary outline omitted it, writing the separate letters of a blend, and writing out word beginnings and endings.

5. Errors of high frequency which resulted in incorrectly written outlines and incorrect transcription included omitted letters, incorrect word endings, substitutions, words written in full, omitted major vowels, incorrect blends, and added minor vowels.

6. Substitutions which appeared to make transcription more difficult included substitution of "O" and "U," substitution of "I" and "E," and substitution of letters that did not seem to be based on shorthand principles or sounds within the word.

Fermenich Study

The problem of the study by Fermenich[8] was to determine the relationship between inaccurate Gregg Simplified shorthand outlines and transcription errors.

The subjects of this study were 100 second-year shorthand students from nine Minnesota schools whose shorthand teachers were willing to participate in the study. These 9 schools, plus 6 others, were chosen randomly from a list of 339 schools in Minnesota which offered two years

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[8]William Frederick Fermenich, "An Analysis of the Relationship Between Application of Some Principles of Gregg Shorthand Simplified and Errors in Transcription" (unpublished Master's thesis, Mankato State College, Mankato, Minn., 1959).

of Gregg shorthand. Of the 15 shorthand teachers at these schools who were asked to participate in the study, 9 agreed, 1 declined, and 5 failed to reply.

Four test letters used in three previous studies at Mankato State College were mailed, with instructions, to the participating teachers, who dictated the letters at 50 words per minute. After the 100 sets of notes and transcripts were returned, those specific words included in the dictation to test principles were checked for accuracy in both outline and transcription. Only the part of a word illustrating a principle was checked, and tally sheets were completed which listed all errors made. In addition, the Horn-Peterson[9] list was used to determine the frequency rank in business vocabulary of those words selected to illustrate principles. Also, the principles of Gregg Simplified shorthand were organized into nine groups based on their similarity.

Major findings from this study were:

1. The relationship between correct shorthand outlines and correct transcription was indicated by a correlation coefficient of .949.

2. The relationship between incorrect shorthand outlines and incorrect transcription was indicated by a correlation coefficient of .575.

3. The relationship between incorrect transcription and illegible shorthand was indicated by a correlation coefficient of .988.

4. No significant relationship existed between correct shorthand outlines and incorrect transcription.

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[9]Ernest Horn and Thelma Peterson, The Basic Vocabulary of Business Letters (New York: Gregg Publishing Company, 1943).

5. The relationship between Horn-Peterson rank and words written correctly and transcribed correctly was indicated by a correlation coefficient of -.490.

6. The relationship between Horn-Peterson rank and words written correctly and transcribed incorrectly was indicated by a correlation coefficient of -.001.

7. The relationship between Horn-Peterson rank and words written incorrectly and transcribed correctly was indicated by a correlation coefficient of .427.

8. The relationship between Horn-Peterson rank and words written incorrectly and transcribed incorrectly was indicated by a correlation coefficient of .293.

9. No significant difference existed between groups of shorthand principles and transcription errors.

Analysis of Errors in Shorthand Notes

The following pair of studies deals with analyses of errors made on principles and brief forms found in the shorthand notes of symbol shorthand students.

Frye Study

The problem of the study by Frye[10] was to analyze shorthand outline errors made on selected principles and brief forms recorded in the dictation notes of beginning Gregg Simplified shorthand students.

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[10]Carolyn Frances Frye, "An Error Analysis of Dictation Notes of Second-Semester High School Students of Gregg Shorthand Simplified" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1965).

The subjects of this study were students from nine high schools who were enrolled in their second semester of Gregg Simplified shorthand and who had completed at least 50 lessons of the shorthand theory text. Teachers of these students were mailed two dictation tests, three practice letters, and detailed instructions on when and how to give the tests. Each dictation test consisted of three 150- to 160-word letters which were dictated without preview at 50 words per minute. The following day 20 minutes was set aside for the students to transcribe, in longhand or by typing, the second letter of the dictation test given the preceding day. The following week the other dictation test was given, and all notes and transcripts were returned by the teachers after both tests had been taken.

The dictation tests included selected brief forms and principles research indicated a need to change and which were, and were not, changed in the shorthand system revision from Simplified to Diamond Jubilee; selected brief forms and principles research indicated no need to change and which were, and were not, changed; and derivatives, which had to be included in the Silverthorn list, of selected brief forms. In addition, each of the chosen brief forms and principles was tested three times in the six letters of the two tests; and each derivative was tested once in the six letters.

Statistical tools used in this study included percentages for the error rate interpretations and a test reliability coefficient, a scorer reliability coefficient, the F test, and the Duncan multiple-range test. A test reliability coefficient of .945 was found for the two dictation tests when a pilot test was performed on 23 second-semester shorthand

students, while a scorer reliability coefficient of .944 was found when one of the six letters was scored by another teacher. In addition, the F test and the Duncan multiple-range test revealed that one school had error rates too different from the other schools for brief forms and derivatives, while another school had error rates too different for principles. For this reason, these schools were removed from the final analysis; and only eight schools were used.

Major findings from this study were:

1. Brief form error rates ranged from 2.8 to 88.5 percent. Brief forms throughout, among, recognize, and upon had the highest rates, all of which were above 80 percent.

2. Of 22 brief forms, among, circle, experience, nevertheless, and prosecute had error rates above 50 percent and were changed in Diamond Jubilee. Brief forms acknowledge, recognize, throughout, and upon also had error rates above 50 percent but were not changed.

3. Brief forms which were changed because research indicated a need had an error rate of 65.4 percent as compared to 66.2 percent for those brief forms for which research indicated a need for change but no change was made. Brief forms which were changed though research indicated no need had an error rate of 23.6 percent as compared to 13.1 percent for those brief forms for which research indicated no need for change and no change was made.

4. Derivative error rates ranged from 8.3 to 94.8 percent. Derivatives circled, progressive, and recognized had the highest rates, all of which were above 80 percent.

5. Of 21 derivatives, 14 had error rates above 50 percent; and

all derivatives except enclosed had error rates higher than their brief form root words.

6. Derivatives which were changed because research indicated a need had an error rate of 75.3 percent as compared to 76 percent for those derivatives for which research indicated a need for change but no change was made. Derivatives which were changed though research indicated no need had an error rate of 39.9 percent as compared to 44.1 percent for those derivatives for which research indicated no need for change and no change was made.

7. Principle error rates ranged from 11.8 to 84.7 percent. Principles -ulate, -incl, and super- had the highest rates, all of which were above 70 percent.

8. Of 24 principles, 6 had error rates above 50 percent and were changed in Diamond Jubilee. Six principles also had error rates above 50 percent but were not changed.

9. Principles which were changed because research indicated a need had an error rate of 64.4 percent as compared to 56.4 percent for those principles for which research indicated a need for change but no change was made. Principles which were changed though research indicated no need had an error rate of 35.6 percent as compared to 33.1 percent for those principles for which research indicated no need for change and no change was made.

Patrick Study

The primary problem of the study by Patrick[11] was to analyze shorthand outline errors made on selected principles and brief forms recorded in the dictation notes of beginning Gregg Diamond Jubilee shorthand students. A secondary problem of the study was to determine the frequency of occurrence of the selected brief forms and principles in Diamond Jubilee textbook material.

The subjects of this study were first-year Diamond Jubilee shorthand students who had completed at least 50 lessons of the shorthand theory text. The 35 high schools which these students attended were randomly chosen from a five-state list of 158 high schools. Final analysis was further randomized by the use of a table of random numbers to choose the shorthand notes and transcripts of 10 students from each of 20 of the 35 schools.

The six letters used in the preceding study by Frye were also dictated at 50 words per minute to the subjects of the Patrick study. Both studies, therefore, tested the same selected brief forms and principles to determine whether shorthand system changes from Simplified to Diamond Jubilee were justified or whether changes still needed to be made.

As in the Frye study, the dictation tests and instructions for their administration were sent to all cooperating teachers. According to the instructions mailed to the teachers, Part A consisting of letters

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[11]Alfred L. Patrick, "An Error Analysis of Selected Brief Forms and Principles in Shorthand Notes of Beginning Gregg Diamond Jubilee Shorthand Students" (unpublished Doctoral dissertation, The University of Tennessee, Knoxville, 1965).

1, 2, and 3 was dictated on the first test day to Group I of the 35 high schools, while Part B consisting of letters 4, 5, and 6 was dictated to the remaining high schools in Group II. On the second test day, Part B was dictated to Group I; and Part A was dictated to Group II. The second letter from each test day's dictation was also transcribed, and all shorthand notes and transcripts from all 35 schools were returned by mail.

Statistical tools used in this study included percentages, reliability coefficients, the Pearson product-moment correlation coefficient, the t test, the F test, the Duncan multiple-range test, and the McCall's transformation. McCall's transformation was used to normalize raw data for the correlations which did not represent normal distributions.

Major findings from this study were:

1. The relationship between the frequency of occurrence of the brief forms in the textbooks and the number of outline errors on brief forms was indicated by a significant correlation of -.650.

2. The relationship between the number of incorrectly written brief forms and the number of incorrectly written derivatives of the brief forms was indicated by a significant correlation of .607.

3. The relationship between the number of correctly written brief forms and derivatives and the number of correctly transcribed brief forms and derivatives was indicated by a significant correlation of .986.

4. Correctly written brief forms and derivatives were correctly transcribed 91.0 percent of the time, while incorrectly written brief

forms and derivatives were correctly transcribed 60.6 percent of the time.

5. No significant difference existed between the frequency of occurrence of the principles in the textbooks and the number of outline errors on the principles.

6. The relationship between the number of different words used for each principle in the textbooks and the number of incorrectly written outlines for each principle was indicated by a significant correlation of -.389.

7. The relationship between the number of correctly written principles and the number of correctly transcribed principles was indicated by a significant correlation of .968.

8. Correctly written principles were correctly transcribed 92.7 percent of the time, while incorrectly written principles were correctly transcribed 63.6 percent of the time.

Summary

The studies selected for review in the first part of this chapter brought out some of the similarities between instructional goals in symbol shorthand and machine shorthand. One of the instructional goals emphasized in both pedogogies was accuracy of writing in dictation notes. Since improving accuracy of writing machine shorthand notes was the primary reason for undertaking this study, the Kahn and Griffiths studies assisted by pointing out the importance of accurate writing in machine shorthand. Of the 26 teaching principles for machine shorthand developed by Kahn, for instance, 10 of them stressed or implied

developing the ability to write machine shorthand notes accurately. Furthermore, accuracy of writing was adopted in the Griffiths study as the evaluating criteria for two of four parts of the measuring device used to determine student achievement.

The studies reviewed in the second and third parts of this chapter continued to show the importance of writing accuracy by presenting evidence of the beneficial effects of writing accuracy on speed achievement and transcription accuracy. Because similar studies had not been done in machine shorthand, all the studies in these two parts of the chapter described the influence of writing accuracy on speed and transcription in Gregg symbol shorthand.

A major finding from the Goetz study presented in the second part of this chapter indicated a correlation coefficient of .82 to describe the high relationship between shorthand dictation speed achievement and symbol mastery. A finding of the Pullis study indicated a similar coefficient of .8326 to describe the relationship. In addition, another major finding from the Pullis study indicated a correlation coefficient of .9305 to describe the very high relationship between shorthand transcription ability and shorthand accuracy.

This major finding of the Pullis study on the very high relationship between shorthand transcription ability and shorthand accuracy was echoed by the Klaseus study, with a coefficient of .924, and by the Fermenich study, with a coefficient of .949. In addition, another major finding of the Klaseus study indicated a correlation coefficient of .538 to describe the substantial relationship between incorrect

shorthand outlines and incorrect transcription. A similar finding of the Fermenich study indicated a coefficient of .575.

Those studies reviewed in the final part of this chapter provided a format for procedures used in completing this error analysis study in machine shorthand. Though both of the studies reviewed were error analyses in Gregg symbol shorthand, the Frye study was useful in presenting procedures for categorizing errors and interpreting findings, while the Patrick study was useful in presenting procedures for developing dictation material and teacher dictation instructions.

CHAPTER IV

PROCEDURES

This chapter provides detailed explanations of: (1) how the principles list was compiled; (2) how the checklist, the word lists, and the dictation material were constructed and administered; (3) how teachers and students were selected to participate in this study; (4) how the accuracy of machine shorthand notes obtained from the administration of the word lists and the dictation material was evaluated; and (5) how data obtained from checklists and machine shorthand notes were treated for analysis.

Compilation of Principles List

To obtain a complete list of all principles of Stenograph machine shorthand, a review of each lesson presented in the Stenograph theory text[1] and dictation text[2] was made. In addition, a review of the Stenograph dictionary[3] was made to locate any additional principles.

The lists of principles obtained from the textbooks and dictionary were merged to form one list; and copies of this merged list were sent

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[1]John R. Bianco, Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 (Skokie, Ill.: Stenograph, 1976).

[2]Judy C. Fox, Stenograph's Computer-Compatible Touch Shorthand Revised Beginning Skill Development and Transcription: Book 2 (Skokie, Ill.: Stenograph, 1977).

[3]Judy C. Fox, ed., Stenograph's Computer-Compatible Touch Shorthand Dictionary/Handbook (Skokie, Ill.: Stenograph, 1977).

to Ms. Judy C. Fox, then Educational Consultant at Stenograph in Skokie, Illinois, and Dr. Hollie Sharpe, Professor and machine shorthand teacher at Western Kentucky University in Bowling Green, for review. Based on the suggestions of the two reviewers, the final revised list of Stenograph Computer-Compatible Touch Shorthand Principles, shown in Appendix A, was developed. This final revised list was subsequently used in constructing the checklist, the word lists, and the dictation material.

Construction and Administration of Instruments

The following part of this chapter describes the procedures used to construct and administer the checklist, the word lists, and the dictation material.

Checklist

The purpose of the checklist was to permit teachers to specify those abbreviations, derivatives, and principles which they perceived their students were regularly having problems learning. This checklist was administered by mail on August 30, 1979, and required only that respondents place checks by those selected abbreviations, derivatives, and principles listed which were particularly troublesome to their students.

The principles section of the checklist was developed by utilizing the revised list of Stenograph principles shown in Appendix A. Of the 60 principles on this list, 49 were included in the 41 entries on the checklist. Those 11 principles not included on the checklist were judged to be so intrinsic to a basic understanding of machine shorthand theory that their inclusion in the checklist was deemed unnecessary.

The abbreviations and derivatives section of the checklist, which included only selected abbreviations and derivatives, was developed in two steps. First, a review was made of the abbreviations and derivatives presented lesson by lesson in the Stenograph theory text. Second, a comparison was made of those abbreviations and derivatives with the Gregg shorthand brief forms and derivatives examined in error analysis studies by Dow,[4] Smith,[5] and Patrick.[6] Since certain brief forms and derivatives in Gregg shorthand were of particular importance in these studies, their occurrences as abbreviations and derivatives in Stenograph machine shorthand were reasoned to be of similar importance in this study. To be included in the checklist, therefore, a machine shorthand abbreviation or derivative had to be presented in the Stenograph theory text and also had to be examined as a brief form or derivative in at least one of the three Gregg shorthand studies. In addition to the 38 abbreviations and derivatives selected for the checklist in this way, several blanks were left in which the respondents could write other abbreviations or derivatives which they thought difficult for their students. After completion, the checklists were returned by mail

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[4]Alice Staples Dow, "An Error Analysis of Brief Forms in Dictation Test Notes of Second-Quarter Shorthand Students" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1954).

[5]Edgar Ray Smith, "An Error Analysis of Thirty-One Selected Brief Forms in Dictation Notes of Second-Semester High School Students" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1960).

[6]Alfred L. Patrick, "An Error Analysis of Selected Brief Forms and Principles in Shorthand Notes of Beginning Gregg Diamond Jubilee Shorthand Students" (unpublished Doctoral dissertation, The University of Tennessee, Knoxville, 1965).

for analysis. Appendix B contains the checklist and the accompanying cover letter and questionnaire-consent form.

Word Lists and Dictation Material

The purpose of the two word lists and the two sets of dictation material was to provide a medium for obtaining, from students, machine shorthand notes containing selected abbreviations, derivatives, and principles so that frequencies and patterns of errors could be determined for those abbreviations, derivatives, and principles. After receiving the two sets of word lists and dictation material sent by mail on April 26, 1980, participating teachers administered the material to their students and returned by mail all machine shorthand notes and longhand transcripts.

In preparation for developing the word lists and the dictation material, over 430 words were chosen from the Stenograph dictionary to illustrate principles of Stenograph machine shorthand and all abbreviations and derivatives listed on the checklist. Since an effort was made to choose only words the students might never have written, those words used in initial presentations of principles in the Stenograph theory text were omitted from the word lists and the dictation material. In addition, an effort was made to choose only those words for which the Stenograph dictionary gave one, and only one, theory pattern.

Based on the results of the checklist, those principles checked by over 14 percent of the respondents and those abbreviations and derivatives checked by over 8 percent of the respondents were selected for further examination and were tested in the word lists and the dictation

material. The words used to test those selected abbreviations, derivatives, and principles were picked at random from the more than 430 words chosen from the Stenograph dictionary.

To obtain an organized pattern for testing, the selected principles were randomly divided into Sets A, B, and C, while the selected abbreviations and derivatives were randomly divided into Sets X, Y, and Z. By using Sets A, B, and C, one-third of the selected principles were tested in one word list and one new-matter letter; another one-third, in the other word list and new-matter letter; and still another one-third, in both word lists and both new-matter letters. By using Sets X, Y, and Z, the same pattern of testing was followed for the selected abbreviations and derivatives. Consequently, as Table 4.1 shows, two-thirds of the abbreviations, derivatives, and principles were tested two times, while one-third was tested four times. Table 4.1 also shows that each set of dictation material contained a short warmup letter containing abbreviations, derivatives, and principles not tested in that set's new-matter letter. These warmup letters provided students with dictation practice only; and none of the machine shorthand notes for these letters were used to provide data for this study.

By utilizing this pattern of testing, each word list or new-matter letter contained 49 test words; and of the 196 words contained in both sets of word lists and new-matter letters, each word was used to test only one selected abbreviation, derivative, or principle. After review by Ms. Judy C. Fox and Dr. Hollie Sharpe, the two sets of instruments containing these test words were administered to students by their teachers. All students were to have completed at least Lesson 68 of

TABLE 4.1

PATTERN FOR TESTING SELECTED ABBREVIATIONS, DERIVATIVES, AND PRINCIPLES

	Word List	Warmup Letter	New-Matter Letter
Set I	AC	A	BC
	XZ	X	YZ
Set II	BC	B	AC
	YZ	Y	XZ

the Stenograph theory text, the final lesson in which new abbreviations, derivatives, and principles were presented.

In administering the first word list, teachers dictated each of the 49 words at the rate of one word every 12 seconds while the students wrote the words on their shorthand machines. Immediately after collecting the machine shorthand notes, the teachers dictated, at 60 words per minute, the warmup letter which accompanied the word list. Following the dictation of the warmup letter, which contained between 100 and 110 words and had a syllabic intensity between 1.57 and 1.58, the teachers dictated the new-matter letter. This second letter, dictated at 50 words per minute, contained between 245 and 280 words and had a syllabic intensity between 1.58 and 1.59.

After dictation the students transcribed the new-matter letter for 20 minutes. At the end of the transcription period, all machine shorthand notes and handwritten or typed transcripts were collected. Within three to five class days, the same procedure was followed by the teachers in administering the other word list and set of dictation material. The

administration of each set of instruments required one class period of at least 40 minutes' length; and after completion of both testing periods, all materials were returned by mail for evaluation.

Appendix C contains Word Lists I and II, Dictation Material I and II, teacher instructions, and the accompanying cover letter and consent form. In addition, Appendix D contains two tables which present the selected abbreviations, derivatives, and principles tested; the words used to test each; and the location of those words as categorized by test and test item number.

Selection of Samples

The following part of this chapter describes the procedures used to select teachers and students who provided data for this study.

Teachers to Receive Checklists

Since a comprehensive list of the names and school addresses of machine shorthand teachers was not available, steps were taken to develop a list of names and addresses of schools at which classes of machine shorthand were believed to be taught. The names and addresses of the schools to which checklists were sent were obtained from:

1. a list of 12 schools provided by Mr. Richard Brennan, then Vice President of Marketing at Stenograph;

2. a perusal of Stenograph News (formerly called Nuz Nots), a publication of Stenograph for teachers in business education, word processing, and court reporting;

3. a review of phone books for selected metropolitan areas over 200,000 in population; and

4. a referral by other machine shorthand teachers or by state supervisors of business education.

Based on the list of high schools, vocational schools, community colleges, universities, and private business schools developed, 100 checklists were sent. Of the 54 responses received, 35 provided useable information on the perceived difficulty of selected abbreviations, derivatives, and principles of machine shorthand. Of the 54 responses, however, 19 provided unuseable information because of one or more of the following reasons:

1. The checklist had been incorrectly completed.

2. A system of machine shorthand other than Stenograph was taught at the school.

3. The teacher receiving the checklist was teaching Stenograph machine shorthand for the first time and did not feel equipped to complete the checklist.

4. The teacher receiving the checklist had never taught Stenograph machine shorthand.

Students to Take Word Lists and Dictation Material

Based on information obtained from the short questionnaires which accompanied the checklists, 20 teachers and their students were chosen for possible participation in this study. These teachers and their students were chosen based on whether the Stenograph theory text and dictionary were to be used in machine shorthand classes during the following year when data were to be collected. Teachers at the remaining schools could not participate because some system of shorthand other

than Stenograph was to be taught the next year or because the classes to be taught were so small that the teachers planned to teach them as independent study or orientation courses.

After further questioning of the 20 teachers by phone, 12 of them from 11 schools agreed to participate in the study. Though all 20 of the teachers expressed a desire to participate in the study, 8 were unable to participate because they either could not meet the testing schedule dates or because they had students who would be too far advanced in machine shorthand skill at the time of testing. The 12 classes, from which 544 test papers were obtained, consisted of 152 students who were using the Stenograph theory text and dictionary and who had completed Lesson 68 of the theory text before participating in the study. Sizes of the classes ranged from 3 to 22 students.

Appendix E contains a list of the names and school addresses of the teachers who participated in this study by administering the test instruments to their students.

Evaluation of Accuracy of Machine Shorthand Notes

In evaluating the accuracy of the machine shorthand notes obtained from the administration of the word lists and the new-matter letters, only those forms written for test words illustrating the selected principles under examination were checked for accuracy. In addition, only the forms written for the selected abbreviations and derivatives under examination were checked for accuracy.

The accuracy of the forms written for the selected abbreviations, derivatives, and principles was determined by comparing the forms written

in the students' machine shorthand notes with the theory patterns given in the Stenograph dictionary. In general, any forms in the shorthand notes which disagreed with the theory patterns in the Stenograph dictionary were checked as errors. Some instances did occur, however, when the theory patterns from the dictionary were supplemented or substituted with other accepted forms. These other accepted forms and the justifications for their use are detailed later in this part of the chapter.

Besides determining errors by comparing forms to theory patterns in the Stenograph dictionary, omissions in the machine shorthand notes of any test words were also checked as errors. In addition, all handwritten corrections in the machine shorthand notes were disregarded. Shadowing of letters in the machine shorthand notes was given special consideration, however. Shadowed letters were considered part of the writing of a test word when the shadows were so dark that the keys appeared to have been purposely stroked with more than a very light pressure of the fingers. When a review of a student's notes showed that shadowing of particular letters was characteristic of that student's stroking pattern, however, the shadowed letters were not counted as errors.

Lastly, any questions or conflicts encountered in evaluating the accuracy of the machine shorthand notes obtained from the administration of the word lists and the new-matter letters were resolved in consultation with Ms. Nancy Kerby, Stenograph textbook author and machine shorthand teacher at Maine Township High School, West, in Des Plaines,

Illinois, and Mrs. Helen Petree, machine shorthand teacher at The University of Tennessee in Knoxville.

The remainder of this part of the chapter details specific procedures followed in determining errors in the forms of abbreviations and derivatives and in determining errors in the forms of test words used to illustrate principles.

Errors in Forms of Abbreviations and Derivatives

When evaluating the accuracy of a form written for a test word used to illustrate a selected abbreviation, only that part of the form which illustrated the abbreviation was examined. When evaluating the accuracy of a form written for a selected derivative, however, the entire form written for the derivative was examined. The forms were then judged to be inaccurate if they were not in agreement with the theory patterns shown in the Stenograph dictionary or if they were not in agreement with any of the additional forms deemed acceptable.

The only instance in which other forms were accepted for abbreviations and derivatives was for the test words "when" and "whenever," both of which were used to test the abbreviation "when." Although Stenograph theory specified that "when" should be written as WHE, some students were taught to write WH instead. Therefore, WHEFR and WH-FR were accepted for "when" in "whenever" in Word List I and New-Matter Letter II; and WHE and WH were accepted for "when" in Word List II and New-Matter Letter I.

Errors in Forms of Words Illustrating Principles

When evaluating the accuracy of a form written for a test word used to illustrate a selected principle, only that part of the form

which illustrated the principle was examined. The part of the form representing that principle was then judged to be inaccurate if it was not written in agreement with the theory pattern listed in the Stenograph dictionary or with any of the additional accepted forms permitted for certain test words.

Of the special instances in which additional forms were accepted as correct, several occurred because of the use by some of the students of shorthand machines other than of Stenograph's most recent model. In one instance, some of the students used shorthand machines which had two "S" keys instead of an "S" key and a "Z" key on the right side of the keyboard. In the forms of those test words which required depression of a final "Z," a final "S" was accepted in the notes of these shorthand machines only if the "S" was printed in the fixed print line at the same position where a final "Z" would have been printed. As shown in Figure 2.9 on page 39, therefore, the stroking of the "S" located below "D" was accepted, while the stroking of the "S" below "T" was not accepted.

In another instance, some of the students used shorthand machines which had wider keys for "T," "S," "D," and "Z" on the right side of the keyboard. As the theory which accompanied this type of shorthand machine specified, the simultaneous depression of these four keys was accepted as correct when writing the forms for test words illustrating the principle -H omitted in TH ending, although Stenograph theory applied on Stenograph machines required only the depression of "T."

Table 4.2 shows all test words illustrating principles for which additional forms were accepted because of the use of shorthand machines other than of Stenograph's most recent model.

TABLE 4.2

ALL ACCEPTED FORMS FOR WORDS WRITTEN ON SHORTHAND MACHINES OTHER THAN OF STENOGRAPH'S MOST RECENT MODEL

Test	Test Word[a]	Stenograph Dictionary Form	Other Accepted Form[b]
Word List I	breezes	PWRAOEZ/-Z	PWRAOES/-S (-Z)
New-Matter Letter II	sizes	SAOEUZ/-Z	SAOEUS/-S (-Z)
Word List I	hearth	HART	HARTSDZ
Word List I	slither	SHREUT/ER	SHREUTSDZ/ER
New-Matter Letter II	weather	WET/ER	WETSDZ/ER
New-Matter Letter II	length	HREPBT	HREPBTSDZ

[a]Underlines emphasize principles being tested.

[b]Underlines emphasize differences between Stenograph dictionary theory patterns and other accepted forms.

The final instance in which a form not listed in the Stenograph dictionary was accepted occurred on the test word "amnesty," which was used in New-Matter Letter I to illustrate the principle -T for TY. The Stenograph dictionary specified the form APL/TPHEST for the test word "amnesty." Based on the fixed print line produced by the shorthand machine, however, a final "S" could never be printed to precede a final "T" on the print line. After consultation with Ms. Nancy Kerby and Mrs. Helen Petree, the form APL/TPHES/TEU was therefore accepted as the only possible correct form.

Treatment of Data

The following part of this chapter outlines the procedures followed in treating the data obtained from administration of the checklist, the word lists, and the new-matter letters.

Responses to Checklist Items

After receipt of the checklists, tabulation of the responses for each checklist item, including any additional abbreviations and derivatives written in, was begun. When tabulation of the responses was completed, the totals for all principles were ranked from high to low frequency of response, as were the totals for all abbreviations and derivatives.

To determine the perceived difficulty for each abbreviation, derivative, or principle, the total number of responses for each was divided by the total number of returned checklists which provided useable data. These percentages of perceived difficulty were later correlated with error rates for corresponding abbreviations, derivatives, and principles tested in the machine shorthand notes to obtain a correlation coefficient for abbreviations and derivatives and for principles.

Errors in Machine Shorthand Notes

Before checking and tabulating the errors found in the machine shorthand notes, circles were drawn around the forms written for test words which illustrated those selected abbreviations, derivatives, and principles being examined. When 10 or more of the forms for the first 25 test words of a word list or new-matter letter were omitted from a

student's machine shorthand notes, the entire set of notes was removed from analysis because the set was deemed too poor to provide adequate data.

Of those machine shorthand notes which were retained for analysis, however, that portion of each circled form which represented the abbreviation, derivative, or principle under study was underlined and checked for accuracy. Those circled forms which contained errors were then written in full, as they appeared in the machine shorthand notes, on tally sheets labeled for each test word. In this way, a tally was kept of the total number of times a specific error occurred in the form of a specific test word used to illustrate a selected abbreviation, derivative, or principle on a specific test. No effort was made, however, to categorize errors by school, by teacher, or by student; thus confidentiality was maintained.

After the underlined portions of all circled forms had been checked for accuracy and all errors had been recorded on the appropriate tally sheets, the total number of errors for each test word was tabulated; and the totals were ranked from high to low frequency of occurrence. To obtain an error rate for each abbreviation, derivative, and principle under study, the total number of errors for all the test words illustrating each particular abbreviation, derivative, and principle were first combined. The total number of errors for each abbreviation, derivative, or principle was then divided by the total number of papers retained for analysis in which each selected abbreviation, derivative, or principle was tested. These error rates, which were next ranked from high to low frequency of occurrence, were then correlated with perceived difficulty

for corresponding abbreviations, derivatives, and principles to obtain a correlation coefficient. The Spearman rank-difference correlation was used because the bivariate distribution departed substantially from normality.

To determine what types of errors were made for each abbreviation, derivative, and principle, the errors were analyzed according to the following classifications: (1) substitution, (2) too many theory pattern letters or strokes, (3) too few theory pattern letters or strokes, (4) omission of forms, and (5) other errors.

An error of substitution occurred, for example, when another abbreviation, derivative, or principle was used in place of the one being tested, while an error caused by the omission of a form occurred when the form for the test word was left out of the student's machine shorthand notes. Any error which did not fit into one of the first four categories, though, was classified as an "other error." To prevent an error from being placed in more than one of these classifications, the classifications were also prioritized in the order listed above. An error fitting two classifications, therefore, was placed only in the first of the two classifications.

After all errors for each abbreviation, derivative, and principle had been evaluated on the basis of error type, the number of errors in each error type was tabulated for each abbreviation, derivative, and principle. The number of errors of each type for each abbreviation, derivative, or principle was then divided by the total number of errors for that abbreviation, derivative, or principle to yield a percent of total errors.

To determine what patterns of errors occurred, the tally sheets containing the incorrectly written forms recorded for each test word were analyzed to develop a list of error patterns for each abbreviation, derivative, and principle tested. From this analysis, a tabulation was made of the number of times a form was written in a particular way for each selected abbreviation, derivative, and principle. The number of times an error pattern appeared for each abbreviation, derivative, or principle was then divided by the total number of errors made on that abbreviation, derivative, or principle to yield a percent of total errors. Error patterns for each abbreviation, derivative, and principle were subsequently ranked from high to low frequency of occurrence based on the percentages obtained.

CHAPTER V

RESULTS OF STUDY

This chapter presents an analysis of the data obtained from the administration of the checklist, the word lists, and the new-matter letters. The checklist, which was completed by machine shorthand teachers, provided data on which selected abbreviations, derivatives, and principles teachers perceived to be the most difficult for their students to learn. The word lists and the new-matter letters from the dictation material, all of which were dictated to beginning machine shorthand students, provided data on rates, types, and patterns of errors for the abbreviations, derivatives, and principles selected for testing.

Perceived Difficulty Derived From Checklist Items

As defined in Chapter I, perceived difficulty was the percentage of teachers who perceived each selected abbreviation, derivative, and principle as difficult. In addition, as Chapter IV states, those abbreviations and derivatives which had more than 8 percent of the checklist responses and those principles which had more than 14 percent of the checklist responses were selected for further examination and were tested in the word lists and the new-matter letters.

The following part of this chapter presents those abbreviations, derivatives, and principles which machine shorthand teachers perceived to be the most difficult for their students and which were selected for testing in the machine shorthand notes of beginning machine shorthand students.

Abbreviations and Derivatives

As Table 5.1 shows, usually (31.4 percent), usual (28.6 percent), and enclosure (20.0 percent) had the largest number of responses, thus illustrating the teachers' perceptions that these were the most difficult abbreviations and derivatives of those listed for their students to learn.

Other abbreviations and derivatives which had more than 10 percent, but less than 20 percent, of the responses included couldn't and when (17.1 percent each), gone in phrases (14.3 percent), and that and between (11.4 percent each). Lastly, those abbreviations and derivatives which had more than 8 percent, but less than 10 percent, of the responses included every, go, importance, important, under, upon, use, and were (8.6 percent each).

Because blank space was provided for the machine shorthand teachers to list other abbreviations and derivatives they considered difficult, Table 5.2 shows that about and where (8.6 percent each) were also included in the last grouping of abbreviations and derivatives which had more than 8 percent of the checklist responses.

Principles

As Table 5.3 shows, SM ending (57.1 percent) had the largest number of checklist responses, thus illustrating the teachers' perceptions that this was the most difficult principle of those listed for their students to learn.

Other principles which had more than one-third of the checklist responses included -NGS and long vowels (42.9 percent each); -BGS and

TABLE 5.1

DIFFICULTY OF SELECTED ABBREVIATIONS AND DERIVATIVES AS PERCEIVED BY TEACHERS

Abbreviation or Derivative	Responses[a] No.	Percent	Abbreviation or Derivative	Responses[a] No.	Percent
usually	11	31.4	could	2	5.7
usual	10	28.6	enclose	2	5.7
enclosure	7	20.0	ever	2	5.7
couldn't	6	17.1	going	2	5.7
when	6	17.1	the	2	5.7
gone (in phrases)	5	14.3	there	2	5.7
that	4	11.4	they	2	5.7
between	4	11.4	acknowledge	1	2.9
every	3	8.6	any	1	2.9
go	3	8.6	doctor	1	2.9
importance	3	8.6	doctors	1	2.9
important	3	8.6	enclosed	1	2.9
under	3	8.6	number	1	2.9
upon	3	8.6	with	1	2.9
use	3	8.6	necessary	--	---
were	3	8.6	order	--	---
acknowledgment	2	5.7	regular	--	---
among	2	5.7	yesterday	--	---
consider	2	5.7			
consideration	2	5.7			

[a]Based on responses from 35 useable checklists.

TABLE 5.2

ADDITIONAL ABBREVIATIONS AND DERIVATIVES LISTED BY CHECKLIST RESPONDENTS

Abbreviation or Derivative	Responses[a] No.	Percent	Abbreviation or Derivative	Responses[a] No.	Percent
about	3	8.6	injure	1	2.9
where	3	8.6	into	1	2.9
again	2	5.7	invoice	1	2.9
against	2	5.7	known	1	2.9
even	2	5.7	legal	1	2.9
opportunity	2	5.7	natural	1	2.9
accident	1	2.9	neglect	1	2.9
advantage	1	2.9	notice	1	2.9
advantageous	1	2.9	only	1	2.9
affect	1	2.9	perhaps	1	2.9
always	1	2.9	proceed	1	2.9
also	1	2.9	question	1	2.9
ask	1	2.9	receipt	1	2.9
began	1	2.9	shall	1	2.9
begin	1	2.9	situate	1	2.9
begun	1	2.9	stand	1	2.9
being	1	2.9	subject	1	2.9
children	1	2.9	suggestion	1	2.9
company	1	2.9	this	1	2.9
confidence	1	2.9	unless	1	2.9
confident	1	2.9	until	1	2.9
convenient	1	2.9	unusually	1	2.9
correspond	1	2.9	wasn't	1	2.9
description	1	2.9	what	1	2.9
develop	1	2.9	whe-/whi-[b]	1	2.9
doesn't	1	2.9	whether	1	2.9
effect	1	2.9	why	1	2.9
either	1	2.9	within	1	2.9
finance	1	2.9	yes	1	2.9
financial	1	2.9			
general	1	2.9			
had	1	2.9			
hasn't	1	2.9			
imagine	1	2.9			
include	1	2.9			

[a]Based on responses from 35 useable checklists.

[b]Abbreviations or derivatives having these beginnings.

TABLE 5.3

DIFFICULTY OF SELECTED PRINCIPLES AS PERCEIVED BY TEACHERS

Theory List No.	Principle	Responses[a] No.	Percent
16	-FM for SM ending	20	57.1
55	-NGS for NKSHUN	15	42.9
20	Long vowels	15	42.9
54	-BGS for KSHUN	14	40.0
14-15	-H omitted in TH ending	14	40.0
8	W for silent W in WR beginning	13	37.1
9	WH for WH beginning	13	37.1
30	Y for I or E sounding like Y	13	37.1
13	-T omitted in past tense of KT ending	12	34.3
18-19	Unaccented vowel omitted	12	34.3
52	-GS for SHUN, SHAL, ASHUN	12	34.3
53	-SHS for SHUS	11	31.4
7	-NG for NG, NK, NJ endings	11	31.4
23	AI in words spelled AI	11	31.4
31	K for COM	11	31.4
44-46	-T for ITY	11	31.4
32	KM for COM followed by second M	10	28.6
12	-T for KT ending	9	25.7
42-43	-L for LY	9	25.7
22	Long A for AIR sound	7	20.0
48	-T for TY	7	20.0
49	-FR for FER, FOR, VER, VOR endings	7	20.0
21	AO in words spelled OO	6	17.1
29	I for Y ending	6	17.1
34	INT for INTER/ENT for ENTER	5	14.3
36	SAOUP for SUPER	5	14.3
39	-Z for plural of word ending in Z	5	14.3
10	-T omitted in XT and ST endings	4	11.4
6	Vowel written preceding S or Z ending	3	8.6
11	T for XT or ST in middle of word	3	8.6

TABLE 5.3 (continued)

Theory List No.	Principle	Responses[a] No.	Responses[a] Percent
51	-BLT for BILITY, ABILITY, IBILITY	3	8.6
25-27	AU for AW sound	2	5.7
28	OU for OW sound	2	5.7
35	S for SOME	2	5.7
56	-B for BODY	1	2.9
57-58	-MT for MENT	1	2.9
59	SEF for SELF, SEFS for SELVES	1	2.9
24	OI for OI, OY	--	----
41	-G for ING	--	----
50	-BL for ABLE, IBLE	--	----
60	-G for THING	--	----

[a]Based on responses from 35 useable checklists.

TH ending (40.0 percent each); WR beginning, WH beginning, and Y for I or E (37.1 percent each); and past tense KT ending, unaccented vowel, and -GS (34.3 percent each).

Still other principles which had less than one-third, but more than one-fifth, of the responses were -SHS, -NG, AI words, COM, and ITY (31.4 percent each); COMM (28.6 percent); and KT ending and LY (25.7 percent each). Next, those principles which had one-fifth of the responses were long A for AIR, TY, and -FR (20.0 percent each).

Lastly, those principles which had less than one-fifth of the responses, but more than the 14-percent cutoff for further examination and testing were 00 words and I for Y (17.1 percent each) and INT/ENT, SUPER, and -Z for plural (14.3 percent each).

Error Rates Derived From Machine Shorthand Notes

As defined in Chapter I, the error rate was the percentage of incorrectly written machine shorthand forms for each selected abbreviation, derivative, and principle. The following part of this chapter presents the error rates for all those abbreviations, derivatives, and principles selected for examination based on results of the checklist and utilization of the 8-percent cutoff for abbreviations and derivatives and the 14-percent cutoff for principles.

These error rates were determined by using Appendix D and Appendix F. After first determining from Appendix D which of the 196 test words were used to test each abbreviation, derivative, or principle, error rates for those individual words, as listed in Appendix F, were combined to derive one error rate for each of the 18 abbreviations and derivatives and for each of the 27 principles selected for examination.

The selected principles, in addition, were divided into the categories of general principles, vowel principles, prefix principles, and suffix principles according to the classifications used in the list of Stenograph machine shorthand principles shown in Appendix A. Division into these categories permitted a more detailed analysis of the selected principles, especially those principles which were tested in more than one type of application. An example of one such principle is the general principle of unaccented vowel. This principle was tested with words which applied the principle both within words and within syllables. Error rates were obtained, then, for the principle's usage within words and within syllables so that any difference in error rates for the two types of applications would be shown. An overall error rate was also obtained for comparing error rates among all 27 selected principles.

Abbreviations and Derivatives

The error rates for the 18 abbreviations and derivatives tested ranged from 73.3 percent for enclosure to 11.1 percent for about, as Table 5.4 shows. In addition, the only other abbreviation or derivative which had errors for more than one-half of the responses was usually (57.1 percent).

Nine of the abbreviations and derivatives had error rates between 40 percent and 20 percent. These abbreviations and derivatives included where (36.5 percent), couldn't (36.1 percent), between (30.2 percent), importance (27.8 percent), gone (25.8 percent), usual (23.9 percent), upon (21.6 percent), under (21.1 percent), and when (20.9 percent). The remaining seven abbreviations and derivatives, however, had errors for less than 20 percent of the responses.

TABLE 5.4

ERROR RATES FOR SELECTED ABBREVIATIONS AND DERIVATIVES

Abbreviation or Derivative	No. of Responses	Errors	
		No.	Percent
enclosure	255	187	73.3
usually	252	144	57.1
where	507	185	36.5
couldn't	252	91	36.1
between	255	77	30.2
importance	252	70	27.8
gone	252	65	25.8
usual	255	61	23.9
upon	255	55	21.6
under	507	107	21.1
when	507	106	20.9
go	255	45	17.7
use	507	74	14.6
important	507	69	13.6
were	252	34	13.5
that	255	32	12.6
every	507	63	12.4
about	252	28	11.1

Source: Appendix F error rates for individual test words were combined for each selected abbreviation and derivative, as shown in Appendix D. For example, enclosure, which was tested twice (83 errors and 104 errors), incurred 187 errors out of 255 responses, thus yielding an overall error rate of 73.3 percent.

Principles

In analyzing the 27 principles selected for testing, Table 5.5 shows the error rates ranged from 77.4 percent for past tense KT ending to 12.9 percent for long vowels. -SHS had the second highest error rate of 70.0 percent. The eight principles with error rates less than 70 percent, but more than 50 percent, included INT/ENT (66.1 percent), SM ending (65.9 percent), COMM (62.3 percent), SUPER (59.9 percent), AI words (58.4 percent), Y for I or E (58.3 percent), COM (53.7 percent), and ITY (53.2 percent).

Table 5.5 also shows that ten principles had errors for between one-half and one-third of the responses. These ten principles included long A for AIR (48.4 percent), -Z for plural (47.8 percent), -NGS (46.0 percent), WR beginning (45.9 percent), TY (44.1 percent), unaccented vowel (43.9 percent), -GS (42.7 percent), LY (41.5 percent), -BGS (38.8 percent), and -FR (35.3 percent). The remaining seven principles tested had errors for less than one-third of the responses.

General principles. In more in-depth analysis by category of the 27 selected principles, Table 5.6 shows that the range for the eight principles in the general principles category extended from 77.4 percent for past tense KT ending to 22.4 percent for KT ending. SM ending had the second highest error rate in this category with 65.9 percent. The remaining five general principles had error rates of less than 50 percent but greater than 25 percent.

In studying those general principles which were tested in more than one type of application, Table 5.6 also shows that, for unaccented vowel, within word (42.3 percent) and within syllable (45.4 percent)

TABLE 5.5

ERROR RATES FOR ALL SELECTED PRINCIPLES

Principle	No. of Responses	Errors	
		No.	Percent
-T omitted in past tense of KT ending	252	195	77.4
-SHS for SHUS	504	353	70.0
INT for INTER/ENT for ENTER	510	337	66.1
-FM for SM ending	252	166	65.9
KM for COM followed by second M	252	157	62.3
SAOUP for SUPER	252	151	59.9
AI in words spelled AI	255	149	58.4
Y for I or E sounding like Y	1014	591	58.3
K for COM	255	137	53.7
-T for ITY	1521	809	53.2
Long A for AIR sound	252	122	48.4
-Z for plural of word ending in Z	255	122	47.8
-NGS for NKSHUN	252	116	46.0
W for silent W in WR beginning	255	117	45.9
-T for TY	762	336	44.1
Unaccented vowel omitted	996	437	43.9
-GS for SHUN, SHAL, ASHUN	1521	649	42.7
-L for LY	1014	421	41.5
-BGS for KSHUN	255	99	38.8
-FR for FER, FOR, VER, VOR endings	2028	716	35.3
-NG for NG, NK, NJ endings	1521	488	32.1
AO in words spelled OO	255	76	29.8
-H omitted in TH ending	510	144	28.2
WH for WH beginning	504	130	25.8
-T for KT ending	255	57	22.4
I for Y ending	522	106	20.3
Long vowels	2535	328	12.9

Source: Appendix F error rates for individual test words were combined for each selected principle, as shown in Appendix D. For example, -T omitted in past tense of KT ending, which was tested using the words "addicted" (83 errors) and "collected" (112 errors), incurred 195 errors out of 252 responses, thus yielding an overall error rate of 77.4 percent.

TABLE 5.6

ERROR RATES FOR GENERAL PRINCIPLES

General Principle	No. of Responses	Errors	
		No.	Percent
-T omitted in past tense of KT ending	252	195	77.4
-FM for SM ending	252	166	65.9
W for silent W in WR beginning	255	117	45.9
Unaccented vowel omitted	996	437	43.9
Within word	(489)	(207)	(42.3)
Within syllable	(507)	(230)	(45.4)
-NG for NG, NK, NJ endings	1521	488	32.1
NG	(507)	(172)	(33.9)
NK	(507)	(169)	(33.3)
NJ	(507)	(147)	(29.0)
-H omitted in TH ending	510	144	28.2
Word ending	(255)	(50)	(19.6)
Syllable ending	(255)	(94)	(36.9)
WH for WH beginning	504	130	25.8
Usage	(252)	(92)	(36.5)
Exception	(252)	(38)	(15.1)
-T for KT ending	255	57	22.4

Source: Appendix F error rates for individual test words were combined for each selected principle, as shown in Appendix D. For example, -T omitted in past tense of KT ending, which was tested using the words "addicted" (83 errors) and "collected" (112 errors), incurred 195 errors out of 252 responses, thus yielding an overall error rate of 77.4 percent.

had similar error rates, thus indicating that students made an almost equal number of errors in applying the parts of the principle.

In applying TH ending as a word ending (19.6 percent) and as a syllable ending (36.9 percent), however, the students made almost twice as many errors when applying the principle as a syllable ending. In addition, usage (36.5 percent) for WH beginning had an error rate almost 1½ times the error rate when WH beginning was tested as an exception (15.1 percent).

Vowel principles. The six vowel principles ranged in error rates from 58.4 percent for AI words and 58.3 percent for Y for I or E to 12.9 percent for long vowels, as shown in Table 5.7. The remaining four vowel principles had errors for between one-half and one-fifth of the responses.

In analyzing the breakdown of appropriate principles, Y for I or E had similar error rates when tested for I (58.7 percent) and for E (57.7 percent). I for Y, however, had an error rate when tested as a short I (17.4 percent) that was smaller than the error rate when tested as a long I (23.4 percent). Long vowels, which were also broken down, showed that A (8.5 percent) had the lowest error rate of the five vowels. O (16.2 percent) and U (17.8 percent), however, had error rates close to two times larger than the error rate for A.

Prefix principles. Of the four prefix principles listed in Table 5.8, INT/ENT (66.1 percent) had the highest error rate, while COM (53.7 percent) had the lowest error rate. Also, for INT/ENT, INT (72.2 percent) had a higher error rate than ENT (60.0 percent).

TABLE 5.7

ERROR RATES FOR VOWEL PRINCIPLES

Vowel Principle	No. of Responses	Errors	
		No.	Percent
AI in words spelled AI	255	149	58.4
Y for I or E sounding like Y	1014	591	58.3
I	(617)	(362)	(58.7)
E	(397)	(229)	(57.7)
Long A for AIR sound	252	122	48.4
AO in words spelled OO	255	76	29.8
I for Y ending	522	106	20.3
Short I	(270)	(47)	(17.4)
Long I	(252)	(59)	(23.4)
Long vowels	2535	328	12.9
A	(507)	(43)	(8.5)
E	(507)	(51)	(10.1)
I	(507)	(62)	(12.2)
O	(507)	(82)	(16.2)
U	(507)	(90)	(17.8)

Source: Appendix F error rates for individual test words were combined for each selected principle, as shown in Appendix D. For example, AI words, which was tested using the words "captain" (81 errors) and "curtain" (68 errors), incurred 149 errors out of 255 responses, thus yielding an overall error rate of 58.4 percent.

TABLE 5.8

ERROR RATES FOR PREFIX PRINCIPLES

Prefix Principle	No. of Responses	Errors	
		No.	Percent
INT for INTER/ENT for ENTER	510	337	66.1
INT	(255)	(184)	(72.2)
ENT	(255)	(153)	(60.0)
KM for COM followed by second M	252	157	62.3
SAOUP for SUPER	252	151	59.9
K for COM	255	137	53.7

Source: Appendix F error rates for individual test words were combined for each selected principle, as shown in Appendix D. For example, INT/ENT, which was tested using the words "enterprise" (73 errors), "enterprising" (80 errors), "interlope" (82 errors), and "interpret" (102 errors), incurred 337 errors out of 510 responses, thus. yielding an overall error rate of 66.1 percent.

Suffix principles. As shown in Table 5.9, -SHS (70.0 percent) had the highest error rate, while -FR (35.3 percent) had the lowest error rate of the nine suffix principles. In addition, five of the remaining principles had error rates between 50 percent and 40 percent.

In analyzing the appropriate principles, saves stroke had higher error rates than adds stroke for -SHS (87.3 percent compared to 52.8 percent), ITY (57.4 percent compared to 44.2 percent), and LY (68.2 percent compared to 14.8 percent), although TY (45.6 percent compared to 42.6 percent) had similar error rates. For -GS, SHAL (61.3 percent) had an error rate almost one-half times larger than SHUN (38.3 percent) and two times larger than ASHUN (28.4 percent). Lastly, the error rate

TABLE 5.9

ERROR RATES FOR SUFFIX PRINCIPLES

Suffix Principle	No. of Responses	Errors	
		No.	Percent
-SHS for SHUS	504	353	70.0
Saves stroke	(252)	(220)	(87.3)
Adds stroke	(252)	(133)	(52.8)
-T for ITY	1521	809	53.2
Saves stroke	(507)	(291)	(57.4)
Adds stroke	(507)	(224)	(44.2)
Adds stroke with consonant	(507)	(294)	(58.0)
-Z for plural of word ending in Z	255	122	47.8
-NGS for NKSHUN	252	116	46.0
-T for TY	762	336	44.1
Saves stroke	(382)	(174)	(45.6)
Adds stroke	(380)	(162)	(42.6)
-GS for SHUN, SHAL, ASHUN	1521	649	42.7
SHUN	(507)	(194)	(38.3)
SHAL	(507)	(311)	(61.3)
ASHUN	(507)	(144)	(28.4)
-L for LY	1014	421	41.5
Saves stroke	(507)	(346)	(68.2)
Adds stroke	(507)	(75)	(14.8)
-BGS for KSHUN	255	99	38.8
-FR for FER, FOR, VER, VOR endings	2028	716	35.3
Usage	(1014)	(484)	(47.7)
Exception	(1014)	(232)	(22.9)

Source: Appendix F error rates for individual test words were combined for each selected principle, as shown in Appendix D. For example, -SHS, which was tested using the words "anxious" (75 errors), "facetious" (111 errors), "judicious" (109 errors), and "scrumptious" (58 errors), incurred 353 errors out of 504 responses, thus yielding an overall error rate of 70.0 percent.

for usage (47.7 percent) of -FR was more than two times larger than the error rate for exception (22.3 percent) to the principle.

Overall Comparisons

A calculation of the total number of errors divided by the total number of responses for all selected abbreviations and derivatives and for all selected principles showed that 40.0 percent of the total responses on the principles were errors as compared to 24.5 percent of the total responses on the abbreviations and derivatives. In comparing the percentages of total errors to total responses for the four categories of selected principles, the highest percentage was incurred by prefix principles, with 61.6 percent of the total responses being errors. Suffix principles had the next highest percentage of 44.6 percent, followed by 38.2 percent for general principles and 28.4 percent for vowel principles.

In addition, a calculation of the total number of errors divided by the total number of responses for abbreviations, derivatives, and principles tested showed that 45.9 percent of the total responses on abbreviations, derivatives, and principles tested in the new-matter letters were errors. On abbreviations, derivatives, and principles tested in the word lists, however, only 34.9 percent of the total responses were errors.

Comparison of Error Rates With Perceived Difficulty

Based on error rates derived from the word lists and the new-matter letters and perceived difficulty derived from the checklist, a comparison was made of the percentages for each of the abbreviations, derivatives, and principles selected for examination in this study.

In comparing error rates with perceived difficulty for the abbreviations and derivatives, a Spearman rank-difference correlation of .588, significant at the .02 level,[1] was obtained. This correlation represented a substantial or marked relationship between the writing errors made by the students and the perceptions of difficulty held by the teachers.

As Table 5.10 shows, enclosure had the highest error rate (73.3 percent) and the third highest perceived difficulty (20.0 percent). Usually had the next highest error rate (57.1 percent) and the highest perceived difficulty (31.4 percent). Usual, however, had the eighth highest error rate (23.9 percent) but the second highest perceived difficulty (28.6 percent). Couldn't, between, and gone had error rates ranked fourth (36.1 percent), fifth (30.2 percent), and seventh (25.8 percent) highest and perceived difficulty ranked fourth (17.1 percent), sixth (11.4 percent), and fifth (14.3 percent) highest, respectively.

Where and importance, however, had error rates ranked third (36.5 percent) and fifth (27.8 percent) highest, while both had the same perceived difficulty (8.6 percent), which was ranked lowest. In reverse, when and go had error rates ranked eleventh (20.9 percent) and twelfth (12.6 percent) highest although their perceived difficulty ranked fourth (17.1 percent) and seventh (8.6 percent) highest.

In comparing error rates with perceived difficulty for the principles, a Spearman rank-difference correlation of .074, insignificant at

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[1] J. P. Guilford and Benjamin Fruchter, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill, 1978), p. 525.

TABLE 5.10

COMPARISON[a] OF ERROR RATES WITH TEACHERS' PERCEPTIONS OF DIFFICULTY FOR SELECTED ABBREVIATIONS AND DERIVATIVES

Abbreviation or Derivative	Error Rate	Perceived Difficulty
enclosure	73.3	20.0
usually	57.1	31.4
where	36.5	8.6
couldn't	36.1	17.1
between	30.2	11.4
importance	27.8	8.6
gone	25.8	14.3
usual	23.9	28.6
upon	21.6	8.6
under	21.1	8.6
when	20.9	17.1
go	17.7	8.6
use	14.6	8.6
important	13.6	8.6
were	13.5	8.6
that	12.6	11.4
every	12.4	8.6
about	11.1	8.6

[a]Rho = .588, significant at the .02 level.

the .02 and .01 levels,[2] was obtained. This correlation represented a negligible relationship between writing errors made by the students and the perceptions of difficulty held by the teachers.

Table 5.11 shows, for example, that past tense KT ending and -SHS had the first (77.4 percent) and second (70.0 percent) highest error rates but only the fifth (34.3 percent) and sixth (31.4 percent) highest perceived difficulty. INT/ENT had the third (66.1 percent) highest error rate but the lowest (14.3 percent) perceived difficulty. Long vowels, which had the lowest error rate (12.9 percent), however, had the second (42.9 percent) highest perceived difficulty. -NGS also had the second highest perceived difficulty (42.9 percent) but only the median error rate (46.0 percent). -BGS and TH ending, though both had the third highest perceived difficulty (40.0 percent), had error rates (38.8 percent and 28.2 percent, respectively) below the median error rate. SM ending, in contrast to the previous examples, had the highest perceived difficulty (57.1 percent) and the fourth highest error rate (65.9 percent).

Error Types Found in Machine Shorthand Notes

To determine the types of errors made in the machine shorthand notes of beginning machine shorthand students, the errors were classified and placed in the following order of priority: substitution, too

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[2] Ibid.

TABLE 5.11

COMPARISON[a] OF ERROR RATES WITH TEACHERS' PERCEPTIONS OF DIFFICULTY FOR SELECTED PRINCIPLES

Principle	Error Rate	Perceived Difficulty
-T omitted in past tense of KT ending	77.4	34.3
-SHS for SHUS	70.0	31.4
INT for INTER/ENT for ENTER	66.1	14.3
-FM for SM ending	65.9	57.1
KM for COM followed by second M	62.3	28.6
SAOUP for SUPER	59.9	14.3
AI in words spelled AI	58.4	31.4
Y for I or E sounding like Y	58.3	37.1
K for COM	53.7	31.4
-T for ITY	53.2	31.4
Long A for AIR sound	48.4	20.0
-Z for plural of word ending in Z	47.8	14.3
-NGS for NKSHUN	46.0	42.9
W for silent W in WR beginning	45.9	37.1
-T for TY	44.1	20.0
Unaccented vowel omitted	43.9	34.3
-GS for SHUN, SHAL, ASHUN	42.7	34.3
-L for LY	41.5	25.7
-BGS for KSHUN	38.8	40.0
-FR for FER, FOR, VER, VOR endings	35.3	20.0
-NG for NG, NK, NJ endings	32.1	31.4
AO in words spelled OO	29.8	17.1
-H omitted in TH ending	28.2	40.0
WH for WH beginning	25.8	37.1
-T for KT ending	22.4	25.7
I for Y ending	20.3	17.1
Long vowels	12.9	42.9

[a]Rho = -.074, insignificant at the .02 and .01 levels.

many theory pattern letters or strokes, too few theory pattern letters or strokes, omission, or other errors.

Substitution errors occurred, for example, when another abbreviation, derivative, or principle was used in place of the one being tested (-GS instead of -BGS). Errors of too many theory pattern letters or strokes occurred when more theory pattern letters in one stroke were used than were specified in the Stenograph dictionary (SUP/ER instead of SAOUP) or when the same number of theory pattern letters were used in more than the required number of strokes (-N/G instead of -NG). Conversely, too few theory pattern letters or strokes occurred when too few theory pattern letters were used in one stroke than were specified in the Stenograph dictionary (-T instead of TI) or when the same number of theory pattern letters were used in fewer than the required number of strokes (KLOUR instead of KLO/AOUR). Omissions occurred, however, only when the forms for test words were omitted from the machine shorthand notes, while "other errors" occurred as a result of misstrokes (KH instead of WH) or as a result of the tested principle being omitted from the test word (IN/TEG instead of IN/TEG/RIT, with RIT being tested).

The following part of this chapter presents the types of errors incurred for each of the abbreviations, derivatives, and principles selected for examination in this study.

Abbreviations and Derivatives

Errors classified as too many letters or strokes accounted for more than 70 percent of the errors made in usually (75.0 percent), gone (73.9 percent), and go (86.7 percent), as shown in Table 5.12.

TABLE 5.12

TYPES OF ERRORS ON ABBREVIATIONS AND DERIVATIVES[a]

Abbreviation or Derivative and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
enclosure	187			---	33.2	55.1	1.1	10.7
usually	144			10.4	75.0	10.4	3.5	.7
where	185			46.5	25.4	.5	18.4	9.2
where		33	17.8	30.3	60.6	---	---	9.1
wherein		46	24.9	58.7	34.8	---	---	6.5
whereby		63	34.1	39.7	9.5	---	41.3	9.5
wherever		43	23.2	55.8	11.6	2.3	18.6	11.6
couldn't	91			---	53.9	22.0	4.4	19.8
between	77			23.4	27.3	24.7	14.3	10.4
importance	70			8.6	50.0	25.7	5.7	10.0
gone	65			12.3	73.9	---	13.9	---
usual	61			---	45.9	34.4	8.2	11.5
upon	55			---	58.2	20.0	9.1	12.7
under	107			---	30.8	43.0	15.0	11.2
under		54	50.5	---	33.3	38.9	18.5	9.3
understand		53	49.5	---	28.3	47.2	11.3	13.2

TABLE 5.12 (continued)

Abbreviation or Derivative and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
when	106			20.8	45.3	5.7	15.1	13.2
when		56	52.8	10.7	46.4	3.6	21.4	17.9
whenever		50	47.2	32.0	44.0	8.0	8.0	8.0
go	45			---	86.7	4.4	2.2	6.7
use	74			1.4	4.1	66.2	21.6	6.8
use		6	8.1	---	---	83.3	---	16.7
useful		14	18.9	---	---	92.9	---	7.1
used		41	55.4	---	4.9	68.3	22.0	4.9
useless		13	17.6	7.7	7.7	23.1	53.9	7.7
important	69			2.9	40.6	18.8	11.6	26.1
important		35	50.7	2.9	37.1	25.7	2.9	31.4
importantly		15	21.7	---	60.0	26.7	---	13.3
unimportant		19	27.5	5.3	31.6	---	36.8	26.3
were	34			32.4	44.1	2.9	17.7	2.9
that	32			---	65.6	15.6	18.8	---
every	63			---	44.4	1.6	39.7	14.3
every		31	49.2	---	45.2	3.2	41.9	9.7
everyone		32	50.8	---	43.8	---	37.5	18.8
about	28			7.1	53.6	---	21.4	17.9

[a]Order of presentation based on Table 5.4.

Errors in this same classification also accounted for between 70 percent and 50 percent of the errors in couldn't (53.9 percent), importance (50.0 percent), upon (58.2 percent), that (65.6 percent), and about (53.6 percent).

Errors classified as too few letters or strokes accounted for more than half of the errors in enclosure (55.1 percent) and use (66.2 percent), while substitution errors accounted for most of the errors in where (46.5 percent). Every was the abbreviation or derivative most often omitted from the students' machine shorthand notes (39.7 percent), although most of the errors for every were classified as too many letters or strokes (44.4 percent). Lastly, important was the abbreviation or derivative which most often had errors classified as other errors (26.1 percent), although most of the errors for important were also classified as errors of too many letters or strokes (40.6 percent).

Principles

To provide a more critical analysis of the error types for the principles, the principles were again divided into the categories of general principles, vowel principles, prefix principles, and suffix principles.

General principles. As shown in Table 5.13, the largest percentage of errors made on general principles for substitution was made on unaccented vowel (84.2 percent). For the error type too many letters or strokes, the highest percentage of errors was made on past tense KT ending (71.8 percent) and -NG (61.7 percent). For too few letters or strokes, however, the highest percentages of errors were made on WR

TABLE 5.13

TYPES OF ERRORS ON GENERAL PRINCIPLES[a]

General Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
-T omitted in past tense of KT ending	195			6.7	71.8	10.3	10.3	1.0
collected		112	57.4	7.1	59.8	15.2	17.9	---
addicted		83	42.6	6.0	88.0	3.6	---	2.4
-FM for SM ending	166			4.2	49.4	31.3	8.4	6.6
capitalism		92	55.4	6.5	32.6	38.0	15.2	7.6
truism		74	44.6	1.4	70.3	23.0	---	5.4
W for silent W in WR beginning	117			---	---	95.7	.9	3.4
wring		70	59.8	---	---	100.0	---	---
wreck		47	40.2	---	---	89.4	2.1	8.5
Unaccented vowel omitted	437			84.2	---	---	7.3	8.5
deputy		95	21.7	77.9	---	---	11.6	10.5
anxiety		28	6.4	92.9	---	---	---	7.1
pioneer		31	7.1	100.0	---	---	---	---
digital		53	12.1	73.6	---	---	24.5	1.9
bowel		23	5.3	87.0	---	---	---	13.0
funnel		106	24.3	81.1	---	---	1.9	17.0
flannel		71	16.3	98.6	---	---	---	1.4
tower		30	6.9	73.3	---	---	20.0	6.7

TABLE 5.13 (continued)

General Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
-NG for NG, NK, NJ endings	488			---	61.7	24.4	12.3	1.6
mangle		44	9.0	---	84.1	15.9	---	---
hangar		46	9.4	---	26.1	37.0	37.0	---
dangle		25	5.1	---	76.0	24.0	---	---
lingo		57	11.7	---	68.4	14.0	17.5	---
canker		71	14.6	---	74.7	23.9	---	1.4
link		36	7.4	---	13.9	55.6	27.8	2.8
trunk		31	6.4	---	22.6	58.1	19.4	---
ankle		31	6.4	---	80.7	19.4	---	---
singe		44	9.0	---	88.6	6.8	---	4.6
hinge		31	6.4	---	35.5	22.6	32.3	9.7
revenge		28	5.7	---	67.9	17.9	---	14.3
dingy		44	9.0	---	79.6	11.4	6.8	2.3
-H omitted in TH ending	144			30.6	22.2	---	16.7	30.6
hearth		8	5.6	---	75.0	---	---	25.0
length		42	29.2	---	2.4	---	23.8	73.8
weather		64	44.4	54.7	10.9	---	21.9	12.5
slither		30	20.8	30.0	60.0	---	---	10.0
WH for WH beginning	130			13.9	17.7	50.8	12.3	5.4
white		40	30.8	45.0	2.5	32.5	5.0	15.0
whiskey		52	40.0	---	---	98.1	---	1.9
why		22	16.9	---	27.3	9.1	63.6	---
which		16	12.3	---	100.0	---	---	---

TABLE 5.13 (continued)

General Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
-T for KT ending	57			12.3	5.3	63.2	17.5	1.8
elect		29	50.9	3.5	6.9	86.2	---	3.5
react		28	49.1	21.4	3.6	39.3	35.7	---

[a]Order of presentation based on Table 5.6.

beginning (95.7 percent), WH beginning (50.8 percent), and KT ending (63.2 percent). KT ending also had the highest percentage of omissions of forms from machine shorthand notes (17.5 percent), although most of the errors for that principle were made as errors of too few letters or strokes. Finally, TH ending had the highest percentage among the general principles for other errors (30.6 percent), although an equal percentage of errors for that principle occurred as substitution errors (30.6 percent).

Vowel principles. As shown in Table 5.14, over 60 percent to over 95 percent of the errors for each vowel principle were classified as errors of substitution. The highest percentage of substitution errors, for example, was incurred by long A for AIR (95.9 percent) and OO words (92.1 percent), with the lowest percentage of substitution errors incurred by AI words (62.4 percent). In addition, 15 of the 38 words used to test all of the vowel principles had only substitution errors.

No errors of too many letters or strokes were incurred by any of the vowel principles, and errors of too few letters or strokes were incurred by only AI words (26.2 percent) and Y for I or E (.5 percent). For other errors, only Y for I or E (3.9 percent) and I for Y (17.9 percent) had errors of this type. Lastly, omitted forms occurred most frequently for long vowels (14.9 percent).

Prefix principles. As shown in Table 5.15, almost 70 percent to almost 95 percent of the errors for each prefix principle were classified as errors of too many letters or strokes. The highest percentage of errors for that classification, for example, was incurred by COM

TABLE 5.14

TYPES OF ERRORS ON VOWEL PRINCIPLES[a]

Vowel Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
AI in words spelled AI	149			62.4	---	26.2	11.4	---
curtain		68	45.6	98.5	---	1.5	---	---
captain		81	54.4	32.1	---	46.9	21.0	---
Y for I or E sounding like Y	591			89.7	---	.5	5.9	3.9
burial		82	13.9	100.0	---	---	---	---
salient		81	13.7	79.0	---	---	17.3	3.7
chariot		67	11.3	97.0	---	---	---	3.0
menial		56	9.5	89.3	---	1.8	1.8	7.1
alien		76	12.9	80.3	---	---	13.2	6.6
cereal		81	13.7	97.5	---	1.2	---	1.2
linear		79	13.4	78.5	---	---	12.7	8.9
cornea		69	11.7	97.1	---	1.5	---	1.5
Long A for AIR sound	122			95.9	---	---	4.1	---
tariff		91	74.6	94.5	---	---	5.5	---
swear		31	25.4	100.0	---	---	---	---
AO in words spelled OO	76			92.1	---	---	7.9	---
schooner		47	61.8	100.0	---	---	---	---
rookie		29	38.2	79.3	---	---	20.7	---

TABLE 5.14 (continued)

Vowel Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
I for Y ending	106			79.3	---	---	2.8	17.9
oratory		22	20.8	54.6	---	---	---	45.5
felony		25	23.6	64.0	---	---	8.0	28.0
verify		55	51.9	94.6	---	---	1.8	3.6
wry		4	3.8	100.0	---	---	---	---
Long vowels	328			85.1	---	---	14.9	---
lame		10	3.1	100.0	---	---	---	---
dray		9	2.7	55.6	---	---	44.4	---
bate		3	.9	100.0	---	---	---	---
brace		21	6.4	81.0	---	---	19.1	---
plead		13	4.0	100.0	---	---	---	---
dean		14	4.3	92.9	---	---	7.1	---
pleat		6	1.8	100.0	---	---	---	---
breach		18	5.5	55.6	---	---	44.4	---
pines		15	4.6	100.0	---	---	---	---
bribe		30	9.2	70.0	---	---	30.0	---
dire		9	2.7	100.0	---	---	---	---
pike		8	2.4	100.0	---	---	---	---
oak		14	4.3	100.0	---	---	---	---
vote		21	6.4	85.7	---	---	14.3	---
sole		24	7.3	100.0	---	---	---	---
local		23	7.0	73.9	---	---	26.1	---
hue		6	1.8	100.0	---	---	---	---
pupil		39	11.9	94.9	---	---	5.1	---
futile		20	6.1	100.0	---	---	---	---
cue		25	7.6	52.0	---	---	48.0	---

[a]Order of presentation based on Table 5.7.

TABLE 5.15

TYPES OF ERRORS ON PREFIX PRINCIPLES[a]

Prefix Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
INT for INTER/ ENT for ENTER	337			10.7	69.7	7.7	9.2	2.7
interlope		82	24.3	9.8	80.5	9.8	---	---
interpret		102	30.3	2.0	84.3	2.0	11.8	---
enterprise		73	21.7	9.6	41.1	17.8	26.0	5.5
enterprising		80	23.7	23.8	66.3	3.8	---	6.3
KM for COM followed by second M	157			---	74.5	3.8	19.8	1.9
commerce		93	59.2	---	61.3	2.2	33.3	3.2
commune		64	40.8	---	93.8	6.3	---	---
SAOUP for SUPER	151			8.6	78.8	5.3	.7	6.6
supersede		61	40.4	13.1	72.1	1.6	1.6	11.5
superlative		90	59.6	5.6	83.3	7.8	---	3.3
K for COM	137			---	93.4	---	5.1	1.5
composite		87	63.5	---	98.9	---	---	1.2
compile		50	36.5	---	84.0	---	14.0	2.0

[a]Order of presentation based on Table 5.8.

(93.4 percent), with INT/ENT (69.7 percent) having had the lowest percentage of that type of error.

For the classification of two few letters or strokes, each of the prefix principles had less than 10 percent of that type of error, with COM having had no errors of that type. For substitution errors, COMM and COM had no errors, while INT/ENT (10.7 percent) and SUPER (8.6 percent) had only about 10 percent as substitution errors. Furthermore, the largest percentage of omission errors was incurred by COMM (19.8 percent; and the largest percentage of other errors was incurred by SUPER (6.6 percent).

Suffix principles. As shown in Table 5.16, between 50 percent and 75 percent of the errors for six of the nine suffix principles were classified as errors of too many letters or strokes. For errors of this type, LY (73.4 percent) and -BGS (73.7 percent) had the highest percentages, while -SHS (36.3 percent) and -Z for plural (23.0 percent) had the lowest percentages.

For errors of substitution, percentages ranged from about 5 percent to almost 50 percent. In this error classification, -SHS (45.9 percent) and -Z for plural (46.7 percent) had the highest percentages, while LY (4.5 percent) had the lowest percentage of substitution errors.

The suffix principle with the highest percentage of errors classified as too few letters or strokes was -Z for plural (18.9 percent). The remaining eight suffix principles, however, had percentages of under 15 percent for errors of this type. Percentages under 15 percent were also incurred by all nine of the suffix principles for omission errors,

TABLE 5.16

TYPES OF ERRORS ON SUFFIX PRINCIPLES[a]

Suffix Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
-SHS for SHUS	353			45.9	36.3	8.2	3.7	6.0
judicious		109	30.9	44.0	45.9	---	5.5	4.6
facetious		111	31.4	34.2	63.1	---	---	2.7
anxious		75	21.3	48.0	10.7	21.3	9.3	10.7
scrumptious		58	16.4	69.0	---	22.4	---	8.6
-T for ITY	809			16.1	52.4	10.9	11.4	9.3
vanity		82	10.1	---	97.6	---	---	2.4
parity		105	13.0	---	61.0	---	35.2	3.8
rarity		45	5.6	2.2	97.8	---	---	---
clarity		59	7.3	---	67.8	---	27.1	5.1
mendacity		49	6.1	42.9	22.5	24.5	---	10.2
tenacity		64	7.9	32.8	15.6	12.5	17.2	21.9
heredity		58	7.2	56.9	17.2	17.2	---	8.6
humidity		53	6.6	24.5	1.9	22.6	17.0	34.0
entity		74	9.2	8.1	83.8	8.1	---	---
mediocrity		92	11.4	29.4	48.9	17.4	---	4.4
integrity		67	8.3	9.0	37.3	16.4	16.4	20.9
varsity		61	7.5	3.3	52.5	21.3	13.1	9.8
-T for TY	336			15.8	60.1	13.1	5.4	5.7
admiralty		52	15.5	---	96.2	---	---	3.9
cruelty		54	16.1	1.9	90.7	---	---	7.4
frailty		68	20.2	4.4	82.4	---	10.3	2.9
amnesty		44	13.1	54.6	---	25.0	4.6	15.9
dynasty		51	15.2	45.1	11.8	41.2	---	2.0
county		67	19.9	3.0	61.2	17.9	13.4	4.5

TABLE 5.16 (continued)

Suffix Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
-Z for plural of word ending in Z	122			46.7	23.0	18.9	9.8	1.6
breezes		66	54.1	54.6	34.9	9.0	---	1.5
sizes		56	45.9	37.5	8.9	30.4	21.4	1.8
-NGS for NKSHUN	116			13.8	69.0	6.9	2.6	7.8
injunction		59	50.9	15.3	57.6	13.6	5.1	8.5
extinction		57	49.1	12.3	80.7	---	---	7.0
-GS for SHUN, SHAL, ASHUN	649			40.2	44.4	---	7.7	7.7
delusion		38	5.9	50.0	44.7	---	---	5.3
tension		63	9.7	33.3	38.1	---	20.6	7.9
percussion		50	7.7	26.0	74.0	---	---	---
prevention		43	6.6	53.5	14.0	---	18.6	14.0
sacrificial		79	12.2	45.6	49.4	---	---	5.1
palatial		71	10.9	23.9	38.0	---	18.3	19.7
martial		102	15.7	10.8	86.3	---	---	2.9
judicial		59	9.1	40.7	54.2	---	1.7	3.4
sedation		34	5.2	61.8	35.3	---	---	2.9
defamation		52	8.0	61.5	3.9	---	21.2	13.5
intonation		29	4.5	93.1	6.9	---	---	---
fascination		29	4.5	58.6	6.9	---	13.8	20.7
-L for LY	421			4.5	73.4	3.8	12.6	5.7
barely		83	19.7	---	96.4	---	---	3.6
hourly		85	20.2	---	83.5	---	14.1	2.4
leisurely		94	22.3	2.1	96.8	---	---	1.1
chiefly		84	20.0	3.6	71.4	---	17.9	7.1

TABLE 5.16 (continued)

Suffix Principle and Test Words	Total Errors	Errors Per Test Word		Percent of Errors by Type				
		No.	Percent	Substitution	Too Many Letters or Strokes	Too Few Letters or Strokes	Omission of Test Word	Other Errors
prickly		11	2.6	54.6	---	27.3	---	18.2
easily		27	6.4	3.7	7.4	29.6	37.0	22.2
homely		7	1.7	42.9	14.3	28.6	---	14.3
speedily		30	7.1	13.3	13.3	10.0	53.3	10.0
-BGS for KSHUN	99			13.1	73.7	4.0	4.0	5.1
traction		55	55.6	3.6	92.7	1.8	---	1.8
rejection		44	44.4	25.0	50.0	6.8	9.1	9.1
-FR for FER, FOR, VER, VOR endings	716			24.0	55.6	6.3	9.5	4.6
coffer		79	11.0	1.3	73.4	---	21.5	3.8
tougher		55	7.7	---	96.4	---	---	3.6
buffer		55	7.7	---	90.9	---	7.3	1.8
effervescent		55	7.7	5.5	78.2	12.7	---	3.6
flavor		69	9.6	1.5	95.7	2.9	---	---
disfavor		51	7.1	3.9	56.9	17.7	19.6	2.0
survivor		89	12.4	11.2	76.4	6.7	1.1	4.5
cleaver		31	4.3	6.5	87.1	3.2	---	3.2
forceps		16	2.2	87.5	---	---	---	12.5
foreclose		19	2.7	57.9	---	---	31.6	10.5
foretell		27	3.8	40.7	---	---	48.2	11.1
fertile		53	7.4	88.7	---	5.7	---	5.7
vortex		40	5.6	87.5	5.0	---	---	7.5
verbose		47	6.6	42.6	2.1	21.3	27.7	6.4
vermin		14	2.0	57.1	7.1	14.3	---	21.4
vertex		16	2.2	43.8	---	31.3	25.0	---

[a]Order of presentation based on Table 5.9.

and percentages for other errors incurred by all nine suffix principles were below 10 percent.

Error Patterns Found in Machine Shorthand Notes

As defined in Chapter I, an error pattern was an incorrectly written machine shorthand form converted to represent the theory pattern of a selected abbreviation, derivative, or principle. The error patterns, which were taken from the students' machine shorthand notes, were first taken from the students' notes as forms but were converted to theory patterns for ease of reading.

The following part of this chapter presents the error patterns for each of the abbreviations, derivatives, and principles selected for examination in this study.

Abbreviations and Derivatives

As Table 5.17 shows, error patterns for abbreviations and derivatives which had more than 50 percent of the errors were AOUSH/LI (54.2 percent) for usually and THAT (50.0 percent) for that. In both cases, the type of error was too many letters or strokes. For the second largest percentages of errors, the error patterns for go, GO (42.2 percent) and GOE (40.0 percent), were also errors of too many letters or strokes.

Error patterns which were third largest in percentages of errors and which had just under one-third of the errors were UP/ON (32.7 percent) for upon, AOU (32.4 percent) for use, W-R (32.4 percent) for were, and B-T (32.1 percent) for about. The error patterns for both upon and about were classified as the error type too many letters or strokes,

TABLE 5.17

MOST FREQUENTLY OCCURRING ERROR PATTERNS FOR ABBREVIATIONS AND DERIVATIVES

Abbreviation or Derivative	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
enclosure	255	187	73.3	KLOUR	28	15.0
usually	252	144	57.1	AOUSH/LI	78	54.2
where	507	185	36.5	WR	41	22.2
couldn't	252	91	36.1	WONT	7	7.7
				KO/NOT	6	6.6
between	255	77	30.2	BAOE/TWAOEN	7	9.1
importance	252	70	27.8	PORN/ANS	7	10.0
				PORN	6	8.6
gone	252	65	25.8	GOEN	16	24.6
usual	255	61	23.9	AOUSH/-L	13	21.3
upon	255	55	21.6	UP/ON	18	32.7
under	507	107	21.1	UN	25	23.4
when	507	106	20.9	WHEN	18	17.0
go	255	45	17.7	GO	19	42.2
				GOE	18	40.0
use	507	74	14.6	AOU	24	32.4
important	507	69	13.6	PERN	11	15.9
were	252	34	13.5	W-R	11	32.4
that	255	32	12.6	THAT	16	50.0
every	507	63	12.4	EFR	13	20.6
about	252	28	11.1	B-T	9	32.1

[a]The percent of pattern errors was obtained by dividing the number of pattern occurrences by the number of errors. For example, the percent of pattern errors for KLOUR, 15.0 percent, was obtained by dividing 28 pattern occurrences by 187 errors.

while the error pattern for use was classified as the error type too few letters or strokes. The error pattern for were was classified as a substitution error.

Principles

To provide a more critical analysis of the patterns of errors for the principles, the principles were again divided into the categories of general principles, vowel principles, prefix principles, and suffix principles.

General principles. As Table 5.18 shows, error patterns for general principles which had the largest percentages of errors were R (93.2 percent) for WR beginning and unaccented vowel written for within word (81.2 percent) and within syllable (82.6 percent) of unaccented vowel. Other error patterns which had the next largest percentages of errors included -N/G (50.0 percent) for NG of -NG, TH ending omitted (66.0 percent) for word ending of TH ending, and W for usage (64.1 percent) and WH for exception (52.6 percent) of WH beginning.

The error patterns for both WR beginning and usage of WH beginning were classified as the error type too few letters or strokes. The error patterns for both NG of -NG and exception of WH beginning were classified, on the other hand, as the error type too many letters or strokes. The error pattern for within word and within syllable of unaccented vowel, however, was classified as a substitution error; and the error pattern for word ending of TH ending was classified as an "other error."

Vowel principles. As Table 5.19 shows, the error pattern for vowel principles which had the largest percentage of errors was short I (93.2

TABLE 5.18

MOST FREQUENTLY OCCURRING ERROR PATTERNS FOR GENERAL PRINCIPLES

General Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
-T omitted in past tense of KT ending	252	195	77.4	-KT/-D	78	40.0
-FM for SM ending	252	166	65.9	-S/-M	58	34.9
W for silent W in WR beginning	255	117	45.9	R (W omitted)	109	93.2
Unaccented vowel omitted:						
Within word	489	207	42.3	Unaccented vowel written	168	81.2
Within syllable	507	230	45.4	Unaccented vowel written	190	82.6
-NG for NG, NK, NJ endings:						
NG	507	172	33.9	-N/G	86	50.0
NK	507	169	33.3	-N/K	72	42.6
NJ	507	147	29.0	-N/-J	28	19.1
-H omitted in TH ending:						
Word ending	255	50	19.6	TH ending omitted	33	66.0
Syllable ending	255	94	36.9	TH	13	13.8
				T/H	12	12.8

TABLE 5.18 (continued)

General Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
WH for WH beginning:						
Usage	252	92	36.5	W (H omitted)	59	64.1
Exception	252	38	15.1	WH	20	52.6
-T for KT ending	255	57	22.4	-K (-T omitted)	21	36.8

[a]The percent of pattern errors was obtained by dividing the number of pattern occurrences by the number of errors. For example, the percent of pattern errors for -KT/-D, 40.0 percent, was obtained by dividing 78 pattern occurrences by 195 errors.

TABLE 5.19

MOST FREQUENTLY OCCURRING ERROR PATTERNS FOR VOWEL PRINCIPLES

Vowel Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
AI in words spelled AI	255	149	58.4	Short I	43	28.9
				Short A	37	24.8
Y for I or E sounding like Y:						
I	617	362	58.7	Unaccented vowel omitted	230	63.5
E	397	229	57.7	Unaccented vowel omitted	110	48.0
Long A for AIR sound	252	122	48.4	Short A	46	37.7
				Short E	44	36.1
AO in words spelled OO	255	76	29.8	Short O	18	23.7
				Long U	14	18.4
				Short U	11	14.5
I for Y ending:						
Short I	270	47	17.4	Long E	14	29.8
				Y ending omitted	14	29.8
Long I	252	59	23.4	Short I	55	93.2
Long vowels:						
A	507	43	8.5	Short A	18	41.9
E	507	51	10.1	Short E	23	45.1
I	507	62	12.2	Short I	40	64.5
O	507	82	16.2	Short O	39	47.6
U	507	90	17.8	Short U	52	57.8

[a]The percent of pattern errors was obtained by dividing the number of pattern occurrences by the number of errors. For example, the percent of pattern errors for short I of AI words, 28.9 percent, was obtained by dividing 43 pattern occurrences by 149 errors.

percent) for long I of I for Y. Other error patterns which had the next largest percentages of errors included unaccented vowel omitted (63.5 percent) for I of Y for I or E, short I (64.5 percent) for I of long vowels, and short U (57.8 percent) for U of long vowels. Substitution was the error type for each of these error patterns.

Prefix principles. As Table 5.20 shows, error patterns for prefix principles which had more than 50 percent of the errors were IN/TER (51.1 percent) for INT of INT/ENT, KOM (55.4 percent) for COMM, and KOM (76.6 percent) for COM. Too many letters or strokes was the error type for each of these error patterns.

Suffix principles. As Table 5.21 shows, the error pattern for suffix principles which had the largest percentage of errors was LI (81.2 percent) for saves stroke of LY. Other error patterns which had the next largest percentages of errors, from 50 percent to about 60 percent, included attempts to write in full for saves stroke of -SHS (50.9 percent), -NGS (61.2 percent), SHAL of -GS (56.3 percent), and -BGS (59.6 percent). Still other error patterns which fit into this second highest range included two strokes instead of one (51.7 percent) for adds stroke with consonant of ITY, TI (50.0 percent) for saves stroke of TY, and -F/ER or -F/OR (54.3 percent) for usage of -FR. Too many letters or strokes was the error type for each of these eight error patterns.

TABLE 5.20

MOST FREQUENTLY OCCURRING ERROR PATTERNS FOR PREFIX PRINCIPLES

Prefix Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
INT for INTER/ENT for ENTER:						
INT	255	184	72.2	IN/TER	94	51.1
ENT	255	153	60.0	EN/TER	26	17.0
				INT	26	17.0
				IN/TER	20	13.1
KM for COM followed by second M	252	157	62.3	KOM	87	55.4
SAOUP for SUPER	252	151	59.9	SAOU/PER	30	19.9
				SUP/ER	27	17.9
				SAOUP/ER	22	14.6
K for COM	255	137	53.7	KOM	105	76.6

[a]The percent of pattern errors was obtained by dividing the number of pattern occurrences by the number of errors. For example, the percent of pattern errors for IN/TER, 51.1 percent, was obtained by dividing 94 pattern occurrences by 184 errors.

TABLE 5.21

MOST FREQUENTLY OCCURRING ERROR PATTERNS FOR SUFFIX PRINCIPLES

Suffix Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
-SHS for SHUS:						
Saves stroke	252	220	87.3	Attempt to write in full	112	50.9
				-GS	43	19.6
Adds stroke	252	133	52.8	Vowel followed by -S	27	20.3
-T for ITY:						
Saves stroke	507	291	57.4	IT	97	33.3
				TI	52	17.9
Adds stroke	507	224	44.2	TI	66	29.5
Adds stroke with consonant	507	294	58.0	Two strokes instead of one	152	51.7
-Z for plural of word ending in Z	255	122	47.8	-Z/-S	24	19.7
				-S/-S	18	14.8
				-Z/ES	17	13.9
-NGS for NKSHUN	252	116	46.0	Attempt to write in full	71	61.2
-T for TY:						
Saves stroke	382	174	45.6	TI	87	50.0
Adds stroke	380	162	42.6	-T/I	38	23.5

TABLE 5.21 (continued)

Suffix Principle	No. of Responses	Errors		Most Frequent Patterns	Pattern	
		No.	Percent		No. of Occurrences	Percent of Errors[a]
-GS for SHUN, SHAL, ASHUN:						
SHUN	507	194	38.3	Attempt to write in full	57	29.4
				-BGS	23	11.9
SHAL	507	311	61.3	Attempt to write in full	175	56.3
				-SHL	24	7.7
ASHUN	507	144	28.4	-BGS	60	41.7
				Attempt to write in full	10	6.9
-L for LY:						
Saves stroke	507	346	68.2	LI	281	81.2
Adds stroke	507	75	14.8	-L	7	9.3
				LAOE	5	6.7
-BGS for KSHUN	255	99	38.8	Attempt to write in full	59	59.6
-FR for FER, FOR, VER, VOR endings:						
Usage	1014	484	47.7	-F/ER or -F/OR	263	54.3
Exception	1014	232	22.9	Use of vowel other than short E for FER and VER or short O for FOR and VOR	99	42.7

[a]The percent of pattern errors was obtained by dividing the number of pattern occurrences by the number of errors. For example, the percent of pattern errors for LI, 81.2 percent, was obtained by dividing 281 pattern occurrences by 346 errors.

CHAPTER VI

INTERPRETATIONS OF RESULTS

This chapter presents a procedures review and lists major findings, conclusions and recommendations, comparisons to the Patrick[1] study, and recommendations for further study.

Procedures Review

The problem of this study was to determine the error rates for selected abbreviations, derivatives, and principles of Stenograph machine shorthand. Sub-problems were: (1) to determine which abbreviations, derivatives, and principles were perceived by machine shorthand teachers to be the most difficult for their students to learn; (2) to compare teachers' perceptions of difficulty with error rates obtained from students' machine shorthand notes; (3) to determine what types of errors occurred in students' machine shorthand notes; and (4) to determine what, if any, patterns of errors occurred in students' machine shorthand notes.

The population of this study consisted of 100 machine shorthand teachers and 152 beginning machine shorthand students. A checklist which listed selected abbreviations, derivatives, and principles of Stenograph machine shorthand was constructed and administered by mail to

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[1]Alfred L. Patrick, "An Error Analysis of Selected Brief Forms and Principles in Shorthand Notes of Beginning Gregg Diamond Jubilee Shorthand Students" (unpublished Doctoral dissertation, The University of Tennessee, Knoxville, 1965).

the teachers to obtain their perceptions of which abbreviations, derivatives, and principles were the most difficult for their students to learn.

Based on the results of the checklist, two word lists and two new-matter letters, containing 196 test words in all, were constructed to test 18 selected abbreviations and derivatives and 27 selected principles. These word lists and sets of dictation material were then sent to 12 machine shorthand teachers who had agreed to administer the word lists and dictation material to their students.

From an analysis of the 544 sets of students' machine shorthand notes returned by the teachers, an error rate, a percentage of errors for each of five error types, and a percentage of errors for the most frequently occurring error pattern were determined for each abbreviation, derivative, and principle selected for examination. Perceived difficulty for each abbreviation, derivative, and principle was also compared with error rates derived from students' machine shorthand notes.

Major Findings

The major findings of this error analysis study on Stenograph machine shorthand are:

1. Enclosure (73.3 percent) and usually (57.1 percent) had the highest error rates for selected abbreviations and derivatives based on the errors in students' machine shorthand notes.

2. -T omitted in past tense of KT ending (77.4 percent), -SHS for SHUS (70.0 percent), INT for INTER/ENT for ENTER (66.1 percent), and

-FM for SM ending (65.9 percent) had the highest error rates for all selected principles based on the errors in students' machine shorthand notes.

3. For the category general principles, -T omitted in past tense of KT ending (77.4 percent) had the highest error rate; for vowel principles, AI in words spelled AI (58.4 percent) and Y for I or E sounding like Y (58.3 percent); for prefix principles, INT for INTER/ ENT for ENTER (66.1 percent); and for suffix principles, -SHS for SHUS (70.0 percent).

4. Usually (31.4 percent), usual (28.6 percent), and enclosure (20.0 percent) had the highest percentages of response for difficulty as perceived by machine shorthand teachers.

5. -FM for SM ending (57.1 percent), -NGS for NKSHUN (42.9 percent), long vowels (42.9 percent), -BGS for KSHUN (40.0 percent), and -H omitted in TH ending (40.0 percent) had the highest percentages of response for difficulty as perceived by machine shorthand teachers.

6. Comparison of error rates with teachers' perceptions of difficulty yielded a correlation coefficient of .588, significant at the .02 level, for the selected abbreviations and derivatives and a correlation coefficient of .074, insignificant at the .02 and .01 levels, for the selected principles.

7. The error type which had the highest percentage of errors for abbreviations and derivatives was too many letters or strokes for go (86.7 percent); for general principles, too few letters or strokes for W for silent W in WR beginning (95.7 percent); for vowel principles, substitution for long A for AIR sound (95.9 percent); for prefix

principles, too many letters or strokes for K for COM (93.4 percent); and for suffix principles, too many letters or strokes for -BGS for KSHUN (73.7 percent) and -L for LY (73.4 percent).

8. The error patterns which had the highest percentages of occurrence for abbreviations and derivatives were AOUSH/LI (54.2 percent) for usually and THAT (50.0 percent) for that; for general principles, R (93.2 percent) for W for silent W in WR beginning; for vowel principles, short I (93.2 percent) for long I of I for Y ending; for prefix principles, KOM (76.6 percent) for K for COM; and for suffix principles, LI (81.2 percent) for saves stroke of -L for LY.

Conclusions and Recommendations

Conclusions drawn from the major findings of this error analysis study on Stenograph machine shorthand are listed. Recommendations were made where appropriate.

1. Of the selected abbreviations and derivatives, more than half of the forms written for enclosure and usually were errors. (Major Finding No. 1) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

2. Of the general principles, more than three-fourths of the forms written for -T omitted in past tense of KT ending were errors. (Major Finding No. 3) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

3. Of the vowel principles, almost three-fifths of the forms

written for AI in words spelled AI and Y for I or E sounding like Y were errors. (Major Finding No. 3) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

4. Of the prefix principles, about two-thirds of the forms written for INT for INTER/ENT for ENTER were errors. (Major Finding No. 3) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

5. Of the suffix principles, somewhat less than three-fourths of the forms for -SHS for SHUS were errors. (Major Finding No. 3) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

6. Of the selected abbreviations and derivatives, usually, usual, and enclosure were perceived by machine shorthand teachers to be the most difficult for their students to learn. (Major Finding No. 4)

7. Of all the selected principles, -FM for SM ending, -NGS for NKSHUN, long vowels, -BGS for KSHUN, and -H omitted in TH ending were perceived by machine shorthand teachers to be the most difficult for their students to learn. (Major Finding No. 5)

8. Based on the correlations between teachers' perceptions of difficulty and error rates obtained from students' machine shorthand notes, a substantial or marked relationship occurred for the selected abbreviations and derivatives, while an indifferent or negligible relationship occurred for the selected principles. (Major Finding No. 6) Careful selection of words for error analysis testing, particularly on principles, is recommended.

9. Too many letters or strokes was the error type with the highest percentage of errors for abbreviations and derivatives on go, for prefix principles on K for COM, and for suffix principles on -BGS for KSHUN and -L for LY. (Major Finding No. 7)

10. Too few letters or strokes was the error type with the highest percentage of errors for general principles on W for silent W in WR beginning. (Major Finding No. 7)

11. Substitution was the error type with the highest percentage of errors for vowel principles on long A for AIR sound. (Major Finding No. 7)

12. Because the error patterns THAT for that and AOUSH/LI for usually occurred for about one-half of the errors for each, evidence is inconclusive as to whether these words should be written in full or abbreviated. (Major Finding No. 8) Increased instructional emphasis as a teaching strategy and supplemental or improved textbook reinforcement material are recommended.

13. Based on the most frequently occurring error pattern, the principle W for silent W in WR beginning should be eliminated; and only the sound heard, R, should be written for the WR beginning. (Major Finding No. 8) A shorthand system change is therefore recommended.

14. Based on the most frequently occurring error pattern, the principle I for Y ending should be changed so that short I should be written for "Y" in all words ending in "Y," no matter what vowel sound is heard at the end of the word. (Major Finding No. 8) A shorthand system change is therefore recommended.

15. Based on the most frequently occurring error pattern, the

principle K for COM should be eliminated; and the theory pattern KOM should be written instead. (Major Finding No. 8) A shorthand system change is therefore recommended.

16. Based on the most frequently occurring error pattern, the principle -L for LY should be eliminated; and the theory pattern LI should be written instead. (Major Finding No. 8) A shorthand system change is therefore recommended.

Comparison With Patrick Study

Comparisons based on error rates and error types for abbreviations (brief forms), derivatives, and principles used in the Patrick study and in this study are:

1. The abbreviation go (22.8 percent, Patrick; 17.7 percent, this study) and the derivative usually (80.5 percent, Patrick; 73.3 percent, this study) had similar error rates.

2. The abbreviations and derivatives couldn't (79.0 percent, Patrick; 36.1 percent, this study), upon (83.5 percent, Patrick; 21.6 percent, this study), usual (94.3 percent, Patrick; 23.9 percent, this study), and usually (87.5 percent, Patrick; 57.1 percent, this study) did not have similar error rates.

3. The abbreviation upon had its largest percentage of errors for the error type too many letters (69.5 percent, Patrick; 58.2 percent, this study) in both studies, and the percentages were similar.

4. The derivative enclosure had its largest number of errors for the error type too few letters (26.7 percent, Patrick; 55.1, this study) in both studies, but the percentages were not similar.

5. For the derivatives couldn't (55.7 percent, Patrick; 53.9 percent, this study) and usually (72.0 percent, Patrick; 75.0 percent, this study), the percentages of errors for the largest error types were similar; but the error types were different. The error types for couldn't were other errors in the Patrick study and too many letters in this study, while the error types for usually were too few letters in the Patrick study and too many letters in this study.

6. For the abbreviations usual (62.5 percent, Patrick; 45.9 percent, this study) and go (43.1 percent, Patrick; 86.7 percent, this study), the percentages of errors for the largest error types were not similar; and the error types were different. The error types for usual were too few letters in the Patrick study and too many letters in this study, while the error types for go were other errors in the Patrick study and too many letters in this study.

7. The principle SUPER (71.5 percent, Patrick; 59.9 percent, this study) had similar error rates.

8. The principles adds stroke with consonant for -T for ITY, similar to -lity/-rity in the Patrick study (10.7 percent, Patrick; 58.0 percent, this study); NG (59.5 percent, Patrick; 33.9 percent, this study); and NK, similar to -ngk in the Patrick study (57.3 percent, Patrick; 33.3 percent, this study), did not have similar error rates.

9. The principles adds stroke with consonant for -T for ITY, similar to -lity/-rity in the Patrick study (37.2 percent, Patrick; 55.8 percent, this study), and SUPER (36.1 percent, Patrick; 78.8 percent, this study) had their largest number of errors for the same error

type, too many letters, in both studies; but the percentages were not similar.

10. For the principle NK, similar to -ngk in the Patrick study (60.2 percent, Patrick; 53.3 percent, this study), the percentages of errors for the largest error types were similar; but the error types were different. The error types for NK were substitution in the Patrick study and too many letters in this study.

11. For the principle NG (33.1 percent, Patrick; 62.2 percent, this study), the percentages of errors for the largest error types were not similar; and the error types were different. The error types for NG were substitution in the Patrick study and too many letters in this study.

Error patterns were not compared for the abbreviations (brief forms), derivatives, and principles which occurred in both studies because the fundamental differences between writing outlines in Diamond Jubilee symbol shorthand and writing forms in Stenograph machine shorthand made comparisons impractical.

Recommendations for Further Study

The recommendations for further study based on the major findings and conclusions and recommendations of this error analysis study on Stenograph machine shorthand are:

1. The derivatives enclosure and usually should be studied further to obtain a more suitable theory pattern for each based on the moderately high error rates incurred by the derivatives and the absence of error patterns which had substantially more than one-half of the errors.

2. The principles -T omitted in past tense of KT ending, -SHS for SHUS, INT for INTER/ENT for ENTER, and -FM for SM ending should be studied further to obtain a more suitable theory pattern for each based on the high error rates incurred by the principles and the absence of error patterns which had substantially more than one-half of the errors.

3. Studies should be made to determine the relationship between the accuracy of forms written for abbreviations, derivatives, and principles in machine shorthand notes and the accuracy of the transcription of those forms.

4. Studies should be made to determine the relationship between the accuracy of forms written for abbreviations, derivatives, and principles in machine shorthand notes and the speed levels of dictation testing achieved.

5. Studies should be made to determine the relationship between the frequency of occurrence of abbreviations, derivatives, and principles in the theory textbook and the accuracy of forms written for those abbreviations, derivatives, and principles in machine shorthand notes.

6. Studies should be made to determine the effects on accuracy of machine shorthand notes and transcripts and on speed level achievement for experimental groups of students exposed to supplemental practice material emphasizing high-error abbreviations, derivatives, and principles as compared with the effects on accuracy of machine shorthand notes and transcripts and on speed level achievement for control groups of students who were exposed only to textbook material.

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APPENDIXES

APPENDIX A

STENOGRAPH COMPUTER-COMPATIBLE TOUCH SHORTHAND PRINCIPLES

APPENDIX A

STENOGRAPH COMPUTER-COMPATIBLE TOUCH SHORTHAND PRINCIPLES

General Principles

1. Write only the letters you hear.

2. Write a single vowel as it is spelled.

3. Write only the predominant vowel when two vowels occur together.

4. When consonants occur together in an order different from their printing sequence on the paper tape, write as much of the word as possible in the first stroke and finish in a subsequent stroke. Use the final side of the keyboard for the second stroke. Examples: settle, SET/-L; crisp, KRIS/-P; arch, AR/-CH.

5. When a single vowel sound opens or closes a word, that vowel must be written to maintain readability even though it is unaccented and a stroke could be saved by omitting it. Examples: omit, OE/MIT; echo, EK/OE.

6. When a vowel precedes the sound of S or Z, the vowel must be written to maintain readability. Examples: office, OF/IS; fellows, FEL/OES.

7. Write -NG for the sounds of NG, NK, and NJ at the ends of words or syllables. Examples: wing, WING; bank, BANG; range, RAING.

8. Write W for words beginning with WR even though W is silent. Examples: wrap, WRAP; wrong, WRONG; writ, WRIT.

9. Write WH for words beginning with WH, except in some abbreviations. Examples: which, WI; where, W-R; why, Y; whet, WHET.

10. Omit -T in words ending in the sounds of XT and ST. Examples: next, NEX; rest, RES.

11. When XT or ST come together in the middle of a word, write T in the next stroke. Examples: fixture, FIX/TUR; Ester, ES/TER.

12. Write -T in words ending in the sound of KT. Examples: act, AKT; tact, TAKT.

13. Omit -T to save a stroke when forming the past tense of a word ending in the sound of KT. Example: acted, AKD.

14. Omit -H at the end of a word or syllable ending in TH. Examples: path, PAT; health, HELT; ethnic, ET/NIK.

15. The following words omit -TH:

other	OER	another	NOER	either*	AOERT
bother	BOER	father	FAER	neither*	NAOERT
mother	MOER	gather	GAER		
brother	BROER	rather	RAER		

(* -T is added to avoid conflict with ear and near.)

16. Write -FM for SM at the end of a word to save a stroke. Example: chasm, KAFM.

17. A consonant must always be followed by a vowel to complete a word sound if the vowel is accented. Example: tea, TE (not T).

18. An unaccented vowel within a word may be omitted if a stroke is saved and the readability of the pattern is maintained. Examples: typical, TIP/KAL; decimal, DES/MAL; telephone, TEL/FOEN.

19. Omit an unaccented vowel within a syllable if a stroke is saved. Examples: profit, PROFT; power, POUR; habit, HABT.

Vowel Principles

20. Write out long vowel sounds. Examples: race, RAIS; beat, BAOET; kind, KAOIND; doe, DOE; glue, GLAOU.

21. Write AO for words spelled OO, regardless of sound. Examples: door, DAOR; roof, RAOF.

22. Write long A in words that have the sound of AIR, regardless of spelling. Examples: care, KAIR; wear, WAIR; share, SHAIR.

23. Write AI for words spelled AI, regardless of sound. Examples: bargain, BAR/GAIN; fountain, FOUN/TAIN.

24. Write OI for OI and OY. Examples: oil, OIL; toy, TOI.

25. Write AU in AW and AU words having the sound of AW. Examples: saw, SAU; taught, TAUT.

26. Write AU in ALL and AL words having the sound of AW. Examples: all, AUL; salt, SAULT.

27. Write AU in OUGH words having the sound of AW. Examples: ought, AUT; sought, SAUT.

28. Write OU in OU and OW words having the sound of OW. Examples: our, OUR; now, NOW.

29. Write I for Y at the end of a word. Examples: merry, MER/I; empty, EM/TI; fly, FLAOI; try, TRAOI.

30. When I or E occur in the middle of a word and can be given the sound of Y, write Y for the vowel to save a stroke. Examples: carrier, KAIR/YER; amiable, AIM/YABL; video, VID/YOE.

Prefix Principles

31. Write K for COM to save a stroke. Examples: combat, KBAT; compare, KPAIR.

32. When COM is followed by a second M in the spelling of a word, write the second M. Examples: command, KMAND; commit, KMIT.

33. When COM is followed by a vowel, it is not a prefix and should be written out. Examples: comedy, KOM/DI; comet, KOM/ET.

34. Write INT for INTER and ENT for ENTER. Examples: intersection, INT/SEBGS; entertain, ENT/TAIN.

35. Write S for SOME to save a stroke. Examples: sometime, STAOIM; somehow, SHOU.

36. Write SAOUP for SUPER. Examples: superstitution, SAOUP/STIGS; supervise, SAOUP/VAOIZ; superficial, SAOUP/FIGS.

Suffix Principles

37. Write the plural of a word by adding -S in the same stroke if possible; otherwise, in a separate stroke. Examples: facts, FAKTS; roses, ROES/-S.

38. Write -Z (or -S under -D) to form the plural of a word or an abbreviation ending in D. Examples: pads, PADZ; words, WORDZ.

39. Write -Z (or -S under -D) to form the plural or a word or an abbreviation ending in Z. Examples: oozes, AOZ/-Z; dozens, DOZ/-Z.

40. Write the past tense of regular verbs by adding -D in the same stroke if possible; otherwise, in a separate stroke. Examples: taxed, TAX/-D; knocked, NOKD.

41. Write -G for ING in the same stroke as the rest of the word if possible; otherwise, in a separate stroke. Examples: owing, OEG; selling, SELG; getting, GET/-G.

42. Write -L for LY when a stroke is saved and the readability of the pattern is maintained. Examples: fairly, FAIRL; yearly, YAOERL.

43. Write LI for LY when -L cannot be used. Examples: fully, FUL/LI; hardly, HARD/LI.

44. Write -T for ITY in the same stroke as the rest of the word if possible; otherwise, in a separate stroke. Examples: reality, RAOE/ALT; humanity, HAOU/MANT; familiarity, FAMT.

45. If -T for ITY cannot be written in the same stroke, include I with -T in the next stroke. Examples: density, DENS/IT; oddity, OD/IT.

46. When ITY must be written with an initial consonant, include I with -T. Example: dignity, DIG/NIT.

47. Write ITY when it is a part of the basic word and not a suffix. Examples: city, SIT/I; pity, PIT/I.

48. Write -T for TY when a stroke is saved and readability of the pattern is not affected. Example: safety, SAIFT.

49. Write -FR for the sounds of FER, FOR, VER, and VOR at the ends of words or syllables. Examples: suffer, SUFR; tougher, TUFR; saver, SAIFR; survivor, SUR/VAOIFR.

50. Write -BL for ABLE and IBLE. Examples: taxable, TAX/-BL; flexible, FLEX/-BL.

51. Write -BLT for BILITY, ABILITY, and IBILITY. Example: legibility, LEJ/-BLT.

52. Write -GS for the sounds of SHUN, SHAL, and ASHUN. Examples: nation, NAIGS; special, SPEGS; relation, RAOELGS.

53. Write -SHS for the sound of SHUS when a stroke is saved. Examples: precious, PRESHS; cautious, KAUSHS.

54. Write -BGS for the sound of KSHUN. Examples: diction, DIBGS; infection, IN/FEBGS; conviction, KON/VIBGS.

55. Write -NGS for the sound of NKSHUN. Examples: function, FUNGS; sanction, SANGS.

56. Write -B for BODY to save a stroke. Examples: anybody, NIB; nobody, NOEB; somebody, S-B.

57. Write -MT for MENT in the same stroke as the rest of the word if possible; otherwise, in a separate stroke. Examples: garment, GARMT; document, DOK/AOUMT.

58. The middle consonant in the following frequently used MENT words is omitted to save a stroke:

shipment	SHIMT	indictment	IN/DAOIMT
judgment	JUMT	equipment	KWIMT
treatment	TRAOEMT	development	VEMT
statement	STAIMT		

59. Write SEF for SELF and SEFS for SELVES. Examples: yourself, UR/SEF; themselves, THEM/SEFS.

60. Write -G for THING to save a stroke. Examples: anything, NIG; everything, FRG.

APPENDIX B

COVER LETTER, CHECKLIST, AND QUESTIONNAIRE-CONSENT FORM

APPENDIX B

COVER LETTER

Box 2347
State University, AR 72467
August 30, 1979

MAKING MACHINE SHORTHAND EASIER TO LEARN

How can machine shorthand teachers better help their students to learn all principles and abbreviations and to transcribe them quickly and accurately?

By noting which principles and abbreviations students are likely to have trouble learning and using, you could then stress these principles and abbreviations when you teach them. Also, if textbook writers were aware of high-error frequencies for certain principles and abbreviations, they could provide more practice material on them.

Your experience in teaching machine shorthand would be valuable in determining which principles and abbreviations most students regularly have trouble learning. Since your name and your school's name will be kept confidential, will you share your experience by marking on the enclosed checklist those elements of machine shorthand which regularly cause difficulty for your students?

Just take a few minutes to fill out the enclosed checklist and consent form (required by The University of Tennessee for all doctoral studies) and return them to me in the enclosed stamped envelope by October 15, 1979. If you have questions about the study, please jot them down on the back of the checklist or call me at (501) 935-0158. I will certainly appreciate your help.

MS. KAREN LEE WOODALL

Enclosures
- Checklist
- Questionnaire-Consent Form
- Envelope

CHECKLIST OF SELECTED STENOGRAPH ABBREVIATIONS, DERIVATIVES, AND PRINCIPLES

Please check any abbreviations, derivatives, or principles which your students regularly have problems learning.

___Vowel written preceding S or Z ending (office, OF/IS)

___-NG for NG, NK, NJ endings (wing, WING; bank, BANG; range, RAING)

___W for silent W in WR beginning (wrap, WRAP)

___WH for WH beginning (whet, WHET)

___-T omitted in XT and ST endings (next, NEX; rest, RES)

___T for XT or ST in middle of word (fixture, FIX/TUR; Ester, ES/TER)

___-T for KT ending (act, AKT)

___-T omitted in past tense of KT ending (acted, AKD)

___-H omitted in TH ending (path, PAT)

___-FM for SM ending (chasm, KAFM)

___Unaccented vowel omitted (typical, TIP/KAL; profit, PROFT)

___Long vowels (race, RAIS; beat, BAOET; kind, KAOIND; doe, DOE; glue, GLAOU)

___AO in words spelled OO (door, DAOR)

___Long A for AIR sound (care, KAIR)

___AI in words spelled AI (bargain, BAR/GAIN)

___OI for OI, OY (oil, OIL; toy, TOI)

___AU for AW sound (saw, SAU; taught, TAUT; all, AUL; salt, SAULT; ought, AUT)

___OU for OW sound (our, OUR; now, NOU)

___I for Y ending (merry, MER/I; fly, FLAOI)

___Y for I or E sounding like Y (video, VID/YOE)

___K for COM (combat, KBAT)

___KM for COM followed by second M (commit, KMIT)

___INT for INTER/ENT for ENTER (intersection, INT/SEBGS; entertain, ENT/TAIN)

___S for SOME (sometime, STAOIM)

___SAOUP for SUPER (supervise, SAOUP/VAOIZ)

___-Z for plural of word ending in Z (oozes, AOZ/-Z)

___-G for ING (owing, OEG)

___-L for LY (fairly, FAIRL)

___-T for ITY (reality, RAOE/ALT)

___-T for TY (safety, SAIFT)

___-FR for FER, FOR, VER, VOR endings (suffer, SUFR; tougher, TUFR; saver, SAIFR; survivor, SUR/VAOIFR)

___-BL for ABLE, IBLE (taxable, TAX/-BL; flexible, FLEX/-BL)

___-BLT for BILITY, ABILITY, IBILITY (legibility, LEJ/-BLT)

___-GS for SHUN, SHAL, ASHUN (nation, NAIGS; special, SPEGS; relation, RAOELGS)

___-SHS for SHUS (precious, PRESHS)

___-BGS for KSHUN (diction, DIBGS)

___-NGS for NKSHUN (function, FUNGS)

___-B for BODY (anybody, NIB)

___-MT for MENT (garment, GARMT)

___SEF for SELF, SEFS for SELVES (yourself, UR/SEF; themselves, THEM/SEFS)

___-G for THING (anything, NIG)

___acknowledge (AK/NOJ)

___acknowledgment (AK/NOJ/-MT)

___among (MONG)

___any (NI)

___between (TWAOEN)

___consider (K-R)

___consideration (K-RGS)

___could (KO)

___couldn't (KONT)

___doctor (DR)

___doctors (DR-S)

___enclose (KLO)

___enclosed (KLOD)

___enclosure (KLO/AOUR)

___ever (-FR)

___every (-FR)

___go (G)

___going (G-G)

___gone (in phrases) (-G)

___importance (PORNS)

___important (PORN)

___necessary (NES)

___number (NUM)

___order (ORD)

___regular (REG)

___that (THA)

___the (-T)

___there (THR)

___they (THE)

___under (UND)

___upon (PON)

___use (AOUS)

___usual (AOUSH)

___usually (AOUSHL)

___were (WR)

___when (WHE)

___with (W)

___yesterday (YED)

Please specify any other difficult abbreviations or derivatives not listed above:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

PLEASE RETURN THIS FORM IN THE ENCLOSED ENVELOPE, ALONG WITH THE CONSENT FORM, BY OCTOBER 15, 1979.

QUESTIONNAIRE

Please answer the following questions:

1. How many years have you taught machine shorthand? _____

2. Approximately how many machine shorthand students have you taught during your career? _____

3. Will you be teaching machine shorthand during Spring 1980? _____

4. Will a Stenograph computer-compatible text be used during Spring 1980? _____

5. How many students are expected to be in your machine shorthand classes during Spring 1980? Beginning_____ Advanced_____

CONSENT FORM REQUIRED BY THE UNIVERSITY OF TENNESSEE

FOR ALL DOCTORAL STUDIES

Whether you decide to participate or not to participate in this study will not affect your future relationship with The University of Tennessee. Also, if you do participate, you are free to withdraw your consent and to discontinue participating at any time without prejudice.

The signature below certifies that the person signing this form will participate of his own free will in the doctoral study "An Error Analysis of Selected Abbreviations, Derivatives, and Principles in the Shorthand Notes of Beginning Stenograph Machine Shorthand Students." The signature certifies, too, that the signer is free to withdraw his consent and to discontinue participating at any time without prejudice.

Signature_____

Title_____

School_____

Do you want a copy of the final results of the study? ___yes ___no

PLEASE RETURN THIS FORM IN THE ENCLOSED ENVELOPE, ALONG WITH THE CHECKLIST,

BY OCTOBER 15, 1979.

Return to: Ms. Karen Lee Woodall
Box 2347
State University, AR 72467

APPENDIX C

COVER LETTER, TEACHER INSTRUCTIONS, WORDS LISTS AND DICTATION MATERIAL, AND CONSENT FORM

APPENDIX C

COVER LETTER

Box 2347
State University, AR 72467
April 26, 1980

PARTICIPATION IN MACHINE SHORTHAND RESEARCH

Thank you for agreeing to participate in my doctoral research which we talked by phone about several weeks ago.

The purpose of the research, as we discussed, is to determine the error rates for selected abbreviations, derivatives, and principles of Stenograph Computer-Compatible Touch Shorthand, to determine if patterns of errors occur, and to determine whether a need exists for changes in high-error abbreviations, derivatives, and principles or in instructional materials. By checking specific words in the shorthand notes of your students, I will determine error rates and patterns. The data your students will produce will in no way be identified by student, teacher, or school; and I will provide you with the results of the study as soon as they are obtained.

In gathering the data, please note that the students need to write <u>something</u> for every word dictated and that both Sets I and II are needed from each student. Also, since the dictation in the enclosed materials had to be increased in length from three minutes to about five minutes, the students need to realize the necessity for efficient use of transcription time. Since punctuation will not be checked, only paragraphs and end-of-sentence punctuation need to be used. In addition, if you teach any modifications of certain abbreviations, derivatives, or principles, please let me know when you return the materials.

Because of the bulkiness of the materials and my not knowing the mailing weight, I ask that you mail all materials to me (first class) by <u>May 12</u> in <u>one</u> package with the enclosed labels used as both the return and the package addresses. I will reimburse you for the mailing charge when I receive the package. Also, if your students will not have covered all the theory by May 12, please return the data <u>no later</u> than <u>June 12</u>.

Since my school will be out on April 28, please call me until May 15 at my home (501-935-0158) if you need me. After May 15 please call my chairman, Professor George Wagoner, The University of Tennessee, Knoxville, at 615-974-5234 and leave a message for me to return your call.

I will certainly appreciate receiving your help because I am eager to analyze the materials to see what the results will be. I will also welcome your comments and suggestions on the study or on Stenograph Computer-Compatible Touch Shorthand in general. Just jot down your remarks on the back of the enclosed Consent Form, which is to be signed and returned with the other materials.

MS. KAREN LEE WOODALL

Enclosures
- Teacher Instructions
- Word Lists I and II
- Dictation Materials I and II
- Consent Form
- Mailing Labels

*USE YELLOW STATIONERY

GENERAL INSTRUCTIONS TO TEACHERS

1. Only those beginning Stenograph machine shorthand students who have completed at least Lesson 68 of Stenograph's Computer-Compatible Touch Shorthand Revised Keyboard and Theory: Book 1 or who are in the early lessons of a following book are to be checked.

2. Word List I, Dictation Material I (pink), and the dictation transcription are to be completed on the same day in one class period at least 40 minutes long. Please follow this time table and note that no waste time has been allocated:

   10 minutes for completing the word list
   8 minutes for dictating
   20 minutes for transcribing
   2 minutes for collecting papers

3. Read the word list instructions to the students. After the students have prepared their machines, dictate one word on the word list every 12 seconds. Then collect the students' notes and put them in an envelope along with the word list.

4. Dictate the warmup letter to your students for practice, and then dictate the second letter. Both letters have been marked off in 15-second intervals, so dictate to a diagonal mark each 15 seconds.

5. Please do not preview the dictation material or tell a student how to write any words that occur in the dictation material until after the transcription has been completed and both the notes and the transcripts have been turned in to you.

6. Allow the students to transcribe with pen or at the typewriter, whichever method they are accustomed to. Allow 20 minutes for transcription. Caution the students to use the transcription time efficiently because completed transcripts are the most valuable for analysis. Also, only end-of-sentence punctuation and paragraphs need be used in the transcription.

7. After collecting the dictation notes and transcripts, put them in the envelope with the word list and the students' word list notes. The warmup letter notes are to be thrown away.

8. Within three to five days, please administer Word List II and Dictation Material II (blue), again following the instructions given above.

9. After administering Sets I and II of the word lists and the dictation materials, please be sure all materials are mailed to me by

May 12. Please mail all materials in one package so that no materials will be lost. You will be reimbursed for all mailing costs.

10. If you have taught your students to write any of the words used here in a way different than the way listed in Stenograph's Computer-Compatible Touch Shorthand Dictionary/Handbook, please list the word, the modification, and the source or justification for the modification on a separate sheet and return it with the other materials.

* USE PINK STATIONERY

WORD LIST I

TO THE TEACHER ONLY: Please read the following instructions to your students slowly. Then dictate one word every 12 seconds. Do not dictate the number of each word. You may compose a sentence for each word to aid your students.

TO THE STUDENTS: Please write the name of your school and your full name in longhand at the top of your machine tape. Then write each word in shorthand as your teacher dictates it. Since you may have never written some of these words, write your first thought for every word. After each word insert a period--FPLT. If you make an error, insert one asterisk and rewrite the word. Your teacher will dictate one word every 12 seconds, with 49 words being dictated. She may also compose a sentence to help you identify the word dictated.

1. lame
2. traction
3. whenever
4. forceps
5. mendacity
6. elect
7. composite
8. usual
9. effervescent
10. canker
11. burial
12. wring
13. enclosure
14. hearth
15. breezes
16. wherein
17. admiralty
18. oak
19. mangle
20. useful
21. flavor
22. barely
23. schooner
24. that
25. sacrificial
26. prickly
27. interlope
28. importantly
29. pines
30. slither
31. dynasty
32. everyone
33. hue
34. single
35. sedation
36. vortex
37. bowel
38. curtain
39. understand
40. mediocrity
41. enterprising
42. upon
43. delusion
44. plead
45. oratory
46. between
47. vanity
48. cereal
49. go

* USE PINK STATIONERY

WARMUP AND NEW-MATTER LETTER I

TO THE TEACHER ONLY: Please read the following instructions to your students slowly, and pause where indicated. Be sure to dictate to a diagonal mark every 15 seconds. Also, please dictate paragraphs. (Syllabic intensity of 1.58 at 60 wpm.)

TO THE STUDENTS: This dictation may contain words you have never written. Be sure to write something for every word even though you may not be sure exactly how to write the word. Write your first thought.

Get ready to take a warmup. (PAUSE) Be sure your paper tray has enough paper in it for at least two minutes of dictation. (PAUSE) Write your full name and your school's name in longhand at the top of your machine tape. (PAUSE) Are you ready for dictation?

Dear Mr. Henderson:

As the enclosure shows, I plan to bequeath a twenty-two-hundred-acre / tract of my land, including Yellow Bird Mountain, to you. Please divide this territory between / you and my granddaughter, for I sanction no one else to be responsible for this complex / arrangement.

Upon dividing the land, I ask that you let thirty-seven acres go for (1) / a home for the goose and wren population of Eagle Feather County. Also, please have the Bird / Watcher Club intersperse bird feeders throughout the territory.

Although this is not your usual / type of will, I cannot entertain any changes in it because it freezes all my assets / and liabilities.

Sincerely,

TO THE STUDENTS: You have 30 seconds before we begin the dictation. DO NOT MAKE ANY CHANGES IN YOUR SHORTHAND NOTES. Tear your warmup notes from your clean tape. These notes are not to be transcribed and are to be thrown away. (PAUSE FOR 30 SECONDS)

Get ready to take the dictation. (PAUSE) Be sure your paper tray has enough paper in it for at least five minutes of dictation. (PAUSE) Write your full name and your school's name in longhand at the top of your machine tape. (PAUSE) Are you ready for dictation? (Syllabic intensity of 1.59 at 50 wpm.)

* USE PINK STATIONERY

WARMUP AND NEW-MATTER LETTER I (continued)

Dear Professor White:

Will you please verify the enclosed telegram's importance / in relation to the injunction brought against you by Deputy Edwardson? /

As Mr. Dean told you today, this felony offense could easily be turned / about to injure your integrity and bring disfavor on your crop-
(1)
dusting / commerce. Plans may even be under way now to foreclose on your county airplane / hangar.

To injure you, Mr. Dray may attempt to link you in a linear / way to the criminals who tried to bribe the state officer who collected / all the farm parity taxes for the state coffer. Therefore, it is very
(2)
/ important that you recognize how verbose claims can be used against you to cause / defamation of your character.

You see, too, that your amnesty will probably / hinge on my ability to reduce the court's tension and to provide an / hourly account of your
(3)
every action. No amount of judicious discussion / based on a salient choice of factors will change the vote of the jury. / When the opportunity arrives whereby I am to explain why you could purchase / and were able to purchase your palatial crop-dusting business, your definition /
(4)
of capitalism must be ready. A review of the Tariff / Enactment would be helpful because it couldn't hurt.

As a pupil of law, I / suggest we funnel our efforts into showing what has gone on. Usually, / I am not that anxious; however, I certainly hope my tenacity will / be able to supersede the court's opinion.

Sincerely,

* USE PINK STATIONERY

WARMUP AND NEW-MATTER LETTER I (continued)

TO THE STUDENTS: You have 30 seconds before we begin transcription. DO NOT MAKE ANY CHANGES IN YOUR SHORTHAND NOTES. Tear your dictation notes from your clean tape. (PAUSE FOR 30 SECONDS)

Get ready to transcribe by getting a clean sheet of paper. Write or type your full name and your school's name at the top of the sheet. If you type your transcription, please use one-inch margins, five-space indentions, and double spacing. Do not waste valuable transcription time in determining what internal punctuation to use. Only end-of-sentence punctuation and paragraphs are needed. (PAUSE) You will be given 20 minutes to transcribe the second letter. Transcribe on one side of your paper only. Turn to the beginning of the second letter. (PAUSE) Are you ready to transcribe? (PAUSE) Begin transcribing.

TO THE TEACHER ONLY: Allow 20 minutes for transcription. Staple together each student's notes and transcript as each student finishes transcribing or at the end of the 20 minutes. Collect all these papers and place them in the return envelope along with the word list, the dictation material, and the students' word list notes. Warmup notes are to be thrown away.

* USE BLUE STATIONERY

WORD LIST II

TO THE TEACHER ONLY: Please read the following instructions to your students slowly. Then dictate one word every 12 seconds. Do not dictate the number of each word. You may compose a sentence for each word to aid your students.

TO THE STUDENTS: Please write the name of your school and your full name in longhand at the top of your machine tape. Then write each word in shorthand as your teacher dictates it. Since you may have never written some of these words, write your first thought for every word. After each word insert a period--FPLT. If you make an error, insert one asterisk and rewrite the word. Your teacher will dictate one word every 12 seconds, with 49 words being dictated. She may also compose a sentence to help you identify the word dictated.

1. leisurely
2. wry
3. usually
4. sole
5. anxiety
6. which
7. extinction
8. flannel
9. when
10. tougher
11. intonation
12. every
13. truism
14. revenge
15. pioneer
16. superlative
17. rarity
18. addicted
19. vermin
20. important
21. entity
22. pleat
23. scrumptious
24. about
25. martial
26. futile
27. whiskey
28. ankle
29. importance
30. bate
31. facetious
32. cornea
33. gone (in phrases)
34. cleaver
35. dangle
36. cruelty
37. use
38. dire
39. commune
40. where
41. fertile
42. couldn't
43. heredity
44. percussion
45. under
46. chariot
47. swear
48. were
49. homely

* USE BLUE STATIONERY

WARMUP AND NEW-MATTER LETTER II

TO THE TEACHER ONLY: Please read the following instructions to your students slowly, and pause where indicated. Be sure to dictate to a diagonal mark every 15 seconds. Also, please dictate paragraphs. (Syllabic intensity of 1.57 at 60 wpm.)

TO THE STUDENTS: This dictation may contain words you have never written. Be sure to write something for every word even though you may not be sure exactly how to write the word. Write your first thought.

Get ready to take a warmup. (PAUSE) Be sure your paper tray has enough paper in it for at least two minutes of dictation. (PAUSE) Write your full name and your school's name in longhand at the top of your machine tape. (PAUSE) Are you ready for dictation?

Dear Mr. Wheat:

We will commence our plans as soon as possible to rectify the salary / problem immediately for it is of importance. Although the crew was dejected, they couldn't / believe that a capricious strike would square the situation or bring about the realism / needed to begin salary discussions.

(1)

Usually the goal of management / is to superimpose its goals over the goals of the crew. The place where a junction is formed, if / it was possible, is the place at which to begin discussion and to end pretentious show. Had / this gone on before, the salary problem would have been settled by now. Sincerely,

TO THE STUDENTS: You have 30 seconds before we begin the dictation. DO NOT MAKE ANY CHANGES IN YOUR SHORTHAND NOTES. Tear your warmup notes from your clean tape. These notes are not to be transcribed and are to be thrown away. (PAUSE FOR 30 SECONDS)

Get ready to take the dictation. (PAUSE) Be sure your paper tray has enough paper in it for at least six minutes of dictation. (PAUSE) Write your full name and your school's name in longhand at the top of your machine tape. (PAUSE) Are you ready for dictation? (Syllabic intensity of 1.58 at 50 wpm.)

* USE BLUE STATIONERY

WARMUP AND NEW-MATTER LETTER II (continued)

Dear Professor Pike:

What can policemen teach the survivor of a serious / automobile wreck to make him show more prevention the next time he drives?

Varsity / Company, a branch of Burlington Enterprise, has asked members of local / police forces and county safety patrols to answer that (1)
question. Based on / what rookie policeman Don Brown and Captain Joe Jones had to foretell, we were able / to compile a list of guides upon which one should center attention.

Chiefly, / they suggested for everyone who drives to carry a digital compass to / help them understand directions given about the weather (2)
on the radio. / Another cue they suggested was to react in a hurry when the trunk / of an automobile comes within a length of your automobile. Since no buffer / is provided for you between the automobiles, you should brace yourself for / any possible breach of safe driving habits.

(3)
They go on to explain, too, / how dingy headlights can be useless and can prevent one from judging the sizes / of oncoming automobiles when humidity is high. Also, driving / on the vertex of a hill can promote lack of clarity in vision when trying / to interpret the right (4)
passing distance. As usual, the policemen suggest / a judicial look for another place to pass.

Fascination with safe driving, / then, is not a menial task which should be alien to us. In fact, whenever / we get into an automobile

* USE BLUE STATIONERY

WARMUP AND NEW-MATTER LETTER II (continued)

and wherever we try to drive, rejection / of unsafe practices should not be unimportant.

(5)

Therefore, please take / our enclosure which was written by the Tower City Police. Learn their lingo / for safe driving. Remember your frailty behind the wheel could speedily get you / a set of wings.

Sincerely,

* USE BLUE STATIONERY

WARMUP AND NEW-MATTER LETTER II (continued)

TO THE STUDENTS: You have 30 seconds before we begin transcription. DO NOT MAKE ANY CHANGES IN YOUR SHORTHAND NOTES. Tear your dictation notes from your clean tape. (PAUSE FOR 30 SECONDS)

Get ready to transcribe by getting a clean sheet of paper. Write or type your full name and your school's name at the top of the sheet. If you type your transcription, please use one-inch margins, five-space indentions, and double spacing. Do not waste valuable transcription time in determining what internal punctuation to use. Only end-of-sentence punctuation and paragraphs are needed. (PAUSE) You will be given 20 minutes to transcribe the second letter. Transcribe on one side of your paper only. Turn to the beginning of the second letter. (PAUSE) Are you ready to transcribe? (PAUSE) Begin transcribing.

TO THE TEACHER ONLY: Allow 20 minutes for transcription. Staple together each student's notes and transcript as each student finishes transcribing or at the end of the 20 minutes. Collect all these papers and place them in the return envelope along with the word list, the dictation material, and the students' word list notes. Warmup notes are to be thrown away.

* USE YELLOW STATIONERY

CONSENT FORM REQUIRED BY THE UNIVERSITY OF TENNESSEE

FOR ALL DOCTORAL STUDIES

Whether you decide to participate or not to participate in this study will not affect your future relationship with The University of Tennessee. Also, if you do participate, you are free to withdraw your consent and to discontinue participating at any time without prejudice.

The signature below certifies that the person signing this form will participate of his own free will in the doctoral study "An Error Analysis of Selected Abbreviations, Derivatives, and Principles in the Shorthand Notes of Beginning Stenograph Machine Shorthand Students." The signature certifies, too, that the signer is free to withdraw his consent and to discontinue participating at any time without prejudice.

Signature _____

Title _____

School _____

Do you want a copy of the final results of the study? ___yes ___no

PLEASE RETURN THIS FORM ALONG WITH THE WORD LISTS AND DICTATION MATERIAL.

Return to: Ms. Karen Lee Woodall
Box 2347
State University, AR 72467

APPENDIX D

SELECTED ABBREVIATIONS, DERIVATIVES, AND PRINCIPLES

CATEGORIZED BY TEST WORD AND TEST

TABLE D.1

SELECTED ABBREVIATIONS AND DERIVATIVES CATEGORIZED BY TEST WORD AND TEST

Abbreviation or Derivative	Word List I		New-Matter Letter I		Word List II		New-Matter Letter II	
	Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word
between	46	between					25	between
enclosure	13	enclosure					45	enclosure
go	49	go					28	go
that	24	that					9	that
upon	42	upon					14	upon
usual	8	usual					36	usual
every	32	everyone	31	every	12	every	16	everyone
important	28	importantly	23	important	20	important	44	unimportant
under	39	understand	13	under	45	under	18	understand
use	20	useful	25	used	37	use	30	useless
when	3	whenever	35	when	9	when	41	whenever
where	16	wherein	36	whereby	40	where	42	wherever
couldn't			42	couldn't	42	couldn't		

TABLE D.1 (continued)

Abbreviation or Derivative	Word List I		New-Matter Letter I		Word List II		New-Matter Letter II	
	Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word
gone			45	gone	33	gone		
importance			3	importance	29	importance		
usually			46	usually	3	usually		
were			38	were	48	were		
about			9	about	24	about		

TABLE D.2

SELECTED PRINCIPLES CATEGORIZED BY TEST WORD AND TEST

Theory List No.	Principle	Word List I		New-Matter Letter I		Word List II		New-Matter Letter II	
		Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word	Test Item No.	Test Word
7	-NG for NG, NK, NJ endings	10	canker	15	hangar	14	revenge	22	trunk
		19	mangle	17	link	28	ankle	29	dingy
		34	singe	28	hinge	35	dangle	47	lingo
8	W for silent W in WR beginning	12	wring					3	wreck
9	WH for WH beginning			1	white	6	which		
				37	why	27	whiskey		
12	-T for KT ending	6	elect					21	react
13	-T omitted in past tense of KT ending			20	collected	18	addicted		
14	-H omitted in TH ending	14	hearth					19	weather
		30	slither					23	length
16	-FM for SM ending			40	capitalism	13	truism		
18-19	Unaccented vowel omitted	37	bowel	5	deputy	5	anxiety	17	digital
				44	funnel	8	flannel	46	tower
						15	pioneer		
20	Long vowels	1	lame	6	dean	4	sole	1	pike
		18	oak	16	dray	22	pleat	7	local

TABLE D.2 (continued)

Theory List No.	Principle	Word List I Test Item No.	Word List I Test Word	New-Matter Letter I Test Item No.	New-Matter Letter I Test Word	Word List II Test Item No.	Word List II Test Word	New-Matter Letter II Test Item No.	New-Matter Letter II Test Word
		29	pines	19	bribe	26	futile	20	cue
		33	hue	34	vote	30	bate	26	brace
		44	plead	43	pupil	38	dire	27	breach
21	AO in words spelled OO	23	schooner					10	rookie
22	Long A for AIR sound			41	tariff	47	swear		
23	AI in words spelled AI	38	curtain					11	captain
29	I for Y ending	45	oratory	2	verify	2	wry		
				7	felony				
30	Y for I or E sounding like Y	11	burial	18	linear	32	cornea	39	menial
		48	cereal	33	salient	46	chariot	40	alien
31	K for COM	7	composite					13	compile
32	KM for COM followed by second M			12	commerce	39	commune		
34	INT for INTER/ENT for ENTER	27	interlope					6	enterprise
		41	enterprising					35	interpret
36	SAOUP for SUPER			49	supersede	16	superlative		

TABLE D.2 (continued)

Theory List No.	Principle	Word List I Test Item No.	Word List I Test Word	New-Matter Letter I Test Item No.	New-Matter Letter I Test Word	Word List II Test Item No.	Word List II Test Word	New-Matter Letter II Test Item No.	New-Matter Letter II Test Word
39	-Z for plural of word ending in Z	15	breezes					31	sizes
42-43	-L for LY	22	barely	8	easily	1	leisurely	15	chiefly
		26	prickly	30	hourly	49	homely	49	speedily
44-46	-T for ITY	5	mendacity	10	integrity	17	rarity	5	varsity
		40	mediocrity	21	parity	21	entity	32	humidity
		47	vanity	48	tenacity	43	heredity	34	clarity
48	-T for TY	17	admiralty	27	amnesty	36	cruelty	8	county
		31	dynasty					48	frailty
49	-FR for FER, VOR, VER, VOR endings	4	forceps	11	disfavor	10	tougher	2	survivor
		9	effervescent	14	foreclose	19	vermin	12	foretell
		21	flavor	22	coffer	34	cleaver	24	buffer
		36	vortex	24	verbose	41	fertile	33	vertex
52	-GS for SHUN, SHAL, ASHUN	25	sacrificial	26	defamation	11	intonation	4	prevention
		35	sedation	29	tension	25	martial	37	judicial
		43	delusion	39	palatial	44	percussion	38	fascination
53	-SHS for SHUS			32	judicious	23	scrumptious		
				47	anxious	31	facetious		
54	-BGS for KSHUN	2	traction					43	rejection
55	-NGS for NKSHUN			4	injunction	7	extinction		

APPENDIX E

LIST OF MACHINE SHORTHAND TEACHERS WHOSE STUDENTS PARTICIPATED IN STUDY

APPENDIX E

LIST OF MACHINE SHORTHAND TEACHERS WHOSE STUDENTS PARTICIPATED IN STUDY

Ms. Marjorie Baran
Gary Area Career Center
Gary, Indiana

Ms. Barbara Brown
Chicago College of Commerce
Chicago, Illinois

Dr. Carmela Caputo
Adirondack Community College
Glens Falls, New York

Ms. Audrey Cox
Paul C. Hays Technical School
Grove City, Ohio

Ms. Margaret Hettinger
Bogan High School
Chicago, Illinois

Ms. Nancy Kerby
Maine Township High School, West
Des Plaines, Illinois

Ms. Charlene Oberman
Broward School of Business & Court Reporting
Pompano Beach, Florida

Ms. Norma Pygon
Chicago College of Commerce
Chicago, Illinois

Ms. Marilyn Reid
Moore's Business College
Sacramento, California

Dr. Hollie Sharpe
Western Kentucky University
Bowling Green, Kentucky

Ms. Marian Speights
Martin Luther King High School
Chicago, Illinois

Ms. Lorraine Vande Walle
Gateway Technical Institute
Kenosha, Wisconsin

APPENDIX F

ERROR RATES FOR WORDS USED TO TEST ABBREVIATIONS, DERIVATIVES, AND PRINCIPLES

TABLE F.1

ERROR RATES[a] FOR WORDS USED TO TEST ABBREVIATIONS AND DERIVATIVES

Test	Test Word	No. of Responses	Errors No.	Errors Percent	Test	Test Word	No. of Responses	Errors No.	Errors Percent
D 1	about	125	15	12.0	W 1	importantly	145	15	10.3
W 2	about	127	13	10.2	W 1	that	145	19	13.1
D 2	between	110	46	41.8	D 2	that	110	13	11.8
W 1	between	145	31	21.4	D 1	under	125	39	31.2
D 1	couldn't	125	54	43.2	W 2	under	127	15	11.8
W 2	couldn't	127	37	29.1	D 2	understand	110	27	24.5
D 2	enclosure	110	83	75.5	W 1	understand	145	26	17.9
W 1	enclosure	145	104	71.7	D 2	unimportant	110	19	17.3
D 1	every	125	23	18.4	D 2	upon	110	31	28.2
W 2	every	127	8	6.3	W 1	upon	145	24	16.6
D 2	everyone	110	17	15.5	W 2	use	127	6	4.7
W 1	everyone	145	15	10.3	D 1	used	125	41	32.8
W 1	go	145	26	17.9	W 1	useful	145	14	9.7
D 2	go	110	19	17.3	D 2	useless	110	13	11.8
D 1	gone	125	45	36.0	D 2	usual	110	34	30.9
W 2	gone	127	20	15.7	W 1	usual	145	27	18.6
D 1	importance	125	49	39.2	D 1	usually	125	81	64.8
W 2	importance	127	21	16.5	W 2	usually	127	63	49.6
D 1	important	125	21	16.8	D 1	were	125	20	16.0
W 2	important	127	14	11.0	W 2	were	127	14	11.0

TABLE F.1 (continued)

Test	Test Word	No. of Responses	Errors		Test	Test Word	No. of Responses	Errors	
			No.	Percent				No.	Percent
D 1	when	125	38	30.4	D 1	whereby	125	63	50.4
W 2	when	127	18	14.2	W 1	wherein	145	46	31.7
D 2	whenever	110	24	21.8	D 2	wherever	110	43	39.1
W 1	whenever	145	26	17.9					
W 2	where	127	33	26.0					

[a]Based on Word List I (W 1), Word List II (W 2), New-Matter Letter I (D 1), and New-Matter Letter II (D 2).

TABLE F.2

ERROR RATES[a] FOR WORDS USED TO TEST PRINCIPLES

Test	Test Word	No. of Responses	Errors		Test	Test Word	No. of Responses	Errors	
			No.	Percent				No.	Percent
W 2	addicted	127	83	65.4	D 1	collected	125	112	89.6
W 1	admiralty	145	52	35.9	D 1	commerce	125	93	74.4
D 2	alien	110	76	69.1	W 2	commune	127	64	50.4
D 1	amnesty	125	44	35.2	D 2	compile	110	50	45.5
W 2	ankle	127	31	24.4	W 1	composite	145	87	60.0
W 2	anxiety	127	28	22.0	W 2	cornea	127	69	54.3
D 1	anxious	125	75	60.0	D 2	county	110	67	60.9
W 1	barely	145	83	57.2	W 2	cruelty	127	54	42.5
W 2	bate	127	3	2.4	D 2	cue	110	25	22.7
W 1	bowel	145	23	15.9	W 1	curtain	145	68	46.9
D 2	brace	110	21	19.1	W 2	dangle	127	25	19.7
D 2	breach	110	18	16.4	D 1	dean	125	14	11.2
W 1	breezes	145	66	45.5	D 1	defamation	125	52	41.6
D 1	bribe	125	30	24.0	W 1	delusion	145	38	26.2
D 2	buffer	110	55	50.0	D 1	deputy	125	95	76.0
W 1	burial	145	82	56.6	D 2	digital	110	53	48.2
W 1	canker	145	71	49.0	D 2	dingy	110	44	40.0
D 1	capitalism	125	92	73.6	W 2	dire	127	9	7.1
D 2	captain	110	81	73.6	D 1	disfavor	125	51	40.8
W 1	cereal	145	81	55.9	D 1	dray	125	9	7.2
W 2	chariot	127	67	52.8	W 1	dynasty	145	51	35.2
D 2	chiefly	110	84	76.4	D 1	easily	125	27	21.6
D 2	clarity	110	59	53.6	W 1	effervescent	145	55	37.9
W 2	cleaver	127	31	24.4	W 1	elect	145	29	20.0
D 1	coffer	125	79	63.2	D 2	enterprise	110	73	66.4

TABLE F.2 (continued)

Test	Test Word	No. of Responses	Errors		Test	Test Word	No. of Responses	Errors	
			No.	Percent				No.	Percent
W 1	enterprising	145	80	55.2	W 1	interlope	145	82	56.6
W 2	entity	127	74	58.3	D 2	interpret	110	102	92.7
W 2	extinction	127	57	44.9	W 2	intonation	127	29	22.8
W 2	facetious	127	111	87.4	D 2	judicial	110	59	53.6
D 2	fascination	110	29	26.4	D 1	judicious	125	109	87.2
D 1	felony	125	25	20.0	W 1	lame	145	10	6.9
W 2	fertile	127	53	41.7	W 2	leisurely	127	94	74.0
W 2	flannel	127	71	55.9	D 2	length	110	42	38.2
W 1	flavor	145	69	47.6	D 1	linear	125	79	63.2
W 1	forceps	145	16	11.0	D 2	lingo	110	57	51.8
D 1	foreclose	125	19	15.2	D 1	link	125	36	28.8
D 2	foretell	110	27	24.5	D 2	local	110	23	20.9
D 2	frailty	110	68	61.8	W 1	mangle	145	44	30.3
D 1	funnel	125	106	84.8	W 2	martial	127	102	80.3
W 2	futile	127	20	15.7	W 1	mediocrity	145	92	63.4
D 1	hangar	125	46	36.8	W 1	mendacity	145	49	33.8
W 1	hearth	145	8	5.5	D 2	menial	110	56	50.9
W 2	heredity	127	58	45.7	W 1	oak	145	14	9.7
D 1	hinge	125	31	24.8	W 1	oratory	145	22	15.2
W 2	homely	127	7	5.5	D 1	palatial	125	71	56.8
D 1	hourly	125	85	68.0	D 1	parity	125	105	84.0
W 1	hue	145	6	4.1	W 2	percussion	127	50	39.4
D 2	humidity	110	53	48.2	D 2	pike	110	8	7.3
D 1	injunction	125	59	47.2	W 1	pines	145	15	10.3
D 1	integrity	125	67	53.6	W 2	pioneer	127	31	24.4

TABLE F.2 (continued)

Test	Test Word	No. of Responses	Errors		Test	Test Word	No. of Responses	Errors	
			No.	Percent				No.	Percent
W 1	plead	145	13	9.0	D 1	tenacity	125	64	51.2
W 2	pleat	127	6	4.7	D 1	tension	125	63	50.4
D 2	prevention	110	43	39.1	W 2	tougher	127	55	43.3
W 1	prickly	145	11	7.6	D 2	tower	110	30	27.3
D 1	pupil	125	39	31.2	W 1	traction	145	55	37.9
W 2	rarity	127	45	35.4	W 2	truism	127	74	58.3
D 2	react	110	28	25.5	D 2	trunk	110	31	28.2
D 2	rejection	110	44	40.0	W 1	vanity	145	82	56.6
W 2	revenge	127	28	22.0	D 2	varsity	110	61	55.5
D 2	rookie	110	29	26.4	D 1	verbose	125	47	37.6
W 1	sacrificial	145	79	54.5	D 1	verify	125	55	44.0
D 1	salient	125	81	64.8	W 2	vermin	127	14	11.0
W 1	schooner	145	47	32.4	D 2	vertex	110	16	14.5
W 2	scrumptious	127	58	45.7	W 1	vortex	145	40	27.6
W 1	sedation	145	34	23.4	D 1	vote	125	21	16.8
W 1	singe	145	44	30.3	D 2	weather	110	64	58.2
D 2	sizes	110	56	50.9	W 2	which	127	16	12.6
W 1	slither	145	30	20.7	W 2	whiskey	127	52	40.9
D 2	speedily	110	30	27.3	D 1	white	125	40	32.0
W 2	sole	127	24	18.9	D 1	why	125	22	17.6
W 2	superlative	127	90	70.9	D 2	wreck	110	47	42.7
D 1	supersede	125	61	48.8	W 1	wring	145	70	48.3
D 2	survivor	110	89	80.9	W 2	wry	127	4	3.1
W 2	swear	127	31	24.4					
D 1	tariff	125	91	72.8					

[a]Based on Word List I (W 1), Word List II (W 2), New-Matter Letter I (D 1), and New-Matter Letter II (D 2).

VITA

Karen Lee Woodall was born in Malden, Missouri, on August 16, 1952. She attended elementary school in Bernie, Missouri, and graduated from Bernie High School in May 1970. The following August she entered Arkansas State University, Jonesboro; and in August 1973 she received a Bachelor's degree in Business Education. She then accepted a graduate assistantship at Arkansas State University and began study toward a Master's degree in Business Education, which was awarded in May 1974.

After teaching at Kennett High School in Missouri and Miami-Dade Community College in Florida, she accepted a teaching assistantship at The University of Tennessee, Knoxville, in September 1976. Before receiving a Doctor's degree in Curriculum and Instruction in August 1982, she had also taught at Arkansas State University and worked in Illinois as a sales representative for GREGG/McGraw-Hill Book Company.

Ms. Woodall is a member of the National Business Education Association, the American Vocational Association, the American Business Communication Association, Delta Pi Epsilon, Phi Delta Kappa, and Alpha Delta Kappa. She will be teaching at Southwest Missouri State University, Springfield, after graduation.