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A prognosis test of stenographic abilty

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A PROGNOSIS TEST OF STENOGRAPHIC ABILITY

by

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E. R. M.

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I. INTRODUCTION

A. Reasons for the Study

1. The writer was interested in determining whether she could construct a test which would predict, with any degree of accuracy, the ability of high-school students to succeed in the study of shorthand.

2. There is need of a reliable prognostic test of stenographic ability in educational guidance work:

a. As a means of eliminating some of the waste resulting from incompetent students' attempting the study of shorthand and failing or becoming discouraged at their inability to succeed and withdrawing from school entirely,

b. In advising students who seem to have a meager possibility of success in shorthand against taking up this work, and

c. In bringing into the field students who seem to have the ability to succeed in shorthand and who are undecided as to what course to pursue.

3. A test of this type would be valuable to teachers of shorthand:

a. As an aid in the homogeneous grouping of students into classes, or

b. As a pre-test to determine the abilities and weaknesses of the students in their shorthand classes and to assist them in planning, more effectively, their teaching procedures.

B. A Test Already Available

The Hoke "Prognostic Test of Stenographic Ability"[1] was available at the time this study was begun, but the validity of the test had not been proved in any study known to the writer.

1. Description of the Hoke Test. The Hoke test consists of a battery of seven tests, printed in an eight-page pamphlet form and is accompanied by a four-page pamphlet, giving a description of the test, directions for administering and scoring, and a table showing the maximum scores, means, and standard deviations for each of the seven sections.

The first page of the test booklet provides blanks for the name of the student, date of taking the test, age, class or grade, city, state, school, teacher, and the length of time shorthand and typewriting have been studied, in addition to space for recording the score made on each section, the total score, and remarks by the teacher or scorer.

Test 1, designed to measure motor reaction, consists of the making of straight downward strokes about one-quarter of an inch long in blocks or cells provided for that purpose on page two of the booklet. The time allowed is one and one-half minutes. The score is the number of strokes made.

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[1] Elmer R. Hoke, Prognostic Test of Stenographic Ability (Chicago: The Gregg Publishing Company, n.d.).

Tests 2 and 3 are combined on page three of the booklet. They are designed to measure speed and quality of writing, respectively, and consist of copying in long-hand as many times as possible in the allotted one and one-half minutes a four-line printed stanza of "Mary Had a Little Lamb". The score for Test 2 is one-third of the number of letters written. The score for Test 3 is determined by matching the sample of handwriting on the test with the Ayres handwriting scale.[2]

Test 4 is a test of reading speed. It consists of two pages of printed material in which every tenth word is placed in parentheses with another word which does not belong to the passage. Students are to underscore the correct word in each case. The time allowed is two minutes. The score is double the remainder found by subtracting twice the number of wrong choices from the total number of choices attempted.

Test 5 measures memory span. This test is composed of four sentences of twenty-five words each to be read by the teacher at the rate of one hundred words per minute. Students are allowed one and one-half minutes, after the reading of each sentence, in which to write as much of the sentence as possible from memory. Space is blocked off on page six of the test booklet for the writing of five words

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[2] Leonard P. Ayres, Measuring Scale for Handwriting (New York City: Department of Education, Russell Sage Foundation, 1917).

to the line and twenty lines. The score is one point for each correct word.

Test 6 tests spelling ability and speed. It consists of sixty words, each word printed twice, once correctly and once incorrectly spelled. Students are to underscore the correct forms. One and one-half minutes are allowed for this test. The score is two points for each correct underscoring minus two points for each incorrect underscoring.

Test 7 is an attempt to measure the association and rapid substitution of symbols for letters. A key at the top of the page gives letter equivalents of the numbers one to zero, inclusive. Below this are arranged twenty lines of numbers, ten numbers to the line. Each number is followed by sufficient space to write the letter which, according to the key, is to be substituted for it. The time allowed for this test is three and one-fourth minutes. The score is one-half of the difference between the number of attempts minus the number wrong.

The total score for the test is the sum of the scores made on the various sections.

2. Some Criticisms of the Hoke Test. The following possible criticisms were suggested by examination and use of the Hoke Test.

a. The writer would suggest instead of the nursery rhyme in Test 2 a paragraph from a simple business letter, using words of high frequency. This would be more in keeping

with a business atmosphere and attitude of mind and more suitable for students of high-school age.

b. From her experience in checking Test 3, the writer finds that it requires a considerable amount of subjective judgment due to the fact that the Ayres scale does not fit all of the specimens of handwriting encountered.

c. The block spacing in the booklet for Test 5, the writer finds in taking the test herself, is confusing because the spacing is unnatural. The blocks are much too long for the short words and not long enough for the long ones. This divides the attention, furnishing an obstacle to memory. Memory span is being tested.

d. Test 7 is a little difficult to time. The time is three and one-fourth minutes.

e. Tests 2, 3, 4, 6, and 7 are difficult to score and, therefore, time consuming for the teacher.

f. The total scores run somewhat high with a maximum of 728 points. This makes calculations from the test more difficult than they would be if the scores were, in some way, reduced in size.

g. A teacher using the Hoke battery has to take time to make his own keys for checking as none are furnished by the publishers.

h. Correlation coefficients found in studies

made of the Hoke test have been low. Hull and Limp[3], in a study made by them, found the correlation between the Hoke test and school marks in shorthand to be .36. They found the Hoke battery had a higher correlation with school marks in English and algebra than with those in shorthand. The correlations were .56 with English and .55 with algebra. They found also that this test had a higher efficiency in forecasting[4] aptitudes in English and algebra than did "Terman's Group Test of Mental Ability". The correlation coefficients between Terman's battery and English and algebra were found to be .42 and .32 respectively.

In a study of the validity of the Hoke test conducted by the Research Department of the "American Shorthand Teacher"[5] in 1928, the coefficient obtained from comparison of the scores with first-semester marks was .241. The Hoke Reading, Writing, and Vocabulary Tests of achievement were used in this study. It was not known whether the low correlation was due to a faulty prognostic test or to faulty achievement tests, or to both.[6]

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[3] Clark L. Hull and Charles E. Limp, "The Differentiation of the Aptitudes of an Individual by Means of Test Batteries," Journal of Educational Psychology, XVI (1925), pp. 73-88.

[4] $E = 1-\sqrt{1 - r^2}$ Ibid., p. 77.

[5] "Results of a Study of the Validity of the Hoke Prognostic Tests of Stenographic Ability," The American Shorthand Teacher, X, January, 1930, p. 179.

[6] Ibid., p. 196.

II. THE PROBLEM

A. Statement of the Problem

With what degree of accuracy can the writer predict the probable success of high-school students in the study of shorthand by a test constructed by her?

1. First, a test must be constructed and given.
2. Second, a study of the data must be made.

B. Limitations

1. The study is limited to Gregg shorthand.
2. The study is limited to the cases of students who enrolled in the beginning shorthand classes in seven high schools at the opening of the fall semester of the school year 1929-1930, and in one high school at the opening of the fall semester of the school year 1930-1931. The communities represented in the study are Marshall, Illinois, and Brazil, Clinton, Greentown, and Terre Haute, Indiana. The schools in the 1929 group are Brazil, Clinton, Garfield (Terre Haute), Gerstmeyer (Terre Haute), Greentown, Marshall (Illinois), and Wiley (Terre Haute). In 1930 the test was given again at Garfield.
3. The subjective element has entered into the construction of the test, since it has been necessary to draw upon personal opinion based upon experience and observation in the choice of material in an attempt to measure traits which seem to contribute to shorthand success.

C. Procedure

1. Construction of the Test.

a. Analysis of the Aptitude to Be Tested. An attempt has been made to analyze shorthand aptitude. The methods employed in this analysis are observations from the writer's experience as a teacher of shorthand and her own experience in learning, studying, and using the art, supplemented by the study of professional literature on the subject of shorthand.

The writer suggests the following abilities from her observations and personal experience:

(I) Language ability
  (A) Ability to memorize symbols
  (B) Ability to use symbols
  (C) Reading ability, including ability to grasp the meaning while reading
  (D) Ability to spell
  (E) Ability to apply grammar knowledge
  (F) Ability to apply knowledge of punctuation

(II) Power of concentration

(III) The ability to think quickly, combined with speed and facility of writing and memory span

(IV) Ability to follow instructions

(V) Ability to memorize and apply rules

The most usable analysis found in the review of the literature of shorthand and the teaching of shorthand is that given indirectly by Beygrau and Arnston[1] as "obstacles to the attainment of speed in shorthand." As given by these authors, the obstacles are:

(I) Indecision

(II) Lack of concentration

(III) Nervousness and excitability

(IV) Lack of poise

(V) Mind wandering

(VI) Sluggish mental habits

(VII) Slowness of perception

(VIII) Inability to grasp the meaning of the English language

(IX) Unfamiliar words

(X) Lack of confidence in ability to read the notes

(XI) Poor memory

(XII) Consciousness of imperfect execution

(XIII) Unfamiliarity with the fundamental word-building principles of the system

(XIV) Imperfect co-ordination between mental and physical operations

(XV) The lack of logical construction of the shorthand system written

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[1] Frederick R. Beygrau and H. H. Arnston, "Obstacles to the Attainment of Speed in Shorthand," Gregg Educational Monographs (Chicago: The Gregg Publishing Company, 1921), pp. 3-4.

Omitting speed obstacles twelve, thirteen, and fifteen, which do not apply to the immediate problem, and stating the others positively as abilities needed, the following list results:

(I) Decision

(II) Ability to concentrate

(III) Freedom from nervousness and excitability

(IV) Poise (decision and freedom from nervousness and excitability)

(V) Ability to keep the mind from wandering (ability to concentrate)

(VI) Mental alertness

(VII) Quick perception

(VIII) Ability to grasp the meaning of the English language

(IX) Familiarity with words

(X) Self-confidence

(XI) Good memory

(XII) Good co-ordination between mental and physical operations

The list, as it now stands, will be seen to be very similar to the list of abilities chosen by the writer.

Beygrau and Arnston[2] go a little further in analyzing "some of the mental processes of the shorthand writer in writing shorthand," by quoting from Rupert P. SoRelle's

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[2] Frederick R. Beygrau and H. H. Arnston, *op. cit.*, pp. 17, 18.

monograph, "The Educational and Practical Value of the Study of Shorthand", as follows:

"'First, there is the hearing and comprehension of the words and the grasping of the thought of the speaker; second, the translation of these words into the elementary sounds (I believe we commonly think of words in their printed or written form); third, the selection of the shorthand material from which they are to be constructed into tangible form; fourth, the transferring of these impressions to the fingers; fifth, the manual execution of the forms. Here are five distinct processes through which each word must be put in the smallest fraction of a second.'"

b. Canvass of Available Test Material. As has already been stated in Section I, page 2, there was one available prognostic test of stenographic ability at the time of beginning this study, namely, the Hoke test. The Hoke test has been studied carefully and the testing field canvassed further in search of material which might be useful in the construction of a new test. Some suggestions have been secured from this canvass. These will be acknowledged in the description of the new test.

c. Description of the New Test. The Mewhinney test, as finally constructed and used in the experimentation, is in mimeographed form, with writing on one side of the sheets only. The sheets are fastened together at the upper left corner and creased to promote facility in the turning

of pages. The student's copy[3] consists of cover page and five additional sheets, one for each of the five sections of the test. The teacher's copy[4] consists of two pages giving directions for administering the test and the dictation material for section two.

On the cover page of the student's copy[5] appears the title "Practice Preliminary to the Study of Shorthand", space for the scores obtained from the first and second checkings of the test, a questionnaire designed to supply the writer with information which she thought might be needed in the study, and three general instructions to the students taking the test.

"Practice Preliminary to the Study of Shorthand" was used as a title, as will be noted in Instruction 1 to the teacher[6], in an attempt to avoid the undue nervousness, on the part of the students, which might result by calling the procedure a test.

Section 1[7] is an attempt to measure speed of writing and motor reaction. It consists of two paragraphs composed of actual business phrases and frequently used words.

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[3] Appendix, pp. 71-77.

[4] Ibid., pp. 69-70.

[5] Ibid., p. 71.

[6] Ibid., p. 69.

[7] Ibid., p. 72.

Thorndike's list of the 10,000 most frequently used words[8] and Hoke's, "Measuring Scale for Knowledge of Gregg Shorthand"[9], have been used in constructing the two independent paragraphs of this test.

This type of test has been chosen as being more purposeful than mere stroking. One can stroke without much attention to the stroking. A stenographer needs the combined powers of writing rapidly and thinking rapidly. The stenographer who takes a letter does not write memorized content over and over again, but writes new combinations of shorthand words and characters which have been memorized. The tests by which the achievement of the student learning shorthand is measured, also require this ability. "Shorthand requires quick thinking, quick decision, and action."[10]

Gregg shorthand is based upon longhand penmanship; therefore, the shorthand characters which are to be memorized should correspond in some degree to the longhand letters already mastered. The measurement of longhand mastery should, then, assist in predicting the student's speed possibilities or speed promise in shorthand.

The most frequently used words should be the most valid

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[8] Edward L. Thorndike, The Teacher's Word Book (New York City: Teachers College Columbia University Press, 1921), pp. 127-134.

[9] Elmer Hoke, Measuring Scale for Knowledge of Gregg Shorthand (Chicago: The Gregg Publishing Company, 1922).

[10] Frederick R. Beygrau and H. H. Arnston, "Obstacles to the Attainment of Speed in Shorthand," Gregg Educational Monographs (Chicago: The Gregg Publishing Company, 1921), p. 9.

representation of speed power or speed skill because, surely, they have had the opportunity through repetition practice to become the most automatic of any writing combinations. In the Gregg system there are simple, abbreviated forms for the words of high frequency. These basic words which the student has mastered in longhand must be made as automatic in their shorthand forms as they have become in their longhand forms.

This section contains 100 words, or 412 letters, which is thought to be sufficient material for the two minutes allotted time. According to Snesrud,[11] "A rate of 100 letters per minute is a full measure of the practical speed possibilities of longhand." Superintendent Snesrud[12] reports, also, that E. E. Lewis has found a median of 90 letters per minute for pupils in 156 normal-training departments in Iowa high schools. Reduced to "word units" of five letters each, this median-letter speed would be equal to 20 words per minute.

The score for Section 1 is the average speed per minute or one-half of the number of words written.

Section 2[13] is a measure of memory span. The shorthand writer must often carry material in mind and finish writing

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[11] J. M. Snesrud, "Handwriting Efficiency in Junior and Senior High Schools," Gregg Educational Monographs (Chicago: The Gregg Publishing Company, 1921), p. 9.

[12] Ibid., pp. 9-10.

[13] Appendix, p. 70.

after the dictator has finished. This section, also, is composed of sections of business letters including words and figures. The material is to be dictated by the teacher from her instruction copy[14] in a prescribed manner. This is an effort to control, as much as possible, the administration of the test. A blank sheet of paper is furnished in the student's test copy.[15]

An attempt has been made to arrange the dictation material according to increasing difficulty in order to measure different abilities and possibly to provide a little practice effect. The word-carrying faculty may be increased by practice. Beygrau[16] says, in regard to the latter point, "as the power to hold the words in mind increases, the length of the exercises may be increased."

The writer has tried to create a somewhat more natural situation than is furnished by the Hoke memory test[17] by permitting the students freedom in the spacing of their words.

No time limit is placed upon Section 2 as it has been designed to test memory span. The score is the number of correct words.

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[14] Appendix, p. 70.

[15] Ibid., p. 73.

[16] Frederick R. Beygrau and H. H. Arnston, op. cit., p. 7.

[17] See page 3 of this thesis.

Section 3[18] is constructed to measure reading speed and reading ability, and involves punctuation and capitalization. Since punctuation is rarely dictated, the stenographer or the student of shorthand must be able to punctuate when transcribing notes.

The writer has tried in this test to secure literary matter sufficiently difficult to require thought and material which probably will be unfamiliar to the students, thus adding to the difficulty.

The two paragraphs used for this section were taken from a small folder[19] describing Niagara Falls. No attempt has been made to estimate the comparative difficulty of the two paragraphs. The second paragraph is supplied merely to furnish enough material for the three minutes allowed for the section. It was thought that this test might be valuable in predicting transcription ability in shorthand.

The score for Section 3 is the number of points right, according to the key.[20]

Section 4[21] is designed to measure memorization of symbols. The general form of this section was suggested

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[18]Appendix, p. 74.

[19]Folder of the Niagara Gorge Belt Line (Niagara Falls, New York: n. d.), pp. 6-7.

[20]Appendix, p. 79.

[21]Appendix, p. 75.

by Form A, Test 3, of the "Thurstone Examination in Clerical Work".[22]

The symbols which are to be substituted for the letters which they represent are the simplest characters used in Gregg shorthand. The larger of the two Gregg circles has been used. The two upward straight strokes and the two horizontal straight strokes are chosen as being simple to make and easy to distinguish, in an effort to test the ability to distinguish lengths. Relative lengths and sizes of characters are very important in Gregg shorthand.

The use of some simple shorthand symbols seems to the writer to be a better test of the ability to memorize symbols than the substitution of letters for numbers, used by Hoke in Test 7.[23] The symbols will have to be memorized, while the letters are already memorized. Hence, in the second case the thing being tested is substitution, not memorization of symbols. The horizontal line arrangement is thought to be better than the column arrangement in Test 7 of the Hoke battery[24] since a longhand or shorthand writer aims at onward movement and writes in horizontal lines.

The time allowed for this section is three minutes. The score is the number of correct substitutions, according

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[22]L. L. Thurstone, Thurstone Employment Tests (Yonkers-on-Hudson, N. Y., and Chicago: World Book Company, 1922).

[23]See page 4 of this thesis.

[24]Ibid., p. 4.

to the key.[25]

Section 5[26] is an attempt to measure ability in spelling and grammar which is needed in the comprehensive reading and transcribing of shorthand notes. It is a test composed of choices between two words similar in spelling or sound and the correct and incorrect forms of some commonly misspelled words. The words are taken from the "Thurstone[27] Examination in Typing," Form A, Test 3, from Clippinger's,[28] Written and Spoken English, and from Bottome and Gregg,[29] The Stenographic Expert.

Mr. Gregg[30] says, "The stenographer must have a thorough training in spelling and particularly in the meaning and use of words."

Knowledge of word-meaning and usage is necessary because more than one word may be represented in Gregg short-

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[25]Appendix, p. 80.

[26]Ibid., p. 76.

[27]L. L. Thurstone, op. cit.

[28]Erle E. Clippinger, Written and Spoken English (Chicago: Silver, Burdett, and Company, 1917), pp. 493-503.

[29]Willard B. Bottome and John Robert Gregg, The Stenographic Expert (Chicago: The Gregg Publishing Company, 1922), pp. 22-32.

[30]John Robert Gregg, The Teaching of Shorthand (Chicago: The Gregg Publishing Company, 1916), p. 92.

hand by the same outline. Shorthand spelling is by sound, and, naturally, if the words sound alike, they are written alike. A thorough knowledge of similar words is given by Bottome and Gregg[31] as one of the principles of speed and accuracy.

The words in this section are arranged in sentence situations. Some are difficult; some are easy, in order to measure different abilities. No attempt has been made, however, to arrange the word choices in the order of difficulty. The students are told not to guess; so there is nothing to prevent their omitting any difficult ones.

The time allowed for Section 5 is four minutes. The score is the number of correct choices.

The total score for the test is the sum of the scores made on the five sections.

2. Timing of the Test. The lengths of the shorthand dictation tests for the district and state contests have been used as a guide in timing the sections of this test.

Two minutes is thought sufficient time for Section 1. The result desired is the writing speed per minute. Two minutes will give an average. There is no need in tiring the students unnecessarily nor in taking any more time than is actually needed.

No time limit is placed on Section 2 since memory span,

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[31]Bottome and Gregg, op. cit., pp. 19-21.

not speed, is being tested.

Three minutes each are allowed for Sections 3 and 4.

Four minutes time is used for Section 5 because in many cases the sentences have to be read a second time before the student is able to cross out the incorrect word. The extra minute is allowed for that.

The timing has been tried out individually with a small number of subjects, including one experienced stenographer, one clerical worker, two teachers of shorthand, two high-school students with one year of training in shorthand (one a "B" student, one a "D"), two high-school students (average students) who had neither training in shorthand nor intention to take up the subject, and one student (scholastic ability unknown) ready to enter high school in the fall. This was done in an attempt to secure extremes of speed in order to guard against the completion of a section in less than the allotted time and to secure a rough measure of the length of time required for the entire test. It proved absolutely nothing in regard to the correct or incorrect timing of the test. The papers have not been checked for errors. No one of the trial subjects completed a section of the test in the allotted time. The entire test was found by this limited experimentation to require approximately twenty minutes, or one-half of a forty-minute class period. This is thought to be a reasonable amount of time.

3. Schools Chosen. The writer secured permission to give the test in the following high schools at the opening

of the fall semester of the school year 1929-1930: Brazil, Clinton, Garfield (Terre Haute), Gerstmeyer (Terre Haute), Greentown, Marshall (Illinois), and Wiley (Terre Haute). Further experimentation was found necessary and permission was secured to give the test at Garfield at the opening of the fall semester of the school year 1930-1931.

4. Administration of the Test. Administration of the test has been made as simple as possible. Teachers have been furnished with definite instructions in order to control conditions as nearly as possible. The time required has been reduced to the minimum. As stated in the section on timing, the entire test can be given in approximately twenty minutes or one-half of a forty-minute class period. Fractions of a minute are avoided in timing the sections.

The test has been administered in each case by the teacher of the class being tested.

A total of 344 tests were given [32] in the eight school groups as follows:

Brazil	40	Gerstmeyer	24
Clinton	55	Greentown	11
Garfield (1929)	77	Marshall	23
Garfield (1930)	67	Wiley	47

5. Scoring. The test papers for this experiment have been checked and scored by the writer with the assistance of a committee of competent student checkers who have had one

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[32] Because of withdrawals only 331 cases were carried through to the final results.

year of training in shorthand. The feasibility of having student checkers is a point in favor of a test, according to Cody.[33]

During the checking an attempt has been made to eliminate or reduce to a minimum the subjective element which might arise in the checking of the test in its future use because of unanticipated errors, by correcting the key to provide for them.

6. The Reliability of the Test Checked by Repetition with One Group. The reliability of the test has been checked by repeating the test with one group at Garfield in the fall semester of the school year 1930-1931. The results of this study are discussed in Section III of this thesis.

7. The Mewhinney and Hoke Tests Given to One Group. Both the Mewhinney and Hoke tests have been given to one group at Garfield in the fall of 1930 and the results of the experiment with this group compared. The results of the study will be found in Section III of this thesis.

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[33] Sherwin Cody, Commercial Tests and How to Use Them (Yonkers-on-Hudson, New York: World Book Company, 1920), p. 43.

III. THE RESULTS

A. Score Ranges

Table I shows the number of tests given, the number of students withdrawing for reasons other than failure,[1] the number of cases used in the study, and the score ranges.[2]

TABLE I

NUMBER OF CASES TESTED, NUMBER OF STUDENTS WITHDRAWING, NUMBER OF CASES USED IN THE STUDY, AND SCORE RANGES

School	Number of Cases Tested	W's[a]	Number of Cases Used	Score Range
Brazil	40	0	40	(217-341), 124
Clinton	55	5	50	(107-319), 212
Garfield '29	77	1	76	(144-324), 180
Garfield '30	67	5	62	(135-274), 139
Gerstmeyer	24	0	24	(98-268), 170
Greentown	11	0	11	(177-233), 56
Marshall	23	2	21	(179-323), 144
Wiley	47	0	47	(116-297), 181
Total	344	13	331	(98-341), 243

[a]Withdrawals for reasons other than failure. A student known to be failing at the time of withdrawing is considered as a failure.

[1]A student known to be failing at the time of withdrawing was considered as a failure.

The score range "is the most general measure of 'spread' or 'scatter'".[3] It may be used in making a rough comparison of the school groups in this study. Since the range takes into account only the two extremes in each distribution of scores, it is not very reliable as a measure of variability, especially "when frequent or large gaps occur in the distribution."[4] This is very evident from the data in Table I. It can be seen that the ranges vary from 56 points in a small school of 11 cases to 212 points in a school with 50 cases. It will be noticed, also, that the school with the lowest score on the test has the fourth from the longest range and only 24 cases scattered over this range, while the school with the highest score has the seventh from the longest range with 40 cases scattered over the range.

The range, then, is not a very reliable measure of variability.

B. Medians

The medians have been found for the data tabulated into frequency distributions[5] of five intervals each, since in later computations the data will all be grouped into five

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[2] The individual raw scores for each school may be found in the Appendix, pp. 82-93.

[3] Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green, and Co., 1926), p. 17.

[4] Ibid., same page.

[5] Appendix, p. 82.

categories. The medians and their standard errors[6] for the school groups are as follows: Brazil, 258.07 ± 5.78; Clinton, 222.1 ± 6.99; Garfield (1929), 209.39 ± 5.42; Garfield (1930), 217 ± 5.87; Gerstmeyer, 171 ± 9.84; Greentown, 202.5 ± 5.21; Marshall, 242.43 ± 8.86; Wiley, 212.12 ± 7.83. The median for the entire distribution of 331 cases is 218.68 ± 3.10.

Table II[7] shows the comparisons of medians and means for the eight school groups and for the entire distribution of 331 cases.

C. Means

The means have been found for grouped data by the short method.[8] The means for the school groups and their standard errors[9] are as follows: Brazil, 263.25 ± 4.63; Clinton, 222.96 ± 5.60; Garfield (1929), 213.07 ± 4.33; Garfield (1930), 213.12 ± 4.70; Gerstmeyer, 173.29 ± 7.87; Greentown, 199.55 ± 4.17; Marshall, 243.22 ± 7.09; Wiley, 213 ± 6.27. The mean for the entire distribution of 331 cases is 219.18 ± 2.48.

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[6] $\sigma_{mdn.} = \frac{5}{4} \cdot \frac{\sigma(dis.)}{\sqrt{N}}$

Interpreted, the standard error of the median means that there are 68 chances in 100 that the obtained median does not differ from the true median by more than $\pm 1\,\sigma_{mdn.}$

[7] See page 27 of this thesis.

[8] Henry E. Garrett, op. cit., pp. 28-32.

[9] $\sigma_{av.} = \frac{\sigma(dis.)}{\sqrt{N}}$

Interpreted, the standard error of the average means that

As has been stated, Table II shows the medians and means for the eight school groups and for the total distribution.

D. Standard Deviations

The standard deviations have been figured in order to measure further the dispersion of the measures and to secure a higher reliability than the mere range of scores gives. The short method[10] of calculation has been used. The data are grouped into five intervals.

The standard deviations and their standard errors[11] for the school groups are as follows: Brazil, 29.25 ± 3.27; Clinton, 39.56 ± 3.96; Garfield (1929), 37.74 ± 3.06; Garfield (1930), 36.96 ± 3.32; Gerstmeyer, 38.5 ± 5.56; Greentown, 13.80 ± 2.94; Marshall, 32.48 ± 5.01; Wiley, 42.92 ± 4.43. The standard deviation for the entire distribution of 331 cases is 45.08 ± 1.75.

The standard deviations are shown in Table II.[12]

The standard deviation is not only "the most reliable of the measures of variability,"[13] but "in a 'normal' distribution...when measured off above and below the average[14]

---

there are 68 chances in 100 that the obtained average does not differ from the true average by more than $\pm 1\sigma_{av.}$

[10] Henry E. Garrett, op. cit., pp. 35-36.

[11] $\sigma_{\sigma} = \frac{\sigma(dis.)}{\sqrt{2N}}$

Interpreted, the standard error means that there are 68 chances in 100 that the obtained standard deviation does not differ from the true standard deviation by more than $\pm 1\sigma_{\sigma}$.

[12] See page 27 of this thesis.

marks the limits of the middle 68.28 per cent (roughly the middle 2/3) of the distribution."[15]

In order to check the number of cases actually measured off by one sigma or standard deviation on each side of the mean, the writer counted off the number of cases in the ranked raw scores[16] of each group and found the per cent that this number was of the number of cases in the group.

TABLE II

MEDIANS, MEANS, STANDARD DEVIATIONS, AND THE NUMBER AND PER CENT OF CASES, BY ACTUAL COUNT FROM THE RAW SCORES, MEASURED BY THE STANDARD DEVIATIONS

School	Number of Cases	Median	Mean	SD	Number of Cases Within ±1 SD	Per Cent
Brazil	40	258.07	263.25	29.25	26	65
Clinton	50	222.1	222.96	39.56	35	70
Garfield '29	76	209.39	213.07	37.74	53	69.7
Garfield '30	62	217.	213.12	36.96	42	67.7
Gerstmeyer	24	171.	173.29	38.5	15	62.5
Greentown	11	202.5	199.55	13.80	8	72.7
Marshall	21	242.43	243.22	32.48	14	66.6
Wiley	47	212.12	213.	42.92	30	63.8
Entire Group	331	218.68	219.18	45.08	237	71.6

[13] Henry E. Garrett, op. cit., p. 26.

By examining Table II, it will be found that one sigma on each side of the mean[17] measured off numbers of cases and percentages in the various groups as follows: Brazil, 26 cases, or 65 per cent; Clinton, 35 cases, or 70 per cent; Garfield (1929), 53 cases, or 69.7 per cent; Garfield (1930), 42 cases, or 67.7 per cent; Gerstmeyer, 15 cases, or 62.5 per cent; Greentown, 8 cases, or 72.7 per cent; Marshall, 14 cases, or 66.6 per cent; Wiley, 30 cases, or 63.8 per cent. For the entire group of 331 cases ± one sigma marks off 237 cases, or 71.6 per cent.

E. Intercorrelations of Sections of the Test

Correlations[18] of the sections of the test with the total score and with each other have been figured for the largest school group; namely, Garfield (1929). Table III shows the correlation coefficients obtained.

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[14] The mean.

[15] Henry E. Garrett, op. cit., p. 27.

[16] The ranked raw scores are shown in the Appendix, pp. 82-93.

[17] The mean found by the short method for grouped data. See page 27 of this thesis.

[18] $r = \frac{\varepsilon xy}{\sqrt{\varepsilon x^2} \cdot \sqrt{\varepsilon y^2}}$

TABLE III

INTERCORRELATIONS OF THE SECTIONS OF THE MEWHINNEY PROGNOSTIC TEST OF STENOGRAPHIC ABILITY WITH THE TOTAL SCORE AND WITH EACH OTHER

Intercorrelation	Sections				
	I	II	III	IV	V
With Total Score	.405	.708	.725	.508	.769
With Section I		.279	.157	.208	.29
With Section II			.348	.294	.535
With Section III				.203	.441
With Section IV					.402

As has already been explained in Section II, Section 1 of the test is designed to measure speed of writing and motor reaction. Section 2 is a measure of memory span. Section 3 is constructed to measure reading speed and reading ability, and involves the use of punctuation and capitalization. Section 4 is an attempt to measure the memorization and use of symbols. Section 5 is a measure of ability in spelling and grammar, or the use of words.

It will be noted from Table III above that Section 5, spelling and grammar, correlates more highly with the total score than does any other section. The second highest correlation with the total is Section 3, reading speed and ability, involving the use of punctuation and capitalization. The

third highest correlation with the total is Section 2, memory span. Section 4, memorization and use of symbols, ranks fourth in its correlation with the total score. The lowest correlation with the total score is Section 1, speed of writing and motor reaction.

The correlation coefficients for Section 1 with the other sections are all low. Each of the sections correlates more highly with Section 5 than with any other section.

All of the correlations are positive.

F. Coefficients of Contingency as a Measure of the Validity of the Test

1. Introductory Discussion of Validity. One of the criteria of a good test is its validity. In fact, according to Ruch,[19] "the most important single fact which can be known about a test or examination is the degree of validity which it possesses."

Garrett[20] says in discussing validity: "The validity of any measuring instrument depends upon the fidelity with which it measures whatever it purports to measure....A test is valid when the capacity which it measures corresponds to the same capacity as otherwise objectively measured and defined."

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[19] G. M. Ruch, The Objective or New-Type Examination (Chicago: Scott, Foresman and Company, 1929), p. 27.

[20] Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green, and Company, 1926), p. 266.

"The validity of a test is usually determined by finding the correlation between the test and some independent criterion. A criterion is defined as that measure in terms of which the value of a test is estimated or judged."[21]

2. The Criterion. The criterion for this particular study is school marks made at the close of the first year of shorthand work, and hereafter called first-year marks. First-year marks have been used because one year is required to complete the theory work of Gregg shorthand. The writer has, however, checked one group of the test scores with first-semester marks.

3. Measure of Relationship. The contingency method[22] of measuring relationship has been chosen since the data are grouped into categories by the letter-grade systems used in the schools. Holzinger's[23] formula:

$$C = \sqrt{\frac{S - 1}{S}}$$

was used in computing the coefficients of contingency. According to this method the data are tabulated into 5 x 5-fold contingency tables and the cell frequencies "fxy" figured. These frequencies are squared to get "f^2xy". The products of "fx" and "fy" are obtained for each cell. The quotients for "f^2xy" divided by "fxfy" are found. The sum of the last quantities equals "S" in the above formula.

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[21] Henry E. Garrett, op. cit., p. 266.

[22] Ibid., pp. 195-203.

[23] Karl J. Holzinger, Statistical Methods for Students of Education (Boston: Ginn and Company, 1928), p. 273.

C may be considered as practically equal to "r", the product-moment coefficient of correlation.[24] There is a correction for C "which should be used with 4 x 4-fold and less fine classifications, if C is to be compared with "r".[25] This correction is not needed in the present study since the classification is 5 x 5-fold.

4. The Data. The data consist of test scores and first-year shorthand marks for the eight school groups represented and first-semester marks for one school group.

The raw scores and marks for each group are shown in tables in the appendix.[26] The data are illustrated graphically in Figures 1-28.

All of the schools except two report school marks in the five-letter system, A, B, C, D, and F, with percentage equivalents. Of the two remaining school groups, one reports marks in percentages, the other, in a six-letter system of E+, E, G+, G, P, and F, with percentage equivalents. In order to make the results of the study comparable, the last two groups of school marks have been transferred to an A, B, C, D, and F basis.

5. The Results.

a. Coefficients of Contingency for the Sections of the Test. Coefficients of contingency for the different

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[24] Henry E. Garrett, op. cit., p. 200.

[25] Ibid., p. 200.

[26] Appendix, pp. 82-93.

sections of the test have been figured for the same group for which the intercorrelations[27] were figured; namely, the Garfield (1929) group. The coefficients of contingency between the 76 scores and first-year marks are as follows:

Section 1. Speed of Writing and Motor Reaction	.504
Section 2. Memory Span.....	.544
Section 3. Reading Speed and Reading Ability plus Punctuation and Capitalization	.57
Section 4. Memorization and Use of Symbols....	.53
Section 5. Spelling and Grammar (Use of Words)	.528

b. Coefficients of Contingency for the Separate Schools. Each school group has been treated as a separate and distinct problem with the data tabulated according to the actual scores made in that school group. Let us consider these groups.

(I) Brazil. The coefficient of contingency between the 40 test scores and first-year marks in this group is .713 with a probable error[28] of ± .052. The scores and marks are represented graphically in the following figures.

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[27] See page 28 of this thesis.

[28] $PE_C = \frac{.6745 \times (1 - C^2)}{\sqrt{N}}$

This is an adaptation of the formula for finding the probable error of "r", on the ground that C may be taken as practically equal to "r".

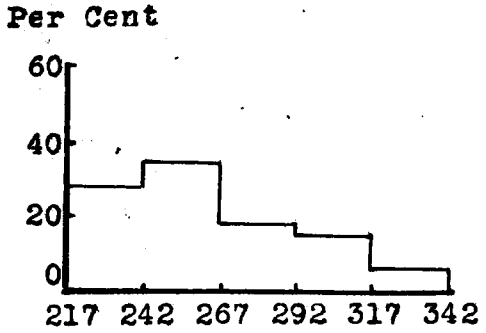

Figure 1. Distribution of scores for Brazil.

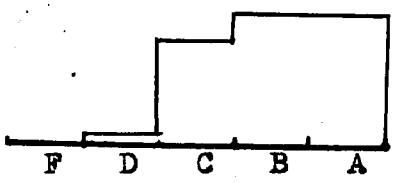

Figure 2. Distribution of school marks for Brazil.

(II) Clinton. The coefficient of contingency between the 50 test scores and first-year marks in the Clinton group is .69 ± .049. These data are represented by Figures 3 and 4.

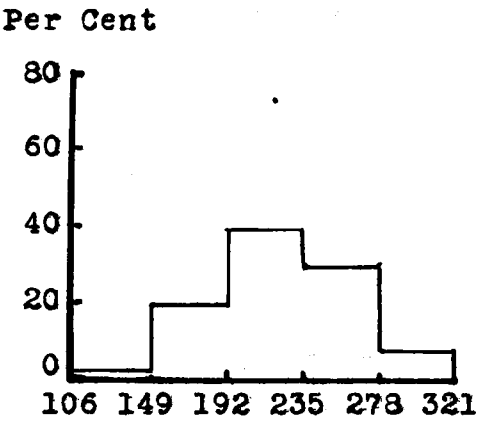

Figure 3. Distribution of scores for Clinton.

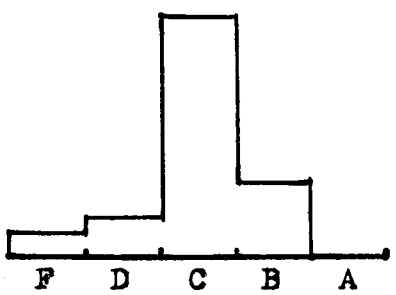

Figure 4. Distribution of school marks for Clinton.

(III) Garfield (1929). The coefficient of contingency between the 76 scores and first-year marks in this group is .697 ± .039. These data are represented in Figures 5 and 6.

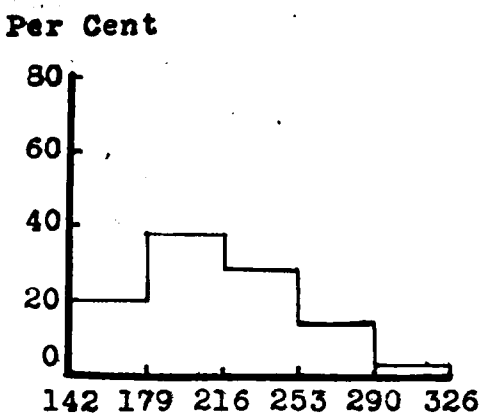

Figure 5. Distribution of scores for Garfield (1929).

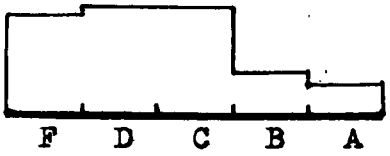

Figure 6. Distribution of school marks for Garfield (1929).

(IV) Garfield (1930). The coefficient of contingency between the 62 scores and first-year marks for this group is .61 ± .053. The data are represented by Figures 7 and 8.

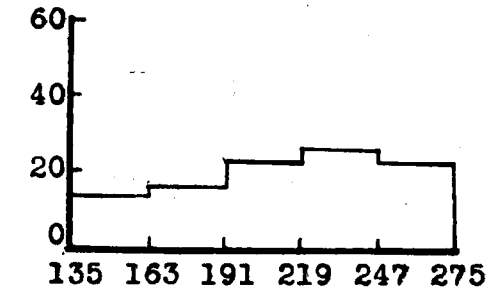

Figure 7. Distribution of scores for Garfield (1930).

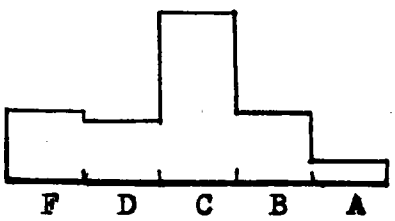

Figure 8. Distribution of school marks for Garfield (1930).

(V) Gerstmeyer. The coefficient of contingency between the 24 scores and first-year marks for this group is .615 ± .085. These data are represented by Figures 9 and 10.

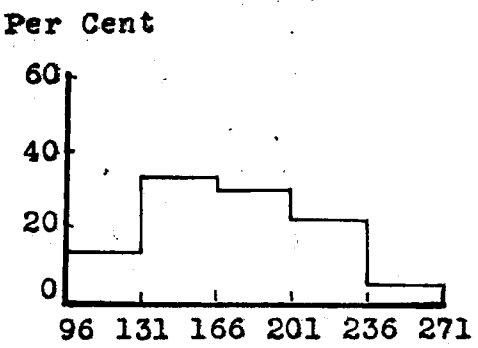

Figure 9. Distribution of scores for Gerstmeyer.

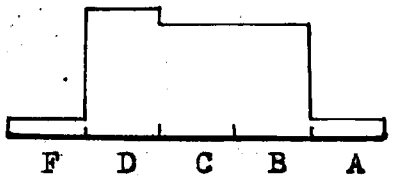

Figure 10. Distribution of school marks for Gerstmeyer.

(VI) Greentown. The coefficient of contingency between the 11 scores and first-year marks in this group is .567 ± .138. These data are represented by Figures 11 and 12.

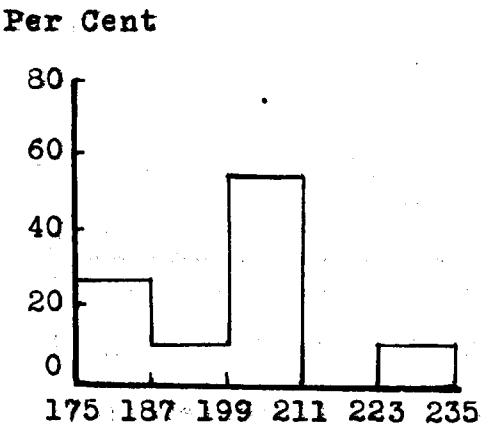

Figure 11. Distribution of scores for Greentown.

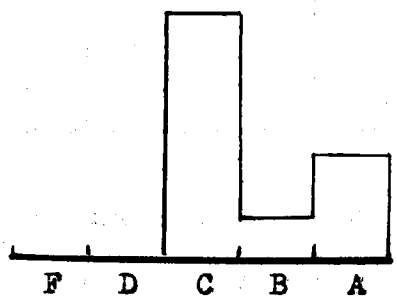

Figure 12. Distribution of school marks for Greentown.

(VII) Marshall. The coefficient of contingency between the 21 scores and first-year marks in the Marshall (Illinois) group is .737 ± .067. These data are represented by Figures 13 and 14.

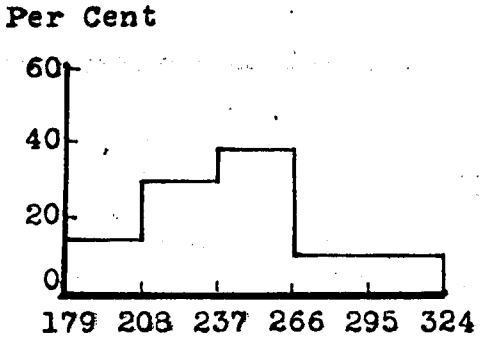

Figure 13. Distribution of scores for Marshall.

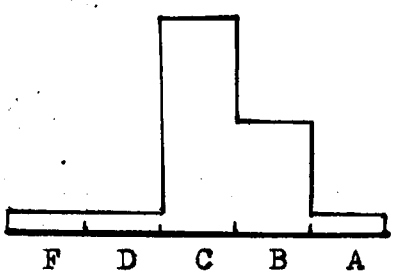

Figure 14. Distribution of school marks for Marshall.

(VIII) Wiley. The coefficient of contingency between the 47 scores and marks in this group is .665 ± .054. These data are represented by Figures 15 and 16.

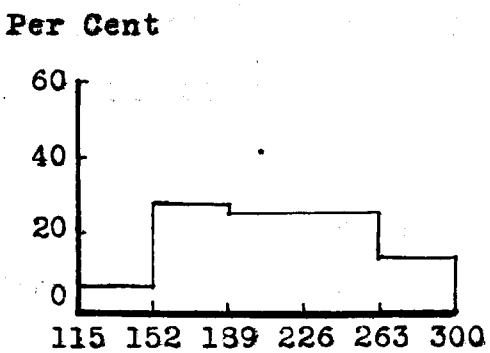

Figure 15. Distribution of scores for Wiley.

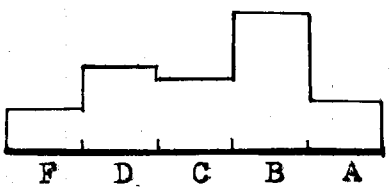

Figure 16. Distribution of school marks for Wiley.

c. Coefficient of Contingency for the Entire Group. Following the study of the schools separately, the data were combined into one group of 331 cases and a problem made of the entire group.

Table IV shows the score distribution by schools in the combined study. Table V shows the distribution of

first-year marks for the entire group.

TABLE IV

SCORE DISTRIBUTION BY SCHOOLS IN THE COMBINED TEST RESULTS DISTRIBUTION

School	Step-Intervals					Total
	98-146	147-195	196-244	245-293	294-342	
Brazil	0	0	14	19	7	40
Clinton	1	11	25	11	2	50
Garfield '29	2	23	34	16	1	76
Garfield '30	4	19	25	14	0	62
Gerstmeyer	5	12	6	1	0	24
Greentown	0	4	7	0	0	11
Marshall	0	2	9	8	2	21
Wiley	2	18	15	9	3	47
Total	14	89	135	78	15	331

TABLE V

DISTRIBUTION OF FIRST-YEAR SHORTHAND MARKS FOR THE ENTIRE GROUP

School	F	D	C	B	A	Total
Brazil	0	1	11	14	14	40
Clinton	3	5	32	10	0	50
Garfield '29	20	21	21	8	6	76
Garfield '30	11	10	27	11	3	62
Gerstmeyer	1	8	7	7	1	24
Greentown	0	0	7	1	3	11
Marshall	1	1	12	6	1	21
Wiley	5	10	9	17	6	47
Total	41	56	126	74	34	331

The coefficient of contingency between scores and first-year marks for the combined study is .588 with a probable error of ± .024. This is smaller than the coefficients for the school groups treated separately. The difference is accounted for by the change made in the scatter of the distribution by the presence of an extremely high score in the Brazil group and an extremely low score in the Gerstmeyer group.

The scores and marks for the combined group are repre-

sented graphically by Figures 17 and 18.

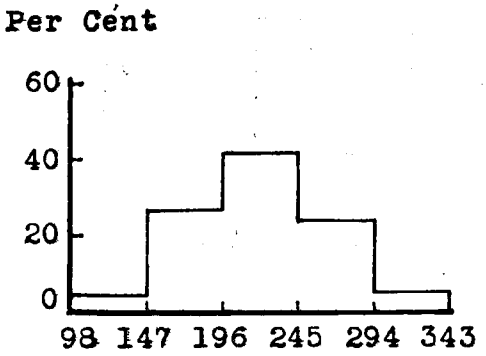

Figure 17. Distribution of scores in the combined distribution.

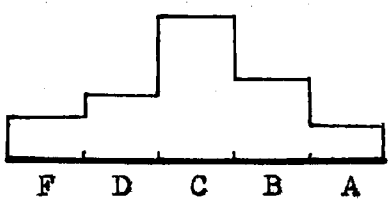

Figure 18. Distribution of school marks for the combined distribution.

Figures 19 to 26, inclusive, show the data for the various schools, grouped according to the range of scores for the entire group distribution. Comparisons between the figures representing data treated as individual school problems and data treated as a portion of the entire distribution will help to show why the coefficient of contingency for the entire group differs from the contingencies found for the various schools treated separately.

Table VI[29] serves to summarize the discussion of contingency coefficients.

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[29] See page 42.

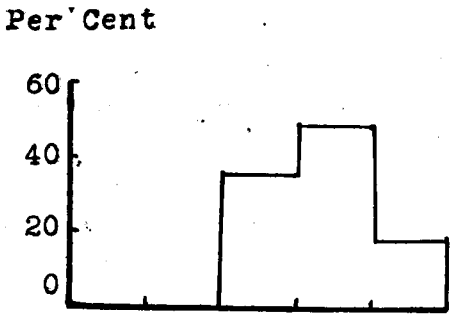

Figure 19. Brazil.

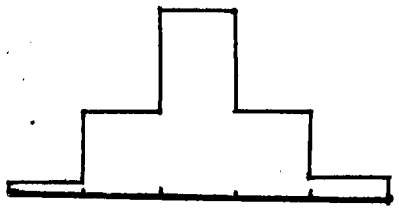

Figure 20. Clinton.

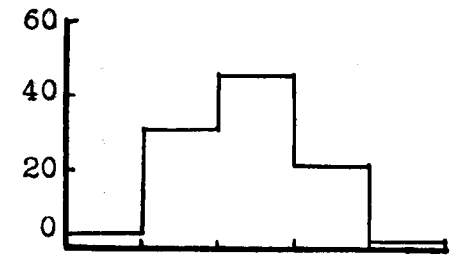

Figure 21. Garfield (1929).

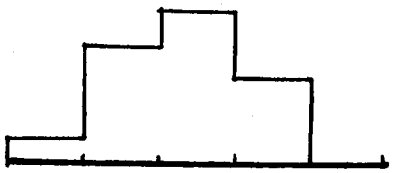

Figure 22. Garfield (1930).

Figure 23. Gerstmeyer.

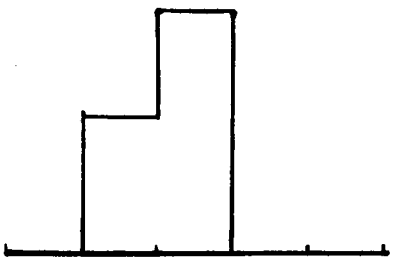

Figure 24. Greentown.

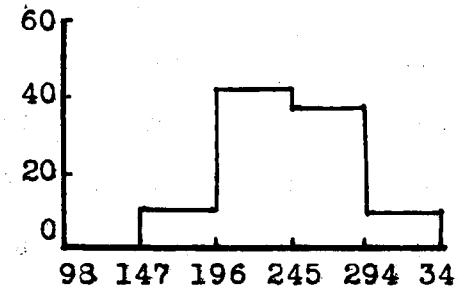

Figure 25. Marshall.

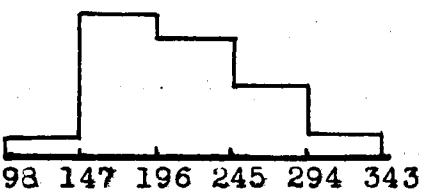

Figure 26. Wiley.

Distributions of scores for the separate schools, grouped according to the combined distribution.

TABLE VI

COEFFICIENTS OF CONTINGENCY AND PROBABLE ERRORS (FIRST-YEAR MARKS)

School	Number of Cases	C[a]	PE[b]
Brazil	40	.713	.052
Clinton	50	.69	.049
Garfield '29	76	.697	.039
Garfield '30	62	.61	.053
Gerstmeyer	24	.615	.085
Greentown	11	.567	.138
Marshall	21	.737	.067
Wiley	47	.665	.054
Entire Group	331	.588	.024

[a]Coefficient of contingency.

[b]Probable error.

d. Coefficient of Contingency for First-Semester Marks. A very limited study has been made of first-semester marks; namely, a study of the 62 cases[30] in the Garfield (1930) group. The coefficient of contingency between test scores and first-semester marks for this group is .63 with a probable error of ± .051.

Comparing this with the result obtained in figuring the relationship between test scores and first-year marks for

this group, we find an increase of .02 points in C and a reduction of .002 points in the probable error of C, the contingency coefficient for first-year marks having been .61 with a probable error of ± .053.

This is a very limited study of first-semester marks and the difference in results is slight. Only further experimentation can determine whether or not the difference found is significant.

Figures 27 and 28 represent the scores and marks in this study. The raw scores and marks are shown in the Appendix in Table XV.

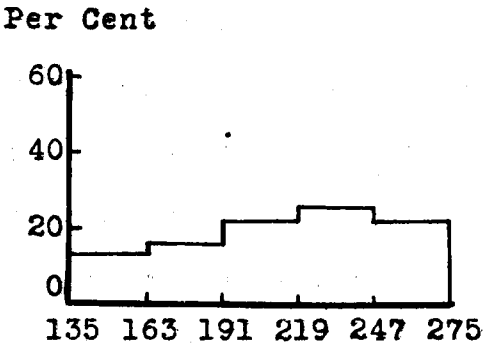

Figure 27. Distribution of scores for first-semester marks for Garfield (1930).

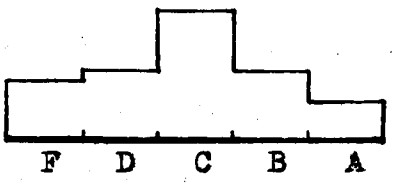

Figure 28. Distribution of first-semester marks for Garfield (1930).

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[30] All of the withdrawals from this group had occurred during the first semester so the number of cases is the same, and the score range, median, mean, and standard deviation are the same as those found for the first-year grades.

G. Comparison of Repeated Test Results as a Measure of the Reliability of the Test

1. Introductory Discussion of Reliability. Reliability, according to Ruch,[31] is "second only to validity as a criterion of the worth of a test or examination."

"The reliability of a test," states Garrett,[32] "is determined by the consistency with which it measures the capacity of those taking it. If a group repeats a test and each individual in the group scores close to his first record, we regard the test as reliable."

"If a test is given twice to the same group of subjects and the second set of scores correlated with the first, the correlation is never perfect," says Hull.[33] The coefficients obtained from this correlation are called "reliability coefficients." Reliability coefficients are said to depend upon the size and heterogeneity of the group. Hull[34] says, in regard to the size of reliability coefficients, that usually a test is not considered of much value if its reliability coefficient falls below .50 and that the same may be said of aptitude measures as well, but that it is much more difficult to secure satisfactory reliability coefficients for aptitude criteria.

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[31]G. M. Ruch, The Objective or New-Type Examination (Chicago: Scott, Foresman and Company, 1929), p. 40.

[32]Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1926), p. 268.

[33]Clark L. Hull, Aptitude Testing (Yonkers-on-Hudson,

2. The Reliability Coefficient Obtained from Self-Correlation of the Mewhinney Test. The test was repeated with a group of 41 students at Garfield at the opening of the fall semester of the school year 1930-1931. There were two withdrawals from the group so that complete data are available for only 39 cases. The raw scores and marks are shown in the Appendix.[35] Table VII shows the medians, means, standard deviations, number of cases by actual count from the raw scores measured by ± one sigma from the mean, and the per cent of cases so measured.

TABLE VII

PARTIAL DATA CONCERNING THE REPETITION OF THE MEWHINNEY TEST WITH ONE GROUP

Take	Number of Cases	Score Range	Mdn. $\sigma_{mdn.}$	Mean $\sigma_{av.}$	SD σ	Number of Cases Within $\pm 1\sigma$	Per Cent[a]
First	39	(133-272) 135	211. ±7.29	208.74 ±5.83	36.4 ±4.12	25	64.1
Second	39	(166-330) 164	258.65 ±8.53	256.96 ±6.82	42.57 ±4.82	24	61.5

[a]Per cent of cases measured from the mean ± one sigma.

New York: World Book Company, 1928), p. 231.

[34]Ibid., pp. 231-232.

[35]Appendix, pp. 82-93.

The reliability coefficient[36] obtained from the self-correlation of the test with the group of 39 subjects is .872 with a probable error of ± .025. This is a fairly high reliability but is, of course, limited because of the small number of cases.

3. Coefficients of Contingency. The coefficients of contingency figured for the two repetitions of the test are as follows:

a. First-Year Marks:

(I) First take, .672 ± .059 PE

(II) Second take, .683 ± .057 PE

b. First-Semester Marks:

(I) First take, .648 ± .062 PE

(II) Second take, .703 ± .054 PE

4. Coefficients of Variation. Coefficients of variation,[37] "V", have been figured as a means of comparing the variability of the group on the two takes[38] of the test. V for the first take is 17.43; V for the second take is 16.56. If we divide 16.56 by 17.43, the result obtained is .95, or 95 per cent. Interpreted, this means that the group is 95 per cent as variable on the second as on the first take.

H. Comparison of the Mewhinney and Hoke Tests for One Group

1. General Statement. A few comparisons of the results

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[36] $r = \frac{\Sigma xy}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}}$

of the Mewhinney and Hoke tests were made with a group of 47 students at Garfield during the school year 1930-1931. There were two withdrawals from the group so that complete data are available for only 45 cases. The Mewhinney test was given one day; the Hoke test the next.

This study can hardly be termed a measure of the reliability of the Mewhinney test, because the reliability of the Hoke test has not yet been proved. We may regard it merely as a limited experiment to determine whether or not there seems to be any possibility that higher contingency coefficients might be obtained from the Mewhinney test than from the Hoke test.

The raw scores and marks from this experiment are given in the Appendix.[39]

Table VIII shows the ranges, medians, means, standard deviations, the actual number of cases from the raw scores measured by ± one sigma from the mean, and the per cent of cases so measured.

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[37] $V = \frac{100}{Aver.}$ See Henry E. Garrett, op. cit., p. 41.

[38] This is a term used in connection with shorthand dictation.

[39] Appendix, pp. 82-93.

TABLE VIII

PARTIAL DATA USED IN THE COMPARISON OF THE MEWHINNEY AND HOKE TESTS FOR ONE GROUP

Take	Number of Cases	Score Range	Mdn. $\sigma_{mdn.}$	Mean $\sigma_{av.}$	SD σ	Number of Cases Within $\pm 1\sigma$	Per Cent[a]
Mewhinney	45	(140-274) 134	225.82 ±6.75	218.89 ±5.4	36.18 ±3.82	32	71.1
Hoke	45	(247-524) 277	422.75 ±11.91	414.62 ±9.53	63.84 ±6.73	30	66.6

[a]Per cent of cases measured from the mean ± one sigma.

2. Coefficients of Contingency. The coefficients of contingency figured for the two tests are as follows:

a. First-Year Marks:

(I) Mewhinney Test, .699 ± .051 PE

(II) Hoke Test, .609 ± .063 PE

b. First-Semester Marks:

(I) Mewhinney Test, .72 ± .048 PE

(II) Hoke Test, .636 ± .059 PE

It will be noticed that a slightly higher C and smaller probable error are found for the Mewhinney test than for the Hoke test with both first-year marks and first-semester marks. The question is: Would the Mewhinney test maintain a higher correlation than the Hoke test if the number of cases were greatly increased? This question can be answered only by

further experimentation.

It will also be noticed that the coefficient of contingency found for the Hoke test in this study is a higher correlation than the writer has been able to find reported for the Hoke test. A different procedure has been used by the writer, however, and the number of cases is small so no direct comparison can be made between the results of this study and reported studies of the Hoke test. Another question arises here: Does the Hoke test also tend to show higher correlations with smaller groups or with single school groups than with larger groups?

3. Coefficients of Variation. Coefficients of variation have been figured as a means of comparing the variability of the group on the two tests. V for the Mewhinney test is 16.52; V for the Hoke test is 15.39. If we divide 15.39 by 16.52 the result obtained is 93.1 per cent. Interpreted, this means that the Hoke test is 93.1 per cent as variable with this group of 45 cases as the Mewhinney test. The Mewhinney test was given first in this experiment. The question arises: Would that fact influence the variability? This is another question for further experimentation.

I. Predictive Value of the Mewhinney Test

1. Introductory Discussion. The purpose of a prognostic test is to predict or forecast. The object of a prognostic test of stenographic ability is, then, to predict stenographic ability. The degree to which it will predict or forecast measures its value as a test.

2. Per Cent of Subjects Rightly Placed. Table IX shows the cell frequencies from the study made of the entire group of data combined. It will serve in a rough way to estimate the forecasting efficiency of the test under consideration.

TABLE IX

CELL FREQUENCIES IN THE COMBINED GROUP STUDY OF THE MEWHINNEY TEST AND PER CENTS OF SUBJECTS RIGHTLY PLACED

School Marks	Scores					
	98-146	147-195	196-244	245-293	294-342	Totals
A			13 9.6%	13 16.6%	8 53.3%	34
B	1 7.1%	8 8.9%	30 22.2%	31 39.7%	4 26.6%	74
C	3 21.4%	27 30.3%	66 48.8%	27 34.6%	3 20%	126
D	3 21.4%	26 29.2%	20 14.8%	7 8.9%		56
F	7 50%	28 31.4%	6 4.4%			41
Totals	14	89	135	78	15	331

As the data now stand as a result of the combined group study of the Mewhinney test results, it seems that there is

only approximately a fifty-fifty chance of prediction at the upper and lower extremes and approximately a fifty-fifty chance of the subjects in the middle group of scores falling in the middle group of school marks.

If we examine the upper fifth of the scores, however, we find that 8/15, or 53.3 per cent, of the cases in this fifth are found to be in the top fifth for the entire group and have received a mark of "A" at the close of the first year of shorthand work. That is, the chances seem to be 53 in 100 that those falling in this group of scores will make "A" in shorthand. Of the other students making scores in the highest fifth, 4/15, or 26.6 per cent, received "B", and 3/15, or 20 per cent, received "C". Combining the "A" and "B" groups in the top fifth of the scores, we have 12/15, or 80 per cent, making either "A" or "B". The chances, then, seem to be 80 in 100 that students making scores in the top-score group, according to this study, will receive "A" or "B" marks. There are no "D's" or "F's" in this high-score group, so the chances are zero that any of these subjects will receive marks of "D" or "F". These results should be of some value.

If we examine the lowest fifth of the scores, we find that 7/14, or 50 per cent, are found to be in the lowest fifth for the entire group and received "F". That is, the chances seem to be 50 in 100 that students receiving scores in the lowest score group according to this study will fail in shorthand. Of the other students making scores in the low-

est fifth, 3/14, or 21.4 per cent, have received "D", 3/14, or 21.4 per cent, have received "C", and 1/14, or 7.1 per cent, have received "B". Combining the "D" and "F" groups in the low fifth of the scores, we have 10/14, or 71.4 per cent, making either "D" or "F". The chances, then, seem to be 71 in 100 that the students making scores in the lowest score group will receive "D" or "F". There is only one "B" mark in this low-score group. Could this have been saved by a retest? There are no "A's" in this group, so the chances seem to be zero for any one in this score group receiving "A" in shorthand. If, now, with further experimentation, a score could be found in the second from the lowest fifth, which would reasonably mark off "D's" and "F's", the value of the test would be increased somewhat. There are too many failures in the second lowest fifth.

3. The Index of Forecasting Efficiency. The per cent of subjects rightly placed is not a very reliable method. Hull[40] suggests a method of finding the forecasting efficiency of a test, when the correlation is known, by the formula:

$$E = 1 - \sqrt{1 - r^2}$$

This formula is derived from the coefficient of alienation radical ($\sqrt{1 - r^2}$) which is used to measure the absence of relationship. The writer has used an adaptation[41] of the above formula as follows:

$$E = 1 - \sqrt{.894 - C^2}$$

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[40] Clark L. Hull, Aptitude Testing (Yonkers-on-Hudson, New York: World Book Company, 1928), p. 268.

The substitution of .894 is made for 1 since the maximum value which a C can attain in a 5 x 5-fold classification is .894. C is substituted for "r" since C is regarded as practically equivalent to "r" in 5 x 5-fold or finer classifications.

Table X shows the forecasting efficiencies for the Mewhinney test in forecasting first-year shorthand marks. The efficiencies for the separate school groups run from 25 to 41 per cent. The efficiency for the entire group is 26 per cent.

TABLE X

FORECASTING EFFICIENCIES FOR THE MEWHINNEY TEST FOR FIRST-YEAR MARK STUDIES

School or Group	Number of Cases	C[a]	E[b]
Brazil	40	.713	38%
Clinton	50	.69	36%
Garfield '29	76	.697	37%
Garfield '30	62	.61	29%
Gerstmeyer	24	.615	29%
Greentown	11	.567	25%
Marshall	21	.737	41%
Wiley	47	.665	33%
Entire Group	331	.588	26%

[a]Coefficient of contingency. [b]Forecasting efficiency.

[41]This adaptation was suggested by Dr. J. W. Jones and approved by Dr. W. O. Shriner of the Indiana State Teachers College Faculty.

Table XI shows the forecasting efficiencies found for the special group studies made.

TABLE XI

FORECASTING EFFICIENCIES FOR SPECIAL GROUP STUDIES

Group Study	Number of Cases	C[a]	E[b]
First-Year Marks:			
Mew. repeated #1	39	.672	34%
Mew. repeated #2	39	.683	35%
Mew.-Hoke (Mew.)	45	.699	37%
Mew.-Hoke (Hoke)	45	.609	28%
First-Semester Marks:			
Garfield '30	62	.63	30%
Mew. repeated #1	39	.648	32%
Mew. repeated #2	39	.703	37%
Mew.-Hoke (Mew.)	45	.72	39%
Mew.-Hoke (Hoke)	45	.636	31%

[a]Coefficient of contingency. [b]Forecasting efficiency.

It will be noticed from the above table that the efficiency of the Mewhinney test has been raised from 34 to 35 per cent for first-year marks and from 32 to 37 per cent for first-semester marks by repeating the test with this group of 39 cases. The Mewhinney test shows a forecasting effi-

ciency of 37 per cent for first-year marks in comparison with 28 per cent for the Hoke test given to the same group of 45 subjects. For first-semester marks, the Mewhinney test shows an efficiency of 39 per cent and the Hoke test, an efficiency of 31 per cent for the same group.

According to Hull,[42] "the practical range of forecasting efficiency of modern psychological tests occupies the narrow zone between 10 and 30 per cent." He summarizes the value of "r" in the light of prediction as follows:

"Below .45 or .50, practically useless for differential prognosis

From .50 to .60, of some value

From .60 to .70, of considerable value

From .70 to .80, of decided value but rarely found

Above .80, not obtained by present methods."

In an article[43] in the Journal of Educational Psychology, Hull explains that an "r" must run up to .87 to be 50 per cent efficient and to .80 to be even 40 per cent efficient. He states that aptitude testing is probably doomed, forever, to an efficiency less than 50 per cent and possibly below 40 per cent. He says further that the lower limit of useful forecasting efficiency will vary with the expense of using the test.

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[42]Clark L. Hull, Aptitude Testing (Yonkers-on-Hudson, New York: World Book Company, 1928), pp. 275-276.

[43]Clark L. Hull and Charles E. Limp, "The Differentiation of the Aptitudes of An Individual by Means of Test Batteries," Journal of Educational Psychology, XVI (1925), p. 81.

[illegible] Appendix, pp. [illegible]

IV. THE CONCLUSION

A. Summary

With what degree of accuracy can the writer predict the probable success of high-school students in the study of shorthand by a test constructed by her?

1. An analysis has been made of the aptitude to be tested. The methods employed in this analysis are observations from the writer's experience as a teacher of shorthand and her own experience in learning, studying, and using the art, supplemented by the study of professional literature on the subject of shorthand.

2. A canvass has been made of available test material. The writer could find only one available test of stenographic ability at the time she began her study. This is the "Hoke Test of Stenographic Ability." The validity of this test has not been proved by any studies found by the writer.

The Hoke test has been studied carefully. The test is described in Section I of this thesis, pages 2 to 6, inclusive. Other test material has been examined in an effort to find suggestions for the construction of a new test. The suggestions secured have been acknowledged in the description of the new test in Section II, pages 11 to 18, inclusive.

3. A new test has been constructed. The test is described in Section II, pages 11 to 18. A copy of the test and a key to the test appear in the appendix.[1]

4. The writer secured permission to give the test in the

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[1] Appendix, pp. 69-81.

following high schools at the opening of the fall semester of the school year 1929-1930: Brazil, Clinton, Garfield (Terre Haute), Gerstmeyer (Terre Haute), Greentown, Marshall (Illinois), and Wiley (Terre Haute). Further experimentation was found necessary and permission was secured to give the test at Garfield at the opening of the fall semester of the school year 1930-1931.

Of the 344 tests given in the eight school groups,[2] because of withdrawals only 331 cases are carried through to the final results.

5. The checking and scoring of the tests are described in Section II, pages 21 and 22.

6. The data are analyzed into score ranges, medians, means, standard deviations, and the reliability of these measures. See pages 23 to 28.

7. Intercorrelations[3] of the sections of the test are reported for the largest group; namely, Garfield (1929).

8. The validity of the test has been checked by finding coefficients of contingency between the scores and first-year shorthand marks.

a. Contingency coefficients are given for each of the five sections of the test for the largest group; namely, the Garfield (1929) group of 76 cases. This is the same group for which the intercorrelations of the sections are

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[2]See page 21 of this study.

[3]See pages 28-30 of this study.

given. The five sections correlated with first-year marks by the contingency method yield coefficients of .504, .544, .57, .53, and .528 respectively. The test taken as a whole correlated with this particular school group yields a contingency coefficient of .697 with a probable error of ±.039.

b. Each school group is treated as a separate problem. The contingency coefficients and their probable errors found for these groups with first-year marks are as follows: Brazil, 40 cases, .713 ±.052; Clinton, 50 cases, .69 ±.049; Garfield (1929), 76 cases, .697 ±.039; Garfield (1930), 62 cases, .61 ±.053; Gerstmeyer, 24 cases, .615 ±.085; Greentown, 11 cases, .567 ±.138; Marshall, 21 cases, .737 ±.067; Wiley, 47 cases, .665 ±.054.

c. The data are grouped into one distribution of 331 cases. The contingency is .588 ±.024. This is lower than that of the separate school groups, with the exception of Greentown. The difference is accounted for by the change in scatter brought about by the presence of an extremely high score in one school group and an extremely low score in another.

9. As a side study, the coefficient of contingency between scores and first-semester marks is figured for one group, namely, the Garfield (1930) group of 62 cases. The coefficient is .63 ±.051. The coefficient for this same group for first-year marks is .61 ±.053. The slightly higher correlation and slightly lower probable error found for first-semester marks, while not conclusive because of

the limited study made of the problem, may be an indication of the possibility that scores from the test may correlate a little more highly with first-semester marks than with first-year marks. Further experimentation alone can determine this. The writer could not carry this study any farther as it had not been planned for and sufficient data were not available.

10. The reliability of the test was checked by repeating the test with one group of 41 students at Garfield in the fall of 1930. There were two withdrawals from the group so that complete data are available for only 39 cases. The reliability coefficient between the scores made on the two takes of the test are .872 with a probable error of ± .025.

Coefficients of contingency for this group are as follows:

a. First-Year Marks:

First take, .672 ± .059 PE

Second take, .683 ± .057 PE

b. First-Semester Marks:

First take, .648 ± .062 PE

Second take, .703 ± .054 PE

Coefficients of variation are given as a means of comparing the variability of the group on the two takes. The group is 95 per cent as variable on the second take as on the first take.

11. As a second side study, the Mewhinney and Hoke tests were given to one group of 47 students at Garfield in

the fall of 1930 and the results compared. There were two withdrawals from this group so that complete data are available for only 45 cases.

Coefficients of contingency for the two tests for this group are:

a. First-Year Marks:

Mewhinney test, .699 ± .051 PE

Hoke test, .609 ± .063 PE

b. First-Semester Marks:

Mewhinney test, .72 ± .048 PE

Hoke test, .636 ± .059 PE

A slightly higher C and smaller probable error have been found for the Mewhinney test than for the Hoke test with both first-year marks and first-semester marks for this group of 45 cases. This is a limited study, however, and the evidence can not be taken as conclusive. The question is: Would the Mewhinney test maintain a higher correlation than the Hoke test if the number of cases were greatly increased? This question can be answered only by further experimentation. The writer lacked sufficient data to carry the study further.

The correlation secured for the Hoke test with this group is higher than any the writer has been able to find reported. Another question arises: Does the Hoke test also tend to show higher correlations for small groups or for single school groups than for large groups?

Coefficients of variation are given as a means of comparing the variability of the group on the two tests. This group is 93.1 per cent as variable on the Hoke test as on

the Mewhinney test. The Mewhinney test was given first. Could the practice effect resulting from this procedure have influenced the variability?

12. The Mewhinney test has been found to predict the probable success of high-school students in the study of shorthand with the following efficiencies:[4]

a. With data treated separately for the separate school groups with first-year marks, the forecasting efficiencies are as follows: Brazil, 38 per cent; Clinton, 36 per cent; Garfield 1929 group, 37 per cent; Garfield 1930 group, 29 per cent; Gerstmeyer, 29 per cent; Greentown, 25 per cent; Marshall, 41 per cent; and Wiley, 33 per cent.

b. With data grouped into one distribution of 331 cases with first-year marks and a contingency coefficient of .588, a forecasting efficiency of 26 per cent is found. This throws the test near the top of the 13 to 30 per cent zone, or the "range of useful forecasting efficiencies of modern aptitude test batteries", as given by Hull.[5] The test would, then, be considered of some value.

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[4] The forecasting efficiencies in this study were found by the formula, $E = 1 - \sqrt{.894 - C^2}$, which is an adaptation of the Hull formula, $E = 1 - \sqrt{1 - r^2}$, made by Dr. J. W. Jones and Dr. W. O. Shriner to fit the contingency coefficients used in this study instead of "r".

[5] Clark L. Hull, Aptitude Testing (Yonkers-on-Hudson, New York: World Book Company, 1928), p. 274.

c. With special group studies too limited to be of great value, the forecasting efficiencies run as shown in Table XI, page 54. It will be noticed, however, that the efficiency of the Mewhinney test has been raised from 34 to 35 per cent for first-year marks and from 32 to 37 per cent for first-semester marks by repeating the test with a group of 39 cases. The Mewhinney test shows a forecasting efficiency of 37 per cent for first-year marks in comparison with 28 per cent for the Hoke test given to the same group of 45 subjects. For first-semester marks, the Mewhinney test shows an efficiency of 39 per cent while the Hoke test shows an efficiency of 31 per cent for the same group.

B. Statement of the Contribution

1. A second prognostic test of stenographic ability has been made available for further study in this field.

2. The test has been found to fall in the zone in which aptitude tests are considered of some value. Although not perfected to the extent to exclude students from taking up the study of shorthand, it may be found of value in diagnosing some of the weaknesses of the students in beginning shorthand classes and thus assist the teacher in planning, more effectively, his teaching procedures.

3. An adaptation of Hull's forecasting efficiency formula, suggested by Dr. Jones and Dr. Shriner, has been used in the study.[6]

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[6] See Section IV, page 61 of this thesis.

C. Limitations

1. The experimentation in this study has been limited to classes studying Gregg shorthand.

2. The study has been limited to eight school groups.

3. The subjective element entered into the construction of the new test since it was necessary to draw upon personal opinion based upon experience and observation in the choice of material.

4. The study has been limited by the writer's experience in the field of testing.

5. It has been limited by time. The writer did not have time to test out the separate sections of the test before incorporating them in the test.

6. Section 4 of the test (memorization and use of symbols) is probably limited by failure of the author to provide for practice effect by a few minutes drill upon the symbols before beginning this section. The scores run low upon this section.

7. The special side studies made of first-semester marks, repetition of the Mewhinney test, and comparison of the Mewhinney and Hoke tests have all been limited by insufficient numbers of cases.

8. The entire study has been limited by the unreliability of school marks, due to the fact that there are no good objective tests of shorthand achievement.

9. One measure is not enough to use in prediction; a combination is needed.

D. Suggestions for Further Experimentation

1. Section 4 of the test might be improved by providing for a short practice period preceding this section.

2. The results of section 5 could be checked to determine the difficulty of the various items and these rearranged according to difficulty.

3. The test might be weighted so that it would yield a higher correlation.

4. A study of the intercorrelations of sections of the Hoke test and of the correlations of these sections with grades made in shorthand in comparison with a similar study of the Mewhinney test might yield suggestions for the improvement of one or both of the tests, or for the construction of a new test.

5. If some improvement or change is made in the Mewhinney test, further studies could be made of correlations with first-semester marks. As the test stands, it is doubtful whether further studies of correlations with first-semester marks would increase the forecasting efficiency enough to pay for the expense and time required for the study.

6. There is need for some valid and reliable achievement tests for the revised Gregg Shorthand Manual. With some good achievement tests to help control the reliability of school marks, more might be accomplished in the field of shorthand aptitude testing.

The writer should like to attempt some improvements in her test and the construction of some achievement tests.

V. APPENDIX

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B. The Test

1. The Teacher's Copy

TO THE TEACHER:

1. "PRACTICE PRELIMINARY to the STUDY of SHORTHAND" has been used instead of the word, test, on the students' copies in an attempt to avoid making them unduly nervous.

2. Students may be instructed by the teacher to fill in the blanks on the first or cover page as quickly as possible, to read the instructions at the bottom of that page, to raise their pencils as soon as <u>any</u> page has been completed or the teacher has called time, and <u>not</u> to turn a page until instructed to do so.

3. The attention of the students may be called to the fact that the upper left corners of the sheets have been creased so that each sheet may be turned back under the copy.

4. It might be well to suggest to students that if there is not enough writing space for Section 1 (sheet 2) the back of the cover page may be used also.

5. There should be <u>no</u> repetition of material dictated in Section 2. You will find the teacher's copy of Section 2 attached to this sheet. The student's copy is a blank sheet of paper.

6. Students should <u>not</u> be assisted in interpreting the instructions and illustrations in the test, since their ability to understand and follow instructions is one of the faculties being tested. They should be allowed time for reading the instructions, however, before beginning the timing of <u>each</u> test.

7. TIMING:

   a.
   Cover page.....no time limit
   Section 1 ..... 2 minutes
   " 2 .....no time limit
   " 3 ..... 3 minutes
   " 4 ..... 3 minutes
   " 5 ..... 4 minutes

   b. If a STOP WATCH is NOT AVAILABLE for giving this test, any good watch with a second hand may be used. Please note here whether or not you have used a stop watch_____and return this sheet with the test copies.

   c. <u>No</u> overtime should be allowed on the timed sections of the test as speed is another of the factors involved.

8. See students' instructions also.

Section 2

INSTRUCTIONS TO BE READ TO STUDENTS: Hold your pencils in the air until I stop reading; then write ALL YOU CAN REMEMBER OF THE LINE OR SENTENCE which has been read. Do not ask to have the matter repeated. AS SOON AS YOU have finished writing, raise your pencil into the air again.

You need not make any paragraph or other indentations or put in any commas. Look up so that I shall know when you have finished writing.

(No time limit)

GET READY! Listen!

Mr. E. E. Brown, 21 E. Washington Street, Indianapolis, Indiana,
Dear Sir: 13

(Wait until students have written this.)

We have just received your letter regarding error in our invoice of September 3. 27

We are extremely sorry that the error occurred, but assure you that it will be corrected immediately. 44

Messrs. Smith and Smith, Sullivan, Indiana, Gentlemen: 51

You will find enclosed invoices for orders numbers 573* and 574.* 66

You will notice that stock No. 5976** on the first invoice has been marked "out of stock". 86

We have deducted the amount of this item from the invoice total and are enclosing a credit memorandum for the amount. 107

NOTICE DICTATOR! Do not break the lines or sentences into sections. Read the entire line or sentence before the students begin to write. A "line or sentence" means a section of the letter as it has been separated here; e. g., The first line to be dictated includes the address and salutation.

---

* Read "five-seven-three and five-seven-four".

**Read "five-nine-seven-six".

2. The Student's Copy

PRACTICE PRELIMINARY TO THE STUDY OF SHORTHAND

SCORE _____ _____
First Checking Second Checking

INSTRUCTIONS: FILL IN the BLANKS on this PAGE as quickly as possible.

NAME _____ DATE _____ 19___
(Last name) (First name)

BOY or GIRL _____ AGE on last birthday _____ HOW many months ago? _____

NATIONALITY of YOUR MOTHER _____ YOUR FATHER _____

NAME of CITY or TOWN _____ STATE _____

NAME of SCHOOL _____ CLASS _____
(Soph., Jr., Sr.)

HOW LONG have you been in high school? _____ DO YOU expect to FINISH high school? _____ IF NOT, for how many years do you expect to REMAIN in high school? ____ IF YOU expect to LEAVE school, place a check mark (✓) in the blank following the reason for leaving school:
(yes or no)

(1) Do not like school work..... ____
(2) Cannot afford to continue in school..... ____
(3) Parents do not want me to remain in school ____
(4) Write in any other reason _____

WHAT DO YOU plan to do when your high-school days are over? (Every one answer this.) _____

HAVE YOU ever failed to be promoted in the grade schools? _____ HAVE YOU ever failed to pass at the end of the semester or at the end of the year in ONE high-school subject? _____ In MORE THAN ONE high-school subject? _____
(yes or no) (yes or no) (yes or no)

INSTRUCTIONS: DO NOT turn the page until instructed to do so by the teacher, or dictator.

AS SOON AS you finish a page, RAISE YOUR PENCIL HAND in the air. You may rest your elbow on the desk, but do not lower your pencil until the teacher says, Ready--GO! WHEN the TEACHER says: STOP! raise your pencil in the air again but DO NOT turn the page--WAIT.

Section 1

INSTRUCTIONS: Keep your pencil in the air while you read these instructions. You will find below sections from two business letters. When the teacher says; "Ready--GO!", begin to copy them. (Write--do not print.) Write until the teacher instructs you to stop. Raise your pencil in the air on the word, "STOP!" DO NOT WRITE TOO LARGE.

We have twice called your attention to the fact that your account is long past due. If this account is not paid in full by the first of the month, your service will be discontinued at once. In this case, it will be necessary for us to remove the meter.

You will find enclosed a check for ten dollars to cover the balance of my account. I have given the machine a thorough trial and have found it to be entirely satisfactory in every respect. I shall be glad for your company to use my name in its future advertisements.

Section 2

Section 3

INSTRUCTIONS: Mark the following paragraphs off in words as shown at the beginning of the first paragraph, below, capitalize words which should be capitalized, and insert the proper marks of punctuation. Keep your pencil raised until the teacher says, "Ready--GO!"

"thegreatgorgeofthelowerniagarariverisoneofthemostmagnificent examplesoferosiontobefoundinamericaitsalmostverticalpalisades itsriotingrapidsitsvaricoloredwatersitssurgingwhirlpoolits jaggedrocksallmakeafantasticpicturetoorealisticandstupendous evertobeerasedfromthememoryofthevisitorthegrindingawayofthe rockbytheceaselessrushingwatershasbeengoingonthroughtheages geologistsestimatingthatithastaken36000yearsforthefallsto recedefromtheescarpmentatqueenstonandlewistontotheirpresent location "

"aboutamilebelowtherailroadbridgestherivertakesanabruptturn atrightanglesandformsthefamouswhirlpoolthisgreatbasinsome60 acresinextentliesatthefootoffrowningtoweringcliffsthecurrent oftheriverenteringthewhirlpoolswingsaboutandonitswayoutpass- esunderneaththeenteringcurrentthedepthofthewhirlpoolisesti- matedat200feetalthoughexactsoundingsareimpossibleathrilling thoughsafesidetripmaybemadeviathespanishaerocarwhichcrosses thewhirlpool150feetabovethemaelstromthisisthelongestand safestaerialcablewayintheworld "

Section 4

INSTRUCTIONS: Copy the letters given below, substituting for the letters, a, d, t, m, n, the following symbols: (Do not print--WRITE the letters or symbols.)

SYMBOLS: a, o d, / t, / m, — n, —

SAMPLE:

a c r l t f m
x n z s u y d

o c r l / f —
x — z s u y /

d f y u m t e x p r z i q v n e k a o c y l x t b u q w e y

u i m o p t r a s d l k j n f g h z a x c v p z b r q a o l

m i k d e c w s x u j n f g h t j e k i o l p f h j k y t q

z i a u w r c b s n z x c h u b t x l y c o a k e n v q i z

r p x c t m u y f d v c x a z h g f n j k l d s a r t p o m

i u y e w q e j t h g f n j u x s w c e d k i m l o a q r b

z p h c x z m s b c r w u a l z q x y k t d j h f p a u v c

h d q p a b c j c f w z p f b e y x t y t

Section 5

INSTRUCTIONS: Read each sentence and cross out the incorrect word. Do not guess. Do not answer the questions.

1. Hear, Here are the sentences.
2. May I see to, too?
3. Please accept, except our apology for the error.
4. What coarse, course are you taking in high school?
5. Two words have been ommitted, omitted.
6. The corps, corpse has been prepared for burial.
7. The ability to adopt, adapt oneself to circumstances is valuable.
8. There seems to be no cessation, secession of controversies.
9. Would you judge his mind to be accessible, accessable to reason?
10. Proceed, Procede with the case!
11. Alright, All right, ready, go!
12. Most people dislike adverse, averse criticism.
13. The soap comes packed with twenty-four bars in each cartoon, carton.
14. How are parcel, partial payments recorded?
15. I looked at him but his face would reveal, revel nothing.
16. One chapter is devoted to the principles, principals of phrasing.
17. The employees are provided with seperate, separate lockers.
18. These papers belong in the miscelaneous, miscellaneous file.
19. This is the nineteenth, ninteenth sentence.
20. The neglected molar resulted in a suppuration, suppression.
21. The decent, descent proved to be quite steep.
22. When heated, air expends, expands.
23. The diseased, deceased leaves a widow and three children.
24. I am sorry to notify you, but your annul, annual interest is due.
25. Her record in this institution has been very credible, creditable.
26. An allusion, illusion is psychologically a misleading perception.
27. What affect, effect do you think the change in policy will have?
28. Their clients had already, all ready been notified.
29. An analyses, analysis is not always an easy matter.
30. Would it be convenient for him to go with her and I, me?
31. Whom, Who are you looking for?
32. Of the two, I like this one best, better.
33. The deter, debtor is hopelessly insolvent.
34. It is impossible to make the petition, partition soundproof.

(Continued on the next page.)

Section 5 Continued[1]

35. Such a concession is made occasionally, ocasionally.
36. He did not fulfill, fullfil his part of the agreement.
37. The bookkeeper neglected to give me a recipe, receipt.
38. Our supply of stationery, stationary is getting low.
39. The address by the imminent, eminent speaker was not appreciated.
40. I have spoken to that person, party several times.
41. She was anxious, eager to go.
42. They are students of, in Indiana University.
43. He is light complected, complexioned.
44. Those homes are luxuriant, luxurious.
45. Did they suspicion, suspect her?
46. The woman seemed trully, truly repentant.
47. Your enquiry was sent to the maintenence, maintenance department.
48. The addresses of my correspondence, correspondents are varied.
49. Can he coroborate, corroborate that statement?
50. It is very disappointing, disapointing, indeed.

HAND IN YOUR PAPER

---

[1]In the original test, Section 5 was on one page and each sentence was but a single line in length so that the eyes would not have to travel back when reading.

C. Key for the Test

Section 1:

No key is needed for Section 1. There are fifty words in each paragraph. The score is one-half of the number of words written.

(It is suggested that, when checking this section and the following sections, the section scores be written in the lower right corner of each sheet.)

Students may help in checking this section.

Section 2:

Page two of the Teacher's Copy will serve as a key to Section 2.

The numbers at the end of each section of the dictation represent the number of words to that point.

The score is the number of correct words. Do not mark misspelled words as errors.

Section 3:

The key to Section 3 is counted off in groups of ten words. The end of each line of the test is indicated in the key by an oblique bar.

Some choice in punctuation may be permitted in checking this section. In the first sentence, the word "river" need not be capitalized. In the second sentence, semicolons may be used instead of commas to separate the phrases and a dash might be used after the word "rocks".

Students may help in the checking of this section.

Key for Section 3

"The Great Gorge of the Lower Niagara River is one[10] of the most magnificent/ examples of erosion to be found[20] in America. Its almost vertical palisades,/ its rioting rapids, its[30] varicolored waters, its surging whirlpool, its/ jagged rocks, all make[40] a fantastic picture too realistic and stupendous/ ever to be[50] erased from the memory of the visitor. The grinding away[60] of the/ rock by the ceaseless, rushing waters has been[70] going on through the ages,/ geologists estimating that it has[80] taken 36,000 years for the falls to/ recede from the[90] escarpment at Queenston and Lewiston to their present/ location."[2] (99)

"About[100] a mile below the railroad bridges the river takes an[110] abrupt turn/ at right angles and forms the famous whirlpool.[120] This great basin, some 60/ acres in extent, lies at[130] the foot of frowning, towering cliffs. The current/ of the[140] river entering the whirlpool swings about, and, on its way[150] out, pass/es underneath the entering current. The depth of the[160] whirlpool is esti/mated at 200 feet, although exact soundings are[170] impossible. A thrilling,/ though safe, side trip may be made[180] via the Spanish Aero Car, which crosses/ the whirlpool 150[190] feet above the maelstrom. This is the longest and/ safest[200] aerial cableway in the world."[3] (205)

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[2] Folder of the Niagara Gorge Belt Line (Niagara Falls, New York: n. d.), p. 6.

[3] Ibid., p. 7.

Key for Section 4

```
1      5 6                15    18          24
d f y u m t e x p r z i q v n e k a o c y l x t b u q w e y-- 6

   3     6   8  10      14        19                  28
u i m o p t r a s d l k j n f g h z a x c v p z b r q a o l--13

1    4              12      16                          29
m i k d e c w s x u j n f g h t j e k i o l p f h j k y t q--18

   3              10              17          23    26
z i a u w r c b s n z x c h u b t x l y c o a k e n v q i z--23

       5 6      10      14        19      23  25  27    30
r p x c t m u y f d v c x a z h g f n j k l d s a r t p o m--32

                 9     13                21    24    27
i u y e w q e j t h g f n j u x s w c e d k i m l o a q r b--37

            7              14            2122        27
z p h c x z m s b c r w u a l z q x y k t d j h f p a u v c--42

  2    5                              19  21
h d q p a b c j c f w z p f b e y x t y t                --46
```

The numbers above the letters represent the positions for the symbol substitutions in each line. The numbers at the ends of the lines represent the number of symbols to those points.

In checking, count the letters across, and check nothing but the symbol substitutions. The symbols have not been written in because it is assumed that this section will be checked by one who knows the shorthand symbols for these letters.

Count shorthand omissions as errors.

Penalize for the writing of shorthand characters only. Penalty--1/5 of the score made.

Count an error if the circle for "a" is entirely too small.

To score, use the figures at the right ends of the lines, and subtract the number wrong.

Key for Section 5

The correct words--the words not crossed out.

1. Here
2. too
3. accept
4. course
5. omitted
6. corpse
7. adapt
8. cessation
9. accessible
10. Proceed
11. All right
12. adverse
13. carton
14. partial
15. reveal
16. principles
17. separate
18. miscellaneous
19. nineteenth
20. suppuration
21. descent
22. expands
23. deceased
24. annual
25. creditable
26. illusion
27. effect
28. already
29. analysis
30. me
31. whom
32. better
33. debtor
34. partition
35. occasionally
36. fulfill
37. receipt
38. stationery
39. eminent
40. person
41. eager
42. in
43. complexioned
44. luxurious
45. suspect
46. truly
47. maintenance
48. correspondents
49. corroborate
50. disappointing

(To check, place a circle around the number of the sentence in which the error occurs.)

(The score is the number of correct choices.)

(Write the score on the lower right-hand corner of the page.)

D. Tables Showing Individual Scores and Marks

TABLE XII

RAW SCORES AND MARKS FOR BRAZIL

Student	Score	Original Mark[a]	Changed Mark[b]	Student	Score	Original Mark[a]	Changed Mark[b]
1...	341	E+	A	21...	252	E+	A
2...	319	E+	A	22...	251	E+	A
3...	306	E+	A	23...	249	E	B
4...	300	G+	C	24...	248	E+	A
5...	300	E	B	25...	248	E+	A
6...	299	E	B	26...	245	E	B
7...	295	E+	A	27...	244	E	B
8...	292	E	B	28...	243	G+	C
9...	288	E	B	29...	242	G+	C
10...	283	E	B	30...	237	E+	A
11...	279	E+	A	31...	236	E	B
12...	279	E+	A	32...	236	G	C
13...	276	E+	A	33...	234	G+	C
14...	272	G+	C	34...	229	G	C
15...	267	E	B	35...	228	E	B
16...	264	E	B	36...	227	P	D
17...	264	G+	C	37...	225	E	B
18...	260	G+	C	38...	218	G	C
19...	258	G	C	39...	217	E+	A
20...	256	E+	A	40...	217	E	B

[a] Brazil Grading Scale:
E+--95-100
E --90-95
G+--85-90
G --80-85
P --75-80
F --Below 75

[b] Changed to A, B, C, D, and F:
A --95-100
B --90-94
C --80-89
D --75-79
F --Below 75

TABLE XIII

RAW SCORES AND MARKS FOR CLINTON

Student	Score	Original Mark	Changed Mark[a]	Student	Score	Original Mark	Changed Mark[a]
1...	319	93	B	29...	218	83	C
2...	298	W[b]		30...	216	87	C
3...	295	88	C	31...	213	86	C
4...	288	94	B	32...	211	87	C
5...	278	91	B	33...	210	87	C
6...	272	90	B	34...	208	80	C
7...	269	86	C	35...	208	86	C
8...	264	86	C	36...	208	87	C
9...	261	82	C	37...	201	85	C
10...	260	88	C	38...	201	W	
11...	250	91	B	39...	201	80	C
12...	249	75	D	40...	199	82	C
13...	246	88	C	41...	197	89	C
14...	246	83	C	42...	193	87	C
15...	243	84	C	43...	190	89	C
16...	241	92	B	44...	190	79	D
17...	241	92	B	45...	190	90	B
18...	239	89	C	46...	179	71	F
19...	238	W		47...	169	70	F
20...	238	83	C	48...	166	86	C
21...	236	88	C	49...	165	79	D
22...	234	83	C	50...	162	76	D
23...	231	89	C	51...	157	86	C
24...	229	80	C	52...	153	77	D
25...	229	90	B	53...	152	W	
26...	225	85	C	54...	140	W	
27...	219	80	C	55...	107	69	F
28...	218	94	B				

[a] A--95-100
B--90-94
C--80-89
D--75-79
F--Below 75

[b] W--Withdrawn

TABLE XIV

RAW SCORES AND MARKS FOR GARFIELD (1929)

Student	Score	Mark	Scores on Sections				
			I	II	III	IV	V
1...	324	A	40	95	114	29	46
2...	291	A	36	95	90	22	48
3...	278	B	28	102	82	19	47
4...	269	D	35	79	79	30	46
5...	268	C	33	98	83	14	40
6...	267	C	27	98	82	21	39
7...	263	B	26	102	76	16	43
8...	260	C	25	98	67	25	45
9...	259	B	33	94	78	16	38
10...	258	D	28	83	82	20	45
11...	255	B	31	94	65	25	40
12...	254	C	25	99	79	10	41
13...	249	C	31	101	67	10	40
14...	249	B	30	99	63	14	43
15...	247	A	24	89	84	16	34
16...	247	C	31	91	73	20	32
17...	245	C	32	87	71	14	41
18...	244	C	29	96	59	19	41
19...	244	A	33	74	82	19	36
20...	241	C	33	93	50	22	43
21...	240	B	23	87	83	15	32
22...	238	C	36	89	59	17	37
23...	238	D	31	92	84	0	31
24...	237	C	31	81	70	18	37
25...	234	D	25	87	74	14	34
26...	234	B	35	84	44	33	38
27...	229	C	25	75	76	14	39
28...	227	C	31	90	53	27	26
29...	226	A	25	87	41	27	46
30...	224	A	21	99	63	4	37
31...	223	D	30	84	63	19	27
32...	222	D	25	79	70	15	33
33...	221	D	27	76	73	19	26
34...	215	C	33	70	65	4	43
35...	215	D	23	80	63	13	36
36...	213	D	30	83	57	9	34
37...	211	D	26	75	67	0	43
38...	211	D	27	87	64	0	33
39...	210	D	7	78	70	14	41
40...	210	D	25	70	65	19	31
41...	210	F	22	83	51	18	36

TABLE XIV. (Continued)

42...	209	D	29	87	59	13	21
43...	208	C	30	75	77	2	24
44...	205	D	34	83	47	4	37
45...	201	D	28	86	47	15	25
46...	201	D	17	88	63	5	28
47...	201	C	24	90	33	20	34
48...	201	F	24	85	54	10	28
49...	198	W	32	80	51	6	29
50...	198	D	35	92	37	3	31
51...	198	C	29	79	35	22	33
52...	196	C	31	77	34	25	29
53...	195	F	22	75	50	6	42
54...	193	F	28	83	35	16	31
55...	192	F	19	86	52	15	20
56...	189	F	19	94	35	6	35
57...	186	C	22	78	60	6	20
58...	185	F	31	85	33	2	34
59...	182	D	22	77	44	14	25
60...	181	C	33	72	37	15	24
61...	181	F	13	82	30	25	31
62...	179	F	14	73	59	10	23
63...	178	D	24	78	41	0	35
64...	178	F	18	70	49	9	32
65...	177	C	25	62	48	12	30
66...	175	F	26	87	30	0	32
67...	170	F	17	72	44	16	21
68...	170	F	32	70	38	5	25
69...	170	B	25	86	10	16	33
70...	168	F	30	69	31	4	34
71...	167	F	36	75	26	14	24
72...	166	F	30	85	37	0	14
73...	152	D	22	68	23	17	22
74...	147	F	26	69	34	1	17
75...	147	F	29	62	40	0	16
76...	144	F	24	72	31	0	17
77...	144	F	20	66	38	3	17

TABLE XV

RAW SCORES AND MARKS FOR GARFIELD (1930)

Student	Score	First-Semester Mark	First-Year Mark
1...	274	A	A
2...	270	A	B
3...	268	A	B
4...	267	C	D
5...	264	B	B
6...	261	B	B
7...	252	C	D
8...	251	C	C
9...	250	C	D
10...	249	B	B
11...	249	C	C
12...	249	B	B
13...	249	B	C
14...	247	C	C
15...	242	C	C
16...	241	B	C
17...	240	B	C
18...	239	W	
19...	237	A	B
20...	236	B	B
21...	234	D	F
22...	234	A	A
23...	229	WF[a]	F
24...	226	A	B
25...	226	D	D
26...	225	C	C
27...	225	B	C
28...	225	C	C
29...	224	F	F
30...	223	W	
31...	222	D	C
32...	222	W	
33...	221	B	B
34...	216	B	C
35...	216	C	C
36...	215	D	C
37...	214	C	C
38...	213	C	C
39...	210	C	C
40...	209	C	C

TABLE XV. (Continued)

41...	209	D	D
42...	206	A	A
43...	200	C	C
44...	195	C	C
45...	194	C	B
46...	194	W	
47...	193	C	C
48...	191	C	C
49...	187	D	D
50...	184	F	F
51...	183	D	D
52...	182	D	D
53...	181	C	C
54...	176	C	C
55...	172	D	D
56...	172	F	F
57...	169	B	C
58...	167	W	
59...	165	F	F
60...	162	WF	WF
61...	159	F	F
62...	159	D	C
63...	155	F	F
64...	145	F	F
65...	144	WF	WF
66...	140	D	D
67...	135	C	C

[a] WF--Withdrawn because of failure

TABLE XVI

RAW SCORES AND MARKS FOR MEWHINNEY TEST REPEATED (FIRST TAKE)

Student	Score	First-Semester Mark	First-Year Mark
1...	270	A	B
2...	268	A	B
3...	264	B	B
4...	261	B	B
5...	252	C	D
6...	251	C	C
7...	250	C	D
8...	249	B	B
9...	242	C	C
10...	241	B	C
11...	240	B	C
12...	237	A	B
13...	236	B	B
14...	234	D	F
15...	229	WF	WF
16...	226	A	B
17...	225	C	C
18...	225	C	C
19...	216	B	C
20...	214	W	
21...	213	C	C
22...	210	C	C
23...	209	C	C
24...	209	D	D
25...	194	W	
26...	193	C	C
27...	191	C	C
28...	187	D	D
29...	184	F	F
30...	183	D	D
31...	182	D	D
32...	181	C	C
33...	176	C	C
34...	172	D	D
35...	172	F	F
36...	169	B	C
37...	165	F	F
38...	159	WF	F
39...	155	F	F
40...	145	WF	F
41...	135	C	C

TABLE XVII

RAW SCORES AND MARKS FOR MEWHINNEY TEST REPEATED (SECOND TAKE)

Student	Score	First-Semester Mark	First-Year Mark
1...	330	A	B
2...	321	B	B
3...	318	B	C
4...	315	A	B
5...	312	B	B
6...	303	C	D
7...	302	A	B
8...	302	B	B
9...	296	C	C
10...	293	B	C
11...	289	C	C
12...	284	A	B
13...	281	B	C
14...	281	B	B
15...	274	C	C
16...	273	C	C
17...	268	WF	WF
18...	260	D	F
19...	260	C	C
20...	259	C	C
21...	254	C	C
22...	253	D	D
23...	251	W	
24...	250	C	D
25...	249	W	
26...	249	C	C
27...	248	C	C
28...	243	D	D
29...	241	C	C
30...	238	D	D
31...	237	F	F
32...	235	D	D
33...	230	C	C
34...	228	D	D
35...	197	F	F
36...	190	B	C
37...	184	C	C
38...	184	F	F
39...	175	F	F
40...	168	F	F
41...	166	F	F

TABLE XVIII

RAW SCORES AND MARKS FOR MEWHINNEY--HOKE GROUP (MEWHINNEY TEST)

Student	Score	First-Semester Mark	First-Year Mark
1...	274	A	A
2...	268	A	B
3...	267	C	D
4...	264	B	B
5...	261	B	B
6...	252	C	D
7...	250	C	D
8...	249	B	B
9...	249	C	C
10...	249	B	B
11...	249	B	C
12...	247	C	C
13...	241	B	C
14...	240	B	C
15...	237	A	B
16...	236	B	B
17...	234	A	A
18...	229	WF	WF
19...	226	D	D
20...	225	C	C
21...	225	B	C
22...	225	C	C
23...	224	F	F
24...	222	D	C
25...	222	W	
26...	221	B	B
27...	216	C	C
28...	215	D	C
29...	214	W	
30...	213	C	C
31...	210	C	C
32...	209	D	D
33...	206	A	A
34...	200	C	C
35...	195	C	C
36...	194	C	C
37...	194	C	B
38...	187	D	D
39...	183	D	D
40...	172	D	D
41...	165	F	F
42...	162	WF	WF
43...	159	F	F
44...	159	D	C
45...	155	F	F
46...	144	WF	WF
47...	140	D	D

TABLE XIX

RAW SCORES AND MARKS FOR MEWHINNEY--HOKE GROUP (HOKE TEST)

Student	Score	First-Semester Mark	First-Year Mark
1...	524	A	A
2...	513	B	B
3...	501	B	C
4...	495	A	B
5...	486	B	B
6...	485	C	C
7...	481	B	B
8...	479	B	B
9...	472	C	C
10...	468	B	B
11...	468	A	A
12...	465	B	B
13...	462	A	A
14...	458	D	C
15...	453	B	C
16...	441	C	D
17...	440	C	D
18...	439	C	C
19...	437	D	D
20...	435	B	C
21...	430	WF	WF
22...	427	C	C
23...	426	C	C
24...	424	WF	WF
25...	417	W	
26...	415	D	C
27...	413	C	C
28...	411	F	F
29...	407	C	B
30...	406	B	C
31...	400	A	B
32...	393	C	C
33...	388	C	C
34...	382	C	C
35...	378	D	D
36...	375	C	C
37...	370	D	D
38...	365	C	D
39...	365	D	D
40...	339	D	D
41...	328	D	C
42...	318	W	
43...	312	F	F
44...	292	F	F
45...	285	D	D
46...	282	F	F
47...	247	F	F

TABLE XX

RAW SCORES AND MARKS FOR GERSTMEYER

Student	Score	Mark	Student	Score	Mark
1...	268	B	13...	168	B
2...	230	B	14...	165	D
3...	229	B	15...	158	D
4...	225	A	16...	156	C
5...	219	B	17...	154	C
6...	201	C	18...	154	F
7...	197	B	19...	151	D
8...	189	C	20...	144	C
9...	186	C	21...	133	B
10...	185	D	22...	125	D
11...	184	D	23...	115	C
12...	169	D	24...	98	D

TABLE XXI

RAW SCORES AND MARKS FOR GREENTOWN

Student	Score	Mark
1...	233	C
2...	207	A
3...	206	A
4...	205	A
5...	205	C
6...	205	B
7...	199	C
8...	195	C
9...	186	C
10...	179	C
11...	177	C

TABLE XXII

RAW SCORES AND MARKS FOR MARSHALL

Student	Score	Mark	Student	Score	Mark
1...	323	C	13...	241	C
2...	307	A	14...	227	B
3...	273	C	15...	216	B
4...	268	W	16...	215	C
5...	267	B	17...	215	C
6...	264	C	18...	212	C
7...	261	B	19...	208	B
8...	259	C	20...	196	WF
9...	251	C	21...	191	W
10...	250	C	22...	187	C
11...	249	C	23...	179	D
12...	243	B			

TABLE XXIII

RAW SCORES AND MARKS FOR WILEY

Student	Score	Mark	Student	Score	Mark
1...	297	A	25...	208	C
2...	296	B	26...	205	B
3...	295	A	27...	204	B
4...	281	A	28...	195	B
5...	275	B	29...	195	C
6...	271	B	30...	193	D
7...	270	B	31...	189	B
8...	261	D	32...	188	D
9...	260	A	33...	185	B
10...	258	B	34...	183	D
11...	253	B	35...	182	C
12...	252	B	36...	181	D
13...	243	C	37...	180	B
14...	243	C	38...	177	D
15...	239	D	39...	174	C
16...	232	B	40...	171	F
17...	232	B	41...	167	F
18...	231	B	42...	163	D
19...	226	A	43...	159	F
20...	225	C	44...	156	D
21...	224	B	45...	147	D
22...	217	A	46...	129	WF
23...	210	C	47...	116	WF
24...	209	C			