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A Comparison of Mean Correct-Words-A-Minute Scores Achieved by Beginning Typewriting Students Taught by Two Different Methods

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A COMPARISON OF MEAN CORRECT-WORDS-A-MINUTE
SCORES ACHIEVED BY BEGINNING
TYPEWRITING STUDENTS TAUGHT
BY TWO DIFFERENT
METHODS

by

Yvonne L. Marquard

August, 1969

This paper presents a comparison of the mean correct-words-a-minute scores achieved by two groups of beginning typewriting students, those with I.Q.s of 90-107 and those with I.Q.s of 112-130, during the year 1968-1969 at Eisenhower High School on five-minute writings after twelve, twenty-four, and thirty-six weeks of instruction when using two different methods and materials presented by two different textbooks.

There was no significant difference between the achievement of the two groups.

A COMPARISON OF MEAN CORRECT-WORDS-A-MINUTE
SCORES ACHIEVED BY BEGINNING
TYPEWRITING STUDENTS TAUGHT
BY TWO DIFFERENT
METHODS

A Thesis
Presented to
The Graduate Faculty
Central Washington State College

In Partial Fulfillment
of the Requirements for the Degree
Master of Education

by
Yvonne L. Marquard
August, 1969

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A C K N O W L E D G M E N T S

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CHAPTER I

THE PROBLEM, HYPOTHESIS, AND DEFINITION OF TERMS USED

Evaluation of a student's progress in learning to typewrite is closely tied to the speed and accuracy at which the student types. Evaluations are made by the student, by his instructor, and by businessmen who might be interested in employing him for his typewriting skill. Consequently, developing speed and accuracy in typewriting is a primary function of a typewriting instructor, and the instructor needs to know the most effective ways to develop speed and accuracy. This study is concerned with speed development.

I. THE PROBLEM

Importance of the Problem

A typewriting teacher finds information on speed building in teaching-methods books and from psychological studies of learning principles, but his main method of teaching is determined by the textbooks provided by the school system for his and his students' use. The choice of the textbook, then, is a vital factor in the development of speed by the student. Teachers should understand the criteria for selecting a typing textbook and, as

stated by Russon and Wanous, "they should have a voice in textbook selection" (18:295).

A comparison of results in speed building achieved by using different textbooks is, therefore, worthwhile.

Statement of the Problem

It was the purpose of this study to (1) compare the mean correct-words-a-minute scores on five-minute writings achieved by beginning students of typewriting when taught by the method and materials presented in Gregg Typing, 191 Series, Book One with the mean correct-words-a-minute scores on five-minute writings achieved by beginning students of typewriting when taught by the method and materials as presented in Typing Simplified, Brief Course, (2) compare mean correct-words-a-minute scores of students whose intelligence quotients fall within the 90-107 range when taught by two different methods and materials and to compare the mean correct-words-a-minute scores of students whose intelligence quotients fall within the 112-130 range when taught by two different methods and materials. The comparisons were based on the correct-words-a-minute scores of the students at intervals of twelve weeks, twenty-four weeks, and thirty-six weeks of instruction.

Basic Elements of the Problem and Procedure Used

At Eisenhower High School, a first class high school located in Yakima, Washington, an experiment was conducted wherein students were selected to make up parallel groups to receive instruction in typewriting by the same teacher, in the same room, and using the same machines, but with each group using a different textbook that endeavored to build speed by different methods. For the purposes of the study, the second period class was the control group which used the textbook adopted by Eisenhower High School as its beginning typewriting text. The third period class was the experimental group using another textbook selected because the materials and method of instruction used were different from the adopted text. Speeds achieved by these two groups were compared statistically to see if one text and method of instruction produced higher speed scores than the other when used by beginning typewriting students.

Both groups, the control group and the experimental group, were sub-divided into groups of twelve according to the I.Q. of the students. This was done to compare timed writing scores of the control group students within an I.Q. range of 90-107 with timed writing scores of the experimental group students within an I.Q. range of 90-107.

These two sub-groups were called the Average Control Group and the Average Experimental Group.

In like manner, scores of twelve students from the control group who had I.Q.s within the range of 112-130, the Superior Control Group, were compared with the scores of twelve students from the Superior Experimental Group who had I.Q.s within the range of 112-130.

There were four sub-groups:

Average Control Group - I.Q.s 90-107
Average Experimental Group - I.Q.s 90-107

Superior Control Group - I.Q.s 112-130
Superior Experimental Group - I.Q.s 112-130.

The scores of the two average groups were compared. The scores of the two superior groups were compared. A "t" test between independent means was made to see if the difference between the scores showed that one method of developing speed in typewriting appeared to be significantly better than the other.

The control group used Gregg Typing, 191 Series, Book One, Second Edition, by John L. Rowe, Alan C. Lloyd, and Fred E. Winger. This was the textbook used by all classes of typewriting at Eisenhower High School with the exception of the experimental class, and the method used by this book will hereinafter be called the R-L-W method.

The experimental group used Typing Simplified, Brief Course, Second Edition by Louis A. Leslie and Philip S. Pepe, and the method used by this book will hereinafter be called the L-P method.

The R-L-W method differed from the L-P method in two ways.

First, the practice material used by the R-L-W method included isolated letter drills, isolated word drills, and sentences in lessons throughout the book. The L-P method did not use isolated letters or isolated words; practice material was in the form of complete sentences starting with the first lesson.

Second, the R-L-W method introduced production tasks to be learned and typed as early as Lesson 11 with centering and as early as Lesson 29 with making exact copies, enumerations, bibliographies, scripts, etc. These lessons occurred during the first twelve weeks of instruction. The L-P method introduced its first production task in the form of a personal letter to be typed in Lesson 50 and included in this lesson some typing style points. No other production tasks were introduced to the students until Lesson 76 which included centering. These lessons did not occur in the first twelve weeks of instruction.

Delimitations of the Study

This study was limited to the students at Eisenhower High School who were enrolled in typewriting during the 1968-1969 school year by choice and scheduled into the second period class and the third period class by the regular scheduling process used by the school. Students in the second period class who had received no previous classroom instruction in typewriting and who had intelligence quotients in the range of 90-107 were compared with those in the third period class who had received no previous classroom instruction in typewriting and who had intelligence quotients in the range of 90-107.

Students in the second period class who had received no previous classroom instruction in typewriting and who had intelligence quotients in the range of 112-130 were compared with those in the third period class who had received no previous classroom instruction in typewriting and who had intelligence quotients in the range of 112-130.

No attempt to match by sex or age was made.

II. HYPOTHESIS

A study of the claims set forth by the publishers of the two different textbooks, study of the psychological

theory of learning, and study of the opinions of experts in the field of typewriting led the writer to advance the following null hypothesis.

Statement of the Null Hypothesis

Students within an I.Q. range of 90-107 taught by the R-L-W method and materials as presented in the textbook Gregg Typing, 191 Series, Book One will show no significant differences in typewriting speed after twelve, twenty-four, and thirty-six weeks as measured by the mean correct-words-a-minute scores on five-minute timings than those with I.Q.s of 90-107 when taught by the L-P method and materials as presented in the textbook Typing Simplified, Brief Course. Likewise, students with I.Q.s of 112-130 taught by the R-L-W method and materials as presented in the textbook Gregg Typing, 191 Series, Book One will show no significant differences in typewriting speed after twelve, twenty-four, and thirty-six weeks as measured by the mean correct-words-a-minute scores on five-minute timings than those with I.Q.s of 112-130 when taught by the L-P method and materials as presented in the textbook Typing Simplified, Brief Course.

III. DEFINITION OF TERMS USED

Arithmetic Mean

The sum of a set of scores divided by the number of scores.

Average Control Group

Twelve students using Gregg Typing, 191 Series, Book One and whose I.Q.s were within the 90-107 range.

Average Experimental Group

Twelve students using Typing Simplified, Brief Course and whose I.Q.s were within the 90-107 range.

Beginning Typewriting Students

Students who had received no previous formal classroom instruction in typewriting.

Control Group

Group not exposed to a variable.

Correct-words-a-minute Scores

Total number of words typed less the number of errors made divided by the number of minutes typed.

Cwam

Abbreviation for correct-words-a-minute.

Experimental Group

Group exposed to a variable.

Level of Significance

Degree of improbability which is deemed necessary to cast sufficient doubt upon the truth of the hypothesis to warrant its rejection.

Mean Cwam Score

The sum of a set of correct-words-a-minute scores divided by the number of scores.

Standard Score

A score in which each individual's score is expressed in terms of the number of standard deviation units of the score from the mean.

Standard Error

An estimate of the magnitude of an "error of measurement" in a score, ie., the amount by which an obtained score differs from a hypothetically true score.

Statistical Hypothesis

An assumption or guess about a population based on sample information.

Superior Control Group

Twelve students using Gregg Typing, 191 Series, Book One and whose I.Q.s were within the 112-130 range.

Superior Experimental Group

Twelve students using Typing Simplified, Brief Course and whose I.Q.s were within the 112-130 range.

Variable

Condition or event that differs.

Word

Five typewriter strokes.

CHAPTER II

REVIEW OF LITERATURE

Literature relevant to this study was reviewed to establish three factors:

1. The extent to which studies similar to this study have been made.
2. A basis on which to make an hypothesis as to which method of teaching typewriting is best for developing speed.
3. A basis on which to set up an experiment to test two methods of developing speed.

I. SIMILAR STUDIES

An analysis of the entries for business education in the 1960 Encyclopedia of Educational Research showed that out of 124 studies none was a direct comparison of student achievement when different textbooks were used (10:173-183).

Rahe's Typewriting Research Index lists 887 items of research studies and articles about typewriting, nineteen of which are based on textbooks, and only one of these was a comparison of different textbooks. This was An Experimental Study to Compare the Achievement of Classes Using Different Textbooks in the Teaching of Typewriting by Warren S. Perry written in 1954 (14:29).

Dauk in 1965 conducted an experiment based on the hypothesis that working for a high speed level first with elimination of errors after speed is developed is an effective approach to teaching typing. The results confirmed his hypothesis with his students comparing favorably in accuracy with a group taught to place emphasis on accuracy over speed. The mean I.Q. for students in this study was 113.683 for the speed group and 113.555 for the control group. The mean age of the students was 13.885 as this study was conducted during summer school with junior high school students (6:1-47).

Blanck made a survey of how to increase speed as recommended by the experts. He quotes Blackstone and Smith as stating "The greatest improvement in accuracy as well as in speed may be expected to come from constant stressing of the acquiring of correct speed alone" (1:1-61).

II. BASIS FOR HYPOTHESIS

"Typewriting is a perceptual-motor skill. To make the most effective use of the teaching time available to use for developing this skill in our students, we must study and apply the findings of learning psychology in our classroom" (19:35).

The principles of learning most often set forth by psychologists are readiness, simple to complex progressions, motivation, reinforcement, and transfer (19:35-38).

Speed in typewriting is the product of at least five basic elements:

1. Reasonable finger dexterity
2. Concentrated reading skill
3. Persistent, intensive practice
4. Enthusiastic interest in continued growth
5. Composure with self-confidence (5:51).

Thus, included throughout a complete program of speed building should be the awareness on the part of the teacher and student "that the basic elements identified must be constantly stressed and continuously refined if key-stroking power is to be increased" (5:51).

Ragsdale states "Fast movement can be learned only when fast movement is tried" (13:86). In his article, "How Children Learn the Motor Types of Activities," in the National Society for the Study of Education 49th Yearbook, he comments that the old recommendation "to work first for accuracy and let speed gradually increase has now been questioned" (13:86).

Wanous believes that speed and accuracy are stressed by giving particular attention to the basic techniques because the student must learn to type so well he can occupy "his mind with the wording and form of the papers he is preparing" (24:ii). Even when, in Part Two of his book, he introduces applications of basic skill, he stresses that:

the higher your skill becomes on the typewriter, the easier it will be for you to use the skill for your written work. The ideal is to type so well that you can forget the typewriter and concentrate on the papers you are preparing; consequently, you will continue to work on speed and control (24:53).

In addition, there is considerable emphasis among psychologists and educators on the method of developing skill by an alternative type of practice, as follows:

so many minutes at a rapid rate with no attention paid to errors; so many minutes at the best rate at which the student can type accurately; and sufficient drives for total speed for short periods and total accuracy for a short period (18:133).

This is the pattern of the program presented in Typing Simplified, Brief Course.

"Admittedly, there is a need for more experimentation along the lines of initial accuracy vs initial speed" (18:133).

III. SETTING UP AN EXPERIMENT

Care must be taken in planning the experiment to provide external and internal validity, objectivity, and suitability (23:312).

The question of ethics in the use of students must be watched. The selection and use of "research tools" and control of the experiment must be carefully studied to assure that the subjects are reacting in a normal way (23:288-290). While it may not be possible to control all variables, still a control situation can be created that would closely resemble the average classroom so that results would be nearly the same as those that might occur in any other classroom situation.

Van Dalen says that:

Certainty cannot be achieved through experimentation, but a competent researcher does everything practicable to reduce uncertainty. He uses a design that is technically as good as current knowledge and the given situation permit (23:294).

The tests used in an experiment to show results must be highly valid for use in the situation to which they are applied. In typewriting, there are traditional methods of scoring straight-copy timings, the usual method for testing speed.

One method of computing speed is net-words-a-minute which is figured by deducting ten words from the total words typed for each error. Another method is gross-words-a-minute which divides the number of words typed by the number of minutes of the writing deducting no penalty for errors. Correct-words-a-minute is a compromise between net-words-a-minute and gross-words-a-minute and is arrived at by subtracting the total number of errors from the total number of words typed and dividing by the number of minutes of the writing. This method was devised by Lessenberry and Wanous, leaders in the field of typewriting.

Another method of computing speed is to allow students to erase all errors, and if all errors are found and corrected, the student counts the number of words completed in the writing. This is the new-performance-rate (25:87). Gross-words-a-minute with per cent of accuracy is still another method of scoring. This method uses the gross-words-a-minute, subtracts the errors, and then divides the larger number into the smaller one to determine the per cent of accuracy. When this system is used, two grades are given--one for gross speed and one for per cent of accuracy (18:390-393). Words-a-minute with error cut-off sets the maximum number of errors that can be made on a writing. "Students count only the words that are typed

before the maximum error tolerance was exceeded" (25:85). Mailable-words-a-minute adds 26 seconds for each error to the time of the writing and then divides to get the score (18:39).

The length of the timing on speed tests is usually five minutes. As Russon and Wanous say:

The 10-minute and 15-minute straight-copy tests are being replaced, in the main, by writings of shorter duration. Many textbook writers advocate the use of 1-minute writings until the student has developed sufficient sustained typing power to type for three minutes. The 3-minute writing is then used for about half the semester; and the 5-minute writing is introduced toward the end of the first semester and used thereafter (18:394).

Copy material for straight copying can be controlled to a degree for syllable intensity, stroking intensity, and per cent of high-frequency words along with other factors. Researchers have shown interest in these in an attempt to set up some guidelines for comparing student achievement by means of timings on straight-copy material. With so many factors influencing the difficulty of the copy and with most available copy controlled for only one of the factors, usually syllable intensity or stroking intensity, it seems that a degree of disregard for copy difficulty can be justified, particularly since Crawford says, "The true measure of a

typist's speed lies in his ability to type comprehensive, new material rather than limited copy" (5:52).

Crawford also says:

It is quite indefensible for a speed-building program to settle for the development of typists capable of stroking at very high speeds on one or two selected passages while demonstrating decidedly less skill on materials more typically encountered outside the classroom (5:52).

Copy especially prepared for timed writings can be found in typewriting textbooks and publications of business education magazines such as Today's Secretary.

CHAPTER III

PROCEDURE OF RESEARCH

I. RESEARCH SETTING

This experiment was conducted as a part of the class offerings in typewriting at Eisenhower High School in Yakima, Washington. Students from the sophomore, junior, and senior classes were allowed to take typewriting as space was available in the classes and as students' schedules permitted. Typewriting was an elective course at Eisenhower High School, and selection was assumed to be based on a desire to learn to typewrite for either personal or vocational reasons. No prognostic tests or prerequisites were established to determine enrollment in classes. No restrictions as to ability were imposed. Any student wanting to take typewriting could do so if it could be included in his schedule.

All classes during the school year met for fifty-minute sessions with the exception of "special" days. On these days, the classes involved in the experiment met for equal periods of time.

II. SELECTION OF STUDENTS FOR EXPERIMENT

Two classes, a second period and a third period class, were taught by the same teacher in the same room using the same machines. From the total enrollment of the second period class, 24 students were selected to make up the population of two testing groups, 12 in an Average Control Group and 12 in a Superior Control Group. From the total enrollment of the third period class, 24 students were selected to make up the population of two testing groups, 12 in the Average Experimental Group and 12 in the Superior Experimental Group.

These four groups received instruction under the same physical and scheduling conditions with the exception that they used two different typing textbooks which used two different teaching approaches and instruction material to build speed.

Students were registered in the classes by the regular scheduling processes. The groups represented a natural class population. At the time of enrollment, the I.Q.s of all students in each class were determined by checking the scores on the permanent records of standardized tests taken by students. Students whose permanent records showed no I.Q. rating were eliminated from the study. Students who had previously received formal

typewriting instruction were also eliminated from the study.

From those not eliminated because of previous typewriting instruction or because there was no established I.Q., and using the I.Q. scores, students were divided into three groups:

1. Those with I.Q.s from 90-107
2. Those with I.Q.s from 112-130
3. Those with I.Q.s too low, too high, or falling between the two ranges.

Those students whose I.Q.s fell within the 90-107 range or the 112-130 range were eligible for the experiment.

During the year, students who changed class periods or dropped typewriting were removed from the groups selected for the experiment. Students in each class who did not enter the class the first day of the year and thereby receive instruction by the textbook and its manual were not eligible for the study.

In summary, students became members of a selected group because they were scheduled into typewriting, because of their I.Q., and because they were beginning students who started at the beginning of the year and continued in either the second or third period class

without schedule changes.

When those students not eligible to participate in the experiment had been eliminated, only enough students remained to make up the sub-groups in each class. All the students not eliminated for the above reasons were used in the experiment. This meant that selection was made without prejudice or teacher manipulation of the groups.

The four resulting groups were:

12 students in the Average Control Group with I.Q.s from 90-107

12 students in the Superior Control Group with I.Q.s from 112-130

12 students in the Average Experimental Group with I.Q.s from 90-107

12 students in the Superior Experimental Group with I.Q.s from 112-130.

III. CONDUCT OF THE EXPERIMENT

Students were not told that they were participating in an experiment, and they were allowed to change from one class to another if they so desired. If they did so, they were eliminated from the experiment. No unnatural classroom situations were allowed to exist.

Each class was the same except that each used a different textbook and the instructor used the teaching

method prescribed by the author as outlined in the teacher's manual and textbook.

Eisenhower High School provided one set of books to be used by all the typewriting classes in the room in which this experiment was conducted, and books had to remain in the classroom. Students using the experimental textbook used books borrowed from the publisher and were allowed to take their books out of the room. The books remained in their possession during the school year. In order that students in both groups could have the same opportunity to practice outside of class if they desired to do so, or so that they could review any lessons if they so desired, provision had to be made to provide students in the control group with copies of the lessons in the control textbook. Copies of all lessons in the control textbook were mimeographed with the permission of the publisher and made available to the control group. A copy of the letter giving permission to reproduce the lessons is found in Appendix B on page 57.

The teacher assigned the teaching material as it appeared in each textbook. No additional or supplementary teaching materials were used. Students were instructed to read carefully all instructions given by the authors of the textbooks and to stress those procedures in their

practice which they were urged to stress by the authors. The teaching manuals of each book were followed carefully in presenting material to the students.

The first four days of each week were used to present textbook material. On Friday of each week, or the last day if irregularities arose, students did not use their textbooks. Instead, they took four five-minute timings. This was started after six weeks of instruction to prepare students for the twelfth-week, the twenty-fourth week, and the thirty-sixth week timings which would be recorded and used for comparison in the study. Students became accustomed to the five-minute timings on the last day of the week and prepared for them in a routine manner on those days. The score on the best of the four timings given became the score to be used for that day. This gave students a choice of scores rather than limiting the testing period to only one timing each testing day.

Because a makeup situation could not be the same as a regular timed-writing session, the score for a student who was absent on a particular timed-writing day was obtained by averaging the score on his timed writing previous to the missed timed writing and the timed writing that followed the missed timed writing.

The timed writing copy was selected at random from a previously collected series of timings used by all classes of typewriting in the school. All material was new to the students and came from textbooks or business education publications.

Students figured the rate on their writings according to the correct-words-a-minute plan of using total strokes typed divided by five to convert to words less one word for each error made divided by five, the duration of the timing. These were called cwam scores.

Students figured the rates; to assure accurate scoring of papers, however, the teacher rechecked all papers. The scores as figured by the instructor were the scores recorded.

The scores for the twelfth, the twenty-fourth, and the thirty-sixth week timed writings were the scores used for comparison in this study.

IV. STATISTICAL PROCEDURE USED TO ANALYZE THE DATA

The arithmetic means to be used for comparison were computed by adding the scores of the subjects and dividing by the number of the subjects, designated N. The mean for

the Average Control Group was designated M_1 ; the mean for the Average Experimental Group, M_2 ; the mean for the Superior Control Group, M_3 ; and the mean for the Superior Experimental Group, M_4 . Each individual score was then subtracted from the arithmetic mean and squared. The sum of the squares of the differences was divided by N to find the standard deviation from the mean, or

$$s = \frac{\sum x^2}{N}.$$

It was necessary to know the standard error of the difference between independent means; the formula for this was

$$s_{dM} = \sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}$$

To find "t", using the difference between the independent means, which is to be tested, M_1 and M_2 , the following formula was used:

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

It was also necessary to compute the region of rejection by using a df (degree of freedom) of the number of subjects less one for each group of subjects in each

test (less two) and consulting a "t" test table, using a .05 level of significance (23:465).

CHAPTER IV

RESULTS OF THE STUDY

I. PRESENTATION AND ANALYSIS OF DATA

Upon completion of the three testing periods and after the close of the school year, a statistical comparison of the scores achieved by the students was made by means of a "t" test between independent means (23:378).

This necessitated running six tests as follows:

- | | |
|-------------------|---|
| Test Number One | A "t" test to compare the mean cwam score of the Average Control Group M_1 with the mean cwam score of the Average Experimental Group M_2 after twelve weeks of instruction. |
| Test Number Two | A "t" test to compare the mean cwam score of the Average Control Group M_1 with the mean cwam score of the Average Experimental Group M_2 after twenty-four weeks of instruction. |
| Test Number Three | A "t" test to compare the mean cwam score of the Average Control Group M_1 with the mean cwam score of the Average Experimental Group M_2 after thirty-six weeks of instruction. |
| Test Number Four | A "t" test to compare the mean cwam score of the Superior Control Group M_3 with the mean cwam score of the Superior Experimental Group M_4 after twelve weeks of instruction. |

- Test Number Five A "t" test to compare the mean cwam score of the Superior Control Group M_3 with the mean cwam score of the Superior Experimental Group M_4 after twenty-four weeks of instruction.
- Test Number Six A "t" test to compare the mean cwam score of the Superior Control Group M_3 with the mean cwam score of the Superior Experimental Group M_4 after thirty-six weeks of instruction.

These tests were run to determine the significant difference between the means of the two groups in each distribution at the .05 level of significance.

The formula, the calculations, and the results are shown on the following Figure 1 through Figure 6.

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Average Control Group M_1 and the Average Experimental Group M_2 after twelve weeks of instruction.
2. Computed means $M_1 = 29.33$
 $M_2 = 25.9$
3. Level of significance = .05
4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{Ex_1^2 + Ex_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$
5. Region of rejection = $t \leq -2.074$ or ≥ 2.074
6. Calculation

$$t = \frac{29.33 - 25.9}{\sqrt{\frac{300.7 + 368.07}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{3.4}{\sqrt{\frac{668.75}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{3.4}{\sqrt{30.40 (.167)}} \quad \text{or} \quad \frac{3.4}{\sqrt{5.08}} \quad \text{or}$$

$$t = \frac{3.4}{2.253}$$

$$t = 1.509$$
7. Null hypothesis retained

Figure 1

Test Number One

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Average Control Group M_1 and the Average Experimental Group M_2 after twenty-four weeks of instruction.

2. Computed means $M_1 = 39.83$

$$M_2 = 42.2$$

3. Level of significance = .05

4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

5. Region of rejection = $t \leq -2.074$ or ≥ 2.074

6. Calculation

$$t = \frac{39.83 - 42.2}{\sqrt{\frac{477.68 + 728.73}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \text{ or}$$

$$t = \frac{2.37}{\sqrt{\frac{1206.41}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \text{ or}$$

$$t = \frac{2.37}{\sqrt{54.84 (.167)}} \text{ or } \frac{2.37}{\sqrt{9.16}} \text{ or}$$

$$t = \frac{2.37}{3.025} \text{ or}$$

$$t = .784$$

7. Null hypothesis retained

Figure 2

Test Number Two

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Average Control Group M_1 and the Average Experimental Group M_2 after thirty-six weeks of instruction.
2. Computed means $M_1 = 40.9$
 $M_2 = 36.1$
3. Level of significance = .05
4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$
5. Region of rejection = $t \leq -2.074$ or ≥ 2.074
6. Calculation

$$t = \frac{40.9 - 36.1}{\sqrt{\frac{711.07 + 612.92}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{4.8}{\sqrt{\frac{1323.99}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{4.8}{\sqrt{60.18 (.167)}} \quad \text{or} \quad \frac{4.8}{\sqrt{10.05}} \quad \text{or}$$

$$t = \frac{4.8}{3.17}$$

$$t = 1.514$$
7. Null hypothesis retained

Figure 3

Test Number Three

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Superior Control Group M_3 and the Superior Experimental Group M_4 after twelve weeks of instruction.
2. Computed means $M_3 = 30.2$
 $M_4 = 31.2$
3. Level of significance = .05
4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$
5. Region of rejection = $t \leq -2.074$ or ≥ 2.074
6. Calculation

$$t = \frac{30.2 - 31.2}{\sqrt{\frac{252.23 + 328.68}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{1.0}{\sqrt{\frac{580.9}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{1.0}{\sqrt{26.41 (.167)}} \quad \text{or} \quad \frac{1.0}{\sqrt{4.41}} \quad \text{or}$$

$$t = \frac{1.0}{2.10} \quad \text{or}$$

$$t = .476$$
7. Null hypothesis retained

Figure 4

Test Number Four

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Superior Control Group M_3 and the Superior Experimental Group M_4 after twenty-four weeks of instruction.

2. Computed means $M_3 = 40.54$

$$M_4 = 50$$

3. Level of significance = .05

4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

5. Region of rejection = $t \leq -2.074$ or ≥ 2.074

6. Calculation

$$t = \frac{40.54 - 50.0}{\sqrt{\frac{418.75 + 913.25}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{9.5}{\sqrt{\frac{1332.00}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \quad \text{or}$$

$$t = \frac{9.5}{\sqrt{60.54 (.167)}} \quad \text{or} \quad \frac{9.5}{\sqrt{10.11}} \quad \text{or}$$

$$t = \frac{9.5}{3.18} \quad \text{or}$$

$$t = 2.99$$

7. Null hypothesis rejected

Figure 5

Test Number Five

1. Null hypothesis - There is no significant difference between the mean cwam scores of the Superior Control Group M_3 and the Superior Experimental Group M_4 after thirty-six weeks of instruction.
2. Computed means $M_3 = 42.2$
 $M_4 = 45.4$
3. Level of significance = .05
4. Test statistic

$$t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2} \right)}}$$
5. Region of rejection = $t \leq -2.074$ or ≥ 2.074
6. Calculation

$$t = \frac{42.2 - 45.4}{\sqrt{\frac{949.68 + 978.92}{12 + 12 - 2} \left(\frac{1}{12} + \frac{1}{12} \right)}} \text{ or}$$

$$t = \frac{3.2}{\sqrt{\frac{1928.60}{22} \left(\frac{1}{12} + \frac{1}{12} \right)}} \text{ or}$$

$$t = \frac{3.2}{\sqrt{87.66 (.167)}} \text{ or } \frac{3.2}{\sqrt{14.64}} \text{ or}$$

$$t = \frac{3.2}{3.825} \text{ or}$$

$$t = .836$$
7. Null hypothesis retained

Figure 6

Test Number Six

II. RECAPITULATION OF TEST RESULTS

Average Sub-groups

The mean cwam score of the Average Control Group, students with I.Q.s in the range of 90-107, and the mean cwam score of the Average Experimental Group, students with I.Q.s of 90-107, were compared at twelve weeks. The computed "t" figure, 1.509, was less than the rejection figure, 2.074; therefore, the null hypothesis was retained.

A similar comparison of the mean cwam score of the Average Control Group with the mean cwam score of the Average Experimental Group was made after twenty-four weeks of instruction. The computed "t" figure, .784, was less than the rejection figure, 2.074; therefore, the null hypothesis was retained for this group too.

At thirty-six weeks, when the mean cwam score of the Average Control Group was compared with the mean cwam score of the Average Experimental Group, the computed "t" figure was 1.514, which was less than the rejection figure, 2.074. The null hypothesis, therefore, was again retained.

The statistical comparison showed that there was no significant difference at the .05 level of significance between the achievement of the average groups of students when using either the R-L-W or the L-P method.

Superior Sub-groups

The mean cwam score of the Superior Control Group, those with I.Q.s in the range of 112-130, and the mean cwam score of the Superior Experimental Group, students with I.Q.s in the range of 112-130, were compared at twelve weeks. The computed "t" figure, .476, was less than the rejection figure, 2.074; therefore, the null hypothesis was retained.

A comparison of the mean cwam score of the Superior Control Group and the mean cwam score of the Superior Experimental Group was also made after twenty-four weeks of instruction. The computed "t" figure, 2.99, was more than the rejection figure, 2.074; for the first time in the study, the null hypothesis was rejected.

At thirty-six weeks, however, when the mean cwam score of the Superior Control Group was compared with the mean cwam score of the Superior Experimental Group, the computed "t" figure was .836, which was less than the rejection figure, 2.074; thus, the null hypothesis for this period of time was retained.

Summary

A summary of the results of the six "t" tests is presented in Table I.

TABLE I
Summary of Test Results

| Test | I.Q. Range | Interval | Result |
|-------|------------|----------|--------------------------|
| One | 90-107 | 12 weeks | Null hypothesis retained |
| Two | 90-107 | 24 weeks | Null hypothesis retained |
| Three | 90-107 | 36 weeks | Null hypothesis retained |
| Four | 112-130 | 12 weeks | Null hypothesis retained |
| Five | 112-130 | 24 weeks | Null hypothesis rejected |
| Six | 112-130 | 36 weeks | Null hypothesis retained |

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was to make statistical comparisons of the mean correct-words-a-minute scores of students taught by two different methods and materials as presented by two different textbooks. Comparisons were made after twelve, twenty-four, and thirty-six weeks of instruction to determine the effectiveness of each textbook in developing speed in beginning typewriting students.

Scores used for comparisons were those achieved by a group of 24 students from each of two classes, 12 of which had I.Q.s within the range of 90-107 and 12 of which had I.Q.s within the range of 112-130. All students were taught by the same teacher, in the same room, and using the same machines; but one class, the control group, used Gregg Typing 191 Series, Book One (hereinafter called the R-L-W method), and the other class, the experimental group, used Typing Simplified, Brief Course (hereinafter called the L-P method).

The groups were:

Average Control Group - I.Q.s 90-107
Average Experimental Group - I.Q.s 90-107

Superior Control Group - I.Q.s 112-130
Superior Experimental Group - I.Q.s 112-130

The null hypothesis to be tested was that the typewriting speed achieved by students with an I.Q. range of 90-107 taught by the R-L-W method and materials will show no significant difference after twelve, twenty-four, and thirty-six weeks as measured by the mean cwam scores on five-minute writings than the speed achieved by students with an I.Q. range of 90-107 when taught by the L-P method and materials. Likewise, the typewriting speed achieved by students with an I.Q. range of 112-130 taught by the R-L-W method and materials will show no significant difference after twelve, twenty-four, and thirty-six weeks as measured by the mean cwam scores on five-minute writings than the speed achieved by students with an I.Q. range of 112-130 when taught by the L-P method and materials.

The study was limited to those students who had no previous formal typewriting instruction, those who had I.Q.s within the ranges of 90-107 and 112-130, and those who were enrolled by regular scheduling processes of the high school in two different classes and remained in the

classes the entire school year. No attempt to match groups by sex or age was made.

The scores were determined by five-minute writings selected from typewriting textbooks and business education publications and figured by the cwam method of dividing the number of strokes by five to convert to words less one word for each error made divided by five, the duration of the timing. To assure accuracy, scores were checked and recorded by the teacher.

Literature was reviewed to establish the extent to which similar studies have been made, a basis on which to make an hypothesis, and a basis on which to set up an experiment to test two methods of instruction to develop speed.

Students were not told they were participating in an experiment and no unnatural classroom situations were allowed to exist.

Lessons were assigned as they appeared in the textbooks and presented to the students as directed by the teacher's manual of each textbook. Students were directed to follow the authors' instructions and to stress those procedures in their practice which they were urged to stress by the authors.

The first four days of the week were used to present textbook material. The last day of the week, students took five-minute timed writings. The timed writings for the twelfth week, the twenty-fourth week, and the thirty-sixth week were recorded for comparisons to be made in this study.

Using the recorded scores, the mean cwam scores were computed and a "t" test between independent means was run to determine the significant difference between the means of the Average Control Group and the Average Experimental Group at the twelfth, the twenty-fourth, and the thirty-sixth week periods. The same test was run to determine the significant difference between the means of the Superior Control Group and the Superior Experimental Group for the same periods. The level of significance used was .05.

The statistical comparisons showed that there was no significant difference at the .05 level of significance between mean cwam scores of the Average Control Group and the Average Experimental Group for the twelve week period, the twenty-four week period, nor for the thirty-six week period. The null hypothesis was retained for these groups.

The statistical comparisons showed that there was no significant difference at the .05 level between the

mean cwam scores of the Superior Control Group and the Superior Experimental Group for the twelve week period and for the thirty-six week period; the null hypothesis was retained for these groups for these periods. There was, however, a significant difference at the .05 level of significance between the mean cwam scores of the Superior Control Group and the Superior Experimental Group for the twenty-four week period. In this instance, the null hypothesis was rejected.

Six tests of significance were run. The null hypothesis that there is no significant difference at the .05 level between the mean cwam scores of the different groups was retained in five of the six tests made.

II. CONCLUSION

From the data presented in this study, there is no indication that Gregg Typing, 191 Series, Book One or Typing Simplified, Brief Course, and their approaches to teaching method, is more effective as a means of developing speed in typewriting for the students involved in this study.

II. RECOMMENDATIONS

As a result of this study, it is recommended that:

1. This study be repeated using the same I.Q. ranges and the same textbooks to establish reliability and validity to the findings of this study.
2. Similar studies be conducted using:
 - a. These same two textbooks but using different I.Q. ranges including the "gifted" and the "slow learner."
 - b. The same I.Q. ranges as used in this study and using different textbooks.
 - c. The I.Q. ranges as used in this study and using Gregg Typing, 191 Series, Book One and a textbook that was not used in this study.
 - d. The same I.Q. ranges as used in this study and using Typing Simplified, Brief Course and a textbook that was not used in this study.
3. Studies be designed to determine the effect of I.Q. on the ability to develop speed in typewriting.
4. Eisenhower High School
 - a. Consider the results of this study when selecting textbooks for speed building.
 - b. Base textbook selection on factors other than speed building potential.
 - c. Continue to use Gregg Typing, 191 Series, Book One for speed building until some specific need for replacing it occurs.

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APPENDIX A

TABLE II
 COMPUTATION OF MEANS FOR M_1 AND M_2
 TWELVE WEEK PERIOD

| Student Number | AVERAGE CONTROL GROUP | | | AVERAGE EXPERIMENTAL GROUP | | |
|----------------|-----------------------|-------|---------|----------------------------|-------|---------|
| | N_1 Score | x_1 | x_1^2 | N_2 Score | x_2 | x_2^2 |
| 1 | 24 | - 5.3 | 28.09 | 36 | +10.1 | 102.01 |
| 2 | 34 | + 4.7 | 22.09 | 23 | - 2.9 | 8.41 |
| 3 | 22 | - 7.3 | 53.29 | 24 | - 1.9 | 3.61 |
| 4 | 32 | + 2.7 | 7.29 | 31 | + 5.1 | 26.01 |
| 5 | 36 | + 6.7 | 44.89 | 24 | - 1.9 | 3.61 |
| 6 | 24 | - 5.3 | 28.09 | 28.5 | + 2.6 | 6.76 |
| 7 | 28 | - 1.3 | 1.69 | 23 | - 2.9 | 8.41 |
| 8 | 37 | + 7.7 | 59.29 | 20 | - 5.9 | 34.81 |
| 9 | 35 | + 5.7 | 32.49 | 19 | - 6.9 | 47.61 |
| 10 | 26 | - 3.3 | 10.89 | 25 | - .9 | .81 |
| 11 | 26 | - 3.3 | 10.89 | 21 | - 4.9 | 24.01 |
| 12 | 28 | - 1.3 | 1.69 | 36 | +10.1 | 102.01 |
| Totals | 352 | | 300.68 | 310.5 | | 368.07 |
| Mean Score | | | 29.33 | | | 25.9 |

Difference between means 3.4

TABLE III
 COMPUTATION OF MEANS FOR M_1 AND M_2
 TWENTY-FOUR WEEK PERIOD

| Student Number | AVERAGE CONTROL GROUP | | | AVERAGE EXPERIMENTAL GROUP | | |
|-------------------------------|-----------------------|-------|---------|----------------------------|-------|---------|
| | N_1 Score | x_1 | x_1^2 | Score | x_2 | x_2^2 |
| 1 | 35 | - 4.8 | 23.04 | 50 | + 7.8 | 60.84 |
| 2 | 37 | - 2.8 | 7.84 | 42 | - .2 | .04 |
| 3 | 30 | - 9.8 | 96.04 | 39 | - 3.2 | 10.24 |
| 4 | 44 | + 4.2 | 17.64 | 36 | - 6.2 | 38.44 |
| 5 | 53 | +13.2 | 174.24 | 51 | + 8.8 | 77.44 |
| 6 | 36 | - 3.8 | 14.44 | 35.5 | - 6.7 | 44.89 |
| 7 | 39 | - .8 | .64 | 33 | - 9.2 | 84.64 |
| 8 | 42 | + 2.2 | 4.84 | 39 | - 3.2 | 10.24 |
| 9 | 48 | + 8.2 | 67.24 | 33 | - 9.2 | 84.64 |
| 10 | 37 | - 2.8 | 7.84 | 53 | +10.8 | 116.64 |
| 11 | 33 | - 6.8 | 46.24 | 39 | - 3.2 | 10.24 |
| 12 | 44 | + 4.2 | 17.64 | 56 | +13.8 | 190.44 |
| Totals | 478 | | 477.68 | 506.5 | | 728.73 |
| Mean Score | | | 39.83 | | | 42.2 |
| Difference between means 2.37 | | | | | | |

TABLE IV
 COMPUTATION OF MEANS FOR M_1 AND M_2
 THIRTY-SIX WEEK PERIOD

| Student Number | AVERAGE CONTROL GROUP | | | AVERAGE EXPERIMENTAL GROUP | | |
|----------------|-----------------------|-------|---------|----------------------------|-------|---------|
| | N_1 Score | x_1 | x_1^2 | N_2 Score | x_2 | x_2^2 |
| 1 | 35 | - 5.9 | 34.81 | 42 | + 5.9 | 34.81 |
| 2 | 40 | - .9 | .81 | 31 | - 5.1 | 26.01 |
| 3 | 28.5 | -12.4 | 153.76 | 39 | + 2.9 | 8.41 |
| 4 | 46 | + 5.1 | 26.01 | 35 | - 1.1 | 1.21 |
| 5 | 52 | +11.1 | 123.21 | 43 | + 6.9 | 47.61 |
| 6 | 30 | -10.9 | 118.81 | 38 | + 1.9 | 3.61 |
| 7 | 45 | + 4.1 | 16.81 | 25 | -11.1 | 123.21 |
| 8 | 48 | + 7.1 | 50.41 | 33 | - 3.1 | 9.61 |
| 9 | 50 | + 9.1 | 82.81 | 31 | - 5.1 | 26.01 |
| 10 | 43 | + 2.1 | 4.41 | 33 | - 3.1 | 9.61 |
| 11 | 31 | - 9.9 | 98.01 | 30 | - 6.1 | 37.21 |
| 12 | 42 | + 1.1 | 1.21 | 53 | +16.9 | 285.61 |
| Totals | 490.5 | | 711.07 | 433 | | 612.92 |
| Mean Score | | | 40.9 | | | 36.1 |

Difference between means 4.8

TABLE V
 COMPUTATION OF MEANS FOR M_3 AND M_4
 TWELVE WEEK PERIOD

| Student Number | SUPERIOR CONTROL GROUP | | | SUPERIOR EXPERIMENTAL GROUP | | |
|------------------------------|------------------------|-------|---------|-----------------------------|-------|---------|
| | N_3 Score | x_3 | x_3^2 | N_4 Score | x_4 | x_4^2 |
| 13 | 27.5 | - 2.7 | 7.29 | 33.5 | + 2.3 | 5.29 |
| 14 | 33 | + 2.8 | 7.84 | 38 | + 6.8 | 46.24 |
| 15 | 31 | + .8 | .64 | 26 | - 5.2 | 27.04 |
| 16 | 33 | + 2.8 | 7.84 | 35 | + 3.8 | 14.44 |
| 17 | 38 | + 7.8 | 60.84 | 27.5 | - 3.7 | 13.69 |
| 18 | 35 | + 4.8 | 23.04 | 36 | + 4.8 | 23.04 |
| 19 | 26 | - 4.2 | 17.64 | 25 | - 6.2 | 38.44 |
| 20 | 26 | - 4.2 | 17.64 | 30 | - 1.2 | 1.44 |
| 21 | 22.5 | - 7.7 | 59.29 | 41.5 | +10.3 | 106.09 |
| 22 | 34 | + 3.8 | 14.44 | 28 | - 3.2 | 10.24 |
| 23 | 32 | + 1.8 | 3.24 | 28 | - 3.2 | 10.24 |
| 24 | 24.5 | - 5.7 | 32.49 | 25.5 | - 5.7 | 32.49 |
| Totals | 362.5 | | 252.23 | 374 | | 328.68 |
| Mean Score | | | 30.2 | | | 31.2 |
| Difference between means 1.0 | | | | | | |

TABLE VI
 COMPUTATION OF MEANS FOR M_3 AND M_4
 TWENTY-FOUR WEEK PERIOD

| Student Number | SUPERIOR CONTROL GROUP | | | SUPERIOR EXPERIMENTAL GROUP | | |
|------------------------------|------------------------|-------|---------|-----------------------------|-------|---------|
| | N_3 Score | x_3 | x_3^2 | N_4 Score | x_4 | x_4^2 |
| 13 | 33 | - 7.5 | 56.25 | 57 | + 7.0 | 49.00 |
| 14 | 52 | +11.5 | 132.25 | 63 | +13.0 | 169.00 |
| 15 | 43 | + 2.5 | 6.25 | 50 | 0.0 | 0.00 |
| 16 | 42 | + 1.5 | 2.25 | 47 | - 3.0 | 9.00 |
| 17 | 44.5 | + 4.0 | 16.00 | 50 | 0.0 | 0.00 |
| 18 | 42 | + 1.5 | 2.25 | 60 | +10.0 | 100.00 |
| 19 | 40 | - .5 | .25 | 39 | -11.0 | 121.00 |
| 20 | 37 | - 3.5 | 12.25 | 46 | - 4.0 | 16.00 |
| 21 | 31 | - 9.5 | 90.25 | 63 | +13.0 | 169.00 |
| 22 | 42 | + 1.5 | 2.25 | 38.5 | -11.5 | 132.25 |
| 23 | 47 | + 6.5 | 42.25 | 48 | - 2.0 | 4.00 |
| 24 | 33 | - 7.5 | 56.25 | 38 | -12.0 | 144.00 |
| Totals | 486.5 | | 418.75 | 599.5 | | 913.25 |
| Mean Score | | | 40.5 | | | 50.0 |
| Difference between means 9.5 | | | | | | |

TABLE VII
 COMPUTATION OF MEANS FOR M_3 AND M_4
 THIRTY-SIX WEEK PERIOD

| Student Number | SUPERIOR CONTROL GROUP | | | SUPERIOR EXPERIMENTAL GROUP | | |
|----------------|------------------------|-------|---------|-----------------------------|-------|---------|
| | N_3 Score | x_3 | x_3^2 | N_4 Score | x_4 | x_4^2 |
| 13 | 32 | -10.2 | 104.04 | 42 | - 3.4 | 11.56 |
| 14 | 57 | +14.8 | 219.04 | 61 | +15.6 | 243.36 |
| 15 | 44 | + 1.8 | 3.24 | 43 | - 2.4 | 5.76 |
| 16 | 42 | - .2 | .04 | 43 | - 2.4 | 5.76 |
| 17 | 47 | + 4.8 | 23.04 | 36 | - 9.4 | 88.36 |
| 18 | 48 | + 5.8 | 33.64 | 63 | +17.6 | 309.76 |
| 19 | 37 | - 5.2 | 27.04 | 34 | -11.4 | 129.96 |
| 20 | 28 | -14.2 | 201.64 | 43 | - 2.4 | 5.76 |
| 21 | 31 | -11.2 | 125.44 | 56 | +10.6 | 112.36 |
| 22 | 54 | +11.8 | 139.24 | 43 | - 2.4 | 5.76 |
| 23 | 49 | + 6.8 | 46.24 | 43 | - 2.4 | 5.76 |
| 24 | 37 | - 5.2 | 27.04 | 38 | - 7.4 | 54.76 |
| Totals | 506 | | 949.68 | 545 | | 978.92 |
| Mean Scores | | | 42.2 | | | 45.4 |

Difference between means 3.2

APPENDIX B



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October 3, 1968

Mrs. Yvonne Marquard, Business Teacher
Dwight D. Eisenhower Senior High School
40th Avenue & Arlington
Yakima, Washington 98902

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