IMPROVEMENT OF SPELLING THROUGH TYPEWRITING

by

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Words are not only our chief means of conveying our ideas to one another, but they are also the symbols containing the concepts, with which we do much of our thinking.

Regardless of whether students are interpreting the printed page or are expressing their own thoughts, words are the "blocks with which they build."

In 1897, Cubberley\(^1\) wrote, "To spell correctly and without consulting a dictionary is one of the most desirable things in education. If one receives a letter which contains a misspelled word or two, one almost always forms a poor opinion of the writer's ability." The above statement is still true today, for the ability to spell reflects definitely upon the training of the individual.

Accuracy in spelling is like courtesy in manners; neither is obvious by its presence. Incorrectness in spelling, however, is like boorishness in manners; each creates an unfavorable impression.

"Next to complete inability to read, poor spelling is to the public the surest sign that one is not educated,"

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\(^1\)Cubberley, E. P., Report of the Public Schools of San Diego, California, 1897, p. 113.
wrote Suzzalo, President of the Carnegie Foundation.  

Cornman writes on the same subject, "The generally high appreciation of accurate spelling is evidenced not only in the prominence accorded the subject in the elementary schools, but also in the frequent employment of relative accuracy and facility in spelling as a measure of the educational status of the individual."

It is perhaps too stringent a criterion to judge a person's educational status by his spelling efficiency, but from the number of egregious spelling blunders that appear in written work, it is evident that there is need for improvement in the spelling habits of senior-high-school pupils. Mistakes in spelling may stand in the way of one's promotion, not only in school but also in the affairs of life; for employers do not want poor spellers in positions of importance.

According to Guiler and Lease, "Pupil maturity is an important factor in learning to spell. Pupils leave the elementary school at a very immature age. Because of the limitations set by nature on pupil maturity, training in

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3Cornman, O. P., Spelling In The Elementary School: An Experimental and Statistical Investigation, 1902, p. 1.

spelling cannot stop with the elementary school. The secondary school must, of necessity, assume responsibility for developing spelling ability to a point where the pupils' spelling habits are adequate for meeting later demands in school and life."

Accuracy and a high degree of proficiency in spelling are necessary in a business office; therefore, typing classes should present an opportunity for integration of spelling and typing.

Craig and Leslie\(^5\) speak of the student's spelling at the typewriter as "getting the word in his fingers". They insist that "the fingers retain correct spelling technique even more tenaciously than the mind, and the habit established in the fingers will remain long after the knowledge put into the mind has been lost."

**Statement of the Problem**

The problem of this study is to discover through experiment whether spelling improvement results from the typing of hundreds of words used in learning to use the typewriter efficiently. Its purpose, therefore, is to attempt to answer the following questions:

1. Is typing a medium through which spelling is notably improved, even though no conscious attempt is made to improve spelling habits?

2. Is the use of the typewriter an incentive to better spelling?

3. Is spelling improvement through specific instruction and drill in the typing class worth while?
   a. Does the emphasis and drill for the improvement of spelling lessen the student's interest in typing?
   b. Does the time taken from the regular typing exercises for the emphasis upon spelling improvement cause a decrease in typing efficiency because of the shortened time for completing the regular typing assignment?

Values of the Study

The experiment conducted by the writer is believed to be valuable because teachers desire evidence to show whether efficiency in spelling is acquired unconsciously as students learn to type, or necessitates the employment of special techniques and methods in teaching typing. The techniques and methods used by the experimenter will be discussed in detail later in this chapter.

In most professions, the ability to spell accurately and efficiently is a definite asset. Especially is this true in the business world, where the acme of proficiency is required. A consistent misspelling of words in a secretary's business letters might be a determining factor
regarding her continued services, or at least might affect her professional advancement.

In spite of the evident interest in solving the problem of efficient and adequate teaching of spelling, no satisfactory solution has yet been presented. As for the correlation of spelling and typing in the high school little seems to have been done in the way of experimentation.

It is not contended that the present experiment is the last word in correct methods. Many similar experiments must and should be performed before definite procedures can be formulated. It is hoped, however, that some slight contribution toward improvement in this subject may be made.

Location of the Study

The experiment which is presented in this study was worked out in the Dallas High School, a first-class four-year high school with an enrollment at the time of approximately 325 students. This high school is situated in Dallas, Oregon, an average small town of approximately 4000 population, whose cross-section of life is similar to that of other small towns all over our nation. Dallas is the County Seat of Polk County and has as its main industry a large lumber mill. These conditions give the results brought out by this experiment a more practical meaning
since such results have not been affected by unusual circumstances, such as might be found in schools of larger size or those located in more populous areas.

The writer, who is the typing instructor in the Dallas High School, conducted this study in her own regularly scheduled forty-five-minute typing-class periods, a situation which gave her the opportunity to control most of the factors involved.

Duration of the Experiment

In order to be significant, the comparison between the Experimental group which received special instruction and the Control group which did not must be expressed in terms of gains over a considerable period of time. For an experiment of this kind, one full school year would probably be a minimum period from which valid and reliable quantitative indications might be obtained; therefore, this investigation was planned for one school year, from October, 1942, through May, 1943. Throughout the study, the time used in special emphasis on improvement in spelling habits and drill was approximately fifteen minutes a day, five days a week. In all other respects the class hours followed the usual routine.

Groups (Experimental and Control)

In order to determine the educational values of this
experiment, it was necessary to compare the progress of students having had the advantages of teacher-directed instruction intended to increase spelling consciousness, with that of another group not having had these advantages.

Pairing the pupils into equivalent groups constituted the first step in the study. For this purpose, an initial spelling test of two hundred words was given to seventy-five pupils who, when the experiment began; were enrolled in three classes of Typing I. Forms I and II of Bixler's High School Spelling Test made up this initial test. Two groups were then equated by matching each pupil selected in one group with a pupil of similar spelling ability in the other group. Although the experiment originally had been planned to include at least thirty couples, various factors finally limited the pairs to 21.

In order to insure valid pairing, only those pupils were selected who could be matched within one point of the total test score. Seven pairs were identical in this criterion, and the other 15 pairs were matched within one point of the composite score. Other criteria which were considered in the pairing were chronological age and sex. Fifteen pairs had the same chronological age, five pairs varied in age by one month, and one pair by three months. They were identically paired as to sex.

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6Bixler, Harold H., High School Spelling Test, Smith, Hammond and Company, Atlanta, Georgia, 1929.
Since the individual students were not paired as to mental age, Forms C and D of Terman-McNemar Test of Mental Ability were given to the unmatched groups. Form C was given October 5, and Form D on October 12, and the average of the two scores was taken as the score for each pupil. From this average the mental age was computed according to the method given by Terman and McNemar.

In the final arrangement, the two sections were found to have an approximate mean mental age of 17 years and 10 months for the Experimental group and 17 years and 11 2/3 months for the Control group. The difference in the two approximate means was considered negligible when the writer came to make her finding at the close of the experiment.

Techniques and Methods

Since the purpose of the study was to discover whether during the process of learning the mechanics of typing correlative learning might also take place in the specific skill of spelling, it was decided to set up the experiment in such a way that the gain in this specific skill might be measured.

The methods utilized in the study were both experimental and statistical. The first set of materials from Terman-McNemar Test of Mental Ability, World Book Company, Yonkers-on-Hudson, New York, 1941.

which data were obtained was the result of standardized tests.

Forty-two students were selected to take part in the experiment: twenty-one in the Experimental group were given specific instruction in spelling; and twenty-one in the Control group were given no spelling instruction. For convenience these groups may be referred to as E and C groups respectively. They were equated on the basis of (1) their total score in a spelling pre-test, Forms I and II of Bixler's High School Spelling Test, (2) chronological age, (3) and sex. All of these tests were personally conducted by the experimenter.

Both groups were given the same basic instruction techniques in learning the keyboard of the typewriter, but from that point the instruction differed; the Experimental group received special instruction in spelling and drill in improving spelling habits. The Control group followed the regular typing-class routine, but with no mention of spelling; however both the Control group and the Experimental group had 15 minutes less each day for the completion of the assigned typing exercises.

"The New Standard High School Spelling Scale", which

9Bixler, Harold H., High School Spelling Test, Smith, Hammond and Company, Atlanta, Georgia, 1929.

is designed for use in junior and senior high schools, was used as a spelling textbook for dictation drill in the Experimental group. In Part I, the words, numbering more than twenty-five hundred, are arranged in lessons for study. These lessons are carefully graded in difficulty, on the basis of scientific data, and the suggestions for class presentation are based on the results of scientific investigation by spelling experts and represent the best current practice. 11

The words are divided into lessons of forty words each. The text suggests one or two lessons a week, but the experimenter gave class instruction on twenty words four days a week, and thus completed the sixty-four lessons during the school year of 1942-43.

The method now outlined was an attempt to adapt instruction to the individual student:

Step 1. Twenty words from each lesson were dictated to the class at their typewriters. (No previous study had been made of these words). Students were directed to use unlined notebook paper and to type the dictated words on the left-hand side of the paper.

Step 2. The teacher then spelled the words correctly; the students marked the misspelled words and then typed

them correctly on the right-hand side of the paper.

Step 3. In order to ascertain which words were misspelled the most frequently, the pupils raised their hands whenever a misspelled word was encountered. These words were then written on the blackboard and pronounced distinctly, and the importance of syllabication was emphasized.

Step 4. The students looked at the word and pronounced it in unison. If it was an unfamiliar word, it was explained by the teacher, and then a student was asked to use the word in a sentence.

Step 5. Attention was often called to the difficult combinations in various words and rules were given whenever they would make the learning easier. Reigner lists the following as "Dependable Rules":

1. Nouns ending in _y preceded by a consonant change _y to _i and add _es to form the plural. Nouns ending in _y preceded by a sounded vowel add _s only. Examples: academy, academies; attorney, attorneys; soliloquy, soliloquies (_u is sounded as consonant _w in this word).

2. Verbs ending in _y preceded by a consonant change _y to _i and add _es to form the third person singular. The past tense of such verbs is formed by changing _y to _i and adding _ed. Example: hurry, hurries, hurried.

3. Nouns ending in _o preceded by a vowel always form their plurals by adding _s only. Example: cameo, cameos.

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4. A verb of one syllable that ends with a single consonant preceded by a single vowel doubles the final consonant before adding ed for the past tense or ing for the present participle. Example: stop, stopped

5. A verb of two syllables that ends with a sounded consonant immediately preceded by a single vowel and that is accented on the last syllable doubles the final consonant before adding ed to form the past tense or ing to form the present participle. Example: occur, occurred, occurring.

6. In words in which ie or ei is pronounced as long e, c is always followed by ei. Examples: perceive, receive.

7. Words ending in ce or ge keep the final e when the suffix able or -ous is added. As an example: change, changeable; courage, courageous. (Supplementary material in the use of prefixes and suffixes was provided in Frick's Ten-Minute Spelling Studies.)

Step 6. A brief period was given for individual practice on the words missed. The student was encouraged to visualize the word, type it with his eyes closed, then check with the correct copy on the board. If the particular lesson was without error, the student could refer to words missed in previous lessons and practice writing them in original sentences.

Step 7. From time to time, words that had been misspelled were incorporated in sentences and given as a dictation exercise, with the objective of improving both spelling and the mechanics of typing.

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Step 8. Each Friday the week's work was concluded by testing the class on all of the words that had been given during the week. The papers were handed in to the instructor to enable her to diagnose the difficulties most common to the class and thus gave a clue to further needed instruction.

Step 9. According to the laws of learning, after four weeks, the curve of remembering drops. Therefore, at the end of a six-week's period, words misspelled during the preceding five Friday tests were given.

Frick's Ten-Minute Spelling Studies, furnished the writer with various suggested techniques. For example, those for:

1. Ascertaining the error point.
2. Diagnosing the cause.
3. Implanting new ideas and associations as corrective elements.

During the year the Ten-Minute Spelling Studies, as well as Craig's, Teach Your Fingers To Spell were used for supplementary drill and dictation practice.

Both groups completed the course of study of typing and took the same initial and final spelling tests. In order to be sure the Control group typed the same words

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14 Frick, Minnie D., op. cit.

that appeared in the final test, the writer checked these words with those appearing in the typing textbook, the supplementary textbook and speed tests, and found all of them appeared at least once and a number of them several times.

The final step in the project consisted in measuring the amount of improvement made by the pupils in the Experimental and Control groups during the course of the experiment. For this purpose a final test of 200 words (Bixler's High School Spelling Test, Forms III and IV) was given. This test was the equivalent of the initial test in content and difficulty.

Great care was exercised to keep uniform the conditions under which the initial and final tests were given and to secure control over nonexperimental factors while the experiment was in progress. Since these precautions were taken, it seems fair to assume that the greater spelling improvement made by pupils in the Experimental group over that made by pupils in the Control group constitutes an objective measure of the comparative effectiveness of special instruction in spelling in the typing class.

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16 Bixler, Harold H., High School Spelling Test, Smith, Hammond and Company, Atlanta, Georgia, 1929.
17 The High School Spelling Test by Bixler is now available in four equivalent forms: I, II, III, and IV. This High School Spelling Test is published by Turner E. Smith & Company, Atlanta, Georgia.
Limitations of the Study

One factor limiting this study was the element of time. If it had been possible to administer the final spelling test again in the fall of 1943 to these same equated groups, the writer might have been able to discover whether real learning had taken place. However, since the law of forgetting operates for both groups, that is not considered a very significant limitation.

Another factor limiting this study was the small number of students in the experiment. Statistically, the results might have been more significant and reliable if there had been at least 50 in each group, instead of only 21. However, these 21 were evenly matched as to composite score on the spelling pre-test, chronological age, and sex. Another criterion for equating the groups was the mean mental age, which was found to vary by only one and two-thirds months in favor of the Control group.

A third contributing factor which may have proved a limitation was the discovery early in the experiment that one student in the Experimental group was handicapped in hearing. The writer made every effort to eliminate this disadvantage, but in interpreting the results, this factor should be considered.
In spite of these three limiting factors, the experiment was worthwhile and provides significant data from which to draw conclusions regarding the correlation of spelling and typing.
CHAPTER II

PREVIOUS STUDIES

The idea of the value of the typewriter as an educational instrument is not new. In the December 16, 1875, issue of The Nation,\(^1\) an advertisement proclaimed that no device is comparable to the typewriter for teaching children "to spell and punctuate." Since 1873 is the year that typewriters were first commercially manufactured, one can see that the idea of their value is almost as old as the machine itself.

William A. Mowry,\(^2\) in June, 1891, expressed the wish that all work in English composition might be done with the typewriter. Mowry's quotations might be significant were it not for the fact that validity of the method of his investigation might be questioned. He writes, "Experiments made with some quite young children show that by the use of one of these instruments they will learn to read, spell and write in less time than they learn to do one of these things under the present method of instruction..."

The conditions of the experiment are not given, nor is the difference in length of time stated.

\(^1\)Unzicker, Cecilia E., An Experimental Study of the Effect of the Use of the Typewriter on Beginning Reading, Bureau of Publications, Teachers College, Columbia University, New York City, New York, 1934, p. 1.

In 1892, Frank H. Palmer\(^3\) listed six advantages of the typewriter as an educational device, and in 1902 Frank Waldo\(^4\) prophesied that the typewriter would become a family necessity.

Unzicker\(^5\) says, "Experimentation, as these writers referred to it, meant experience with the machines in New England elementary schools and the collecting of subjective opinions of teachers. A few writers referred to good effect on grammar, reading, writing and spelling; but again no scientific experimentation was done to verify these statements."

Although in recent years there have been a number of scientifically conducted experiments regarding the value of the typewriter as an instrument for promoting the educational growth of elementary school children, perhaps the most extensive experiment is the Wood-Freeman\(^6\) Study.

The joint authors seemed to have had two objectives in mind when they were investigating the educational influences of the typewriter in the elementary school classroom.


\(^5\) Unzicker, Cecilia E., op. cit., p. 4.

Their major purpose was to study the "nature and extent of the educational influences of the portable typewriter when used as a part of the regular classroom equipment in the kindergarten and elementary school grades." A second objective was "to study the pedagogy of the typewriter as a classroom instrumentality." The plan of the investigation was to compare the educational progress of a large group of students in the elementary grades who had the advantage of the typewriter as a classroom instrument with that of another large group who did not have such an advantage. However, there was no scientific handling of correct typing techniques. Each teacher handled the subject in her own way. Indeed, many of the experimental teachers were said not to have had any training in the skill of typing or typing methods.

For evidence in formulating their results, Wood and Freeman write, "We are depending on three other major types of evidence, in addition to the test results: the children's writings, the teachers' judgements, and, last but not least, the testimony of the children themselves."

The following paragraphs describe briefly the results of the above experiment, as adduced by the teachers

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7 Wood, B. D., and F. N. Freeman, An Experimental Study of Educational Influences of the Typewriter in the Elementary School Classroom, p. 3.
regarding the general influence of the classroom typewriter on spelling: 8

The ease of typing words and sentences over and over, in legible, compact, and neat columns, promotes much self-initiated practice, and tends toward automaticity in spelling most of the common words and many others which children would not ordinarily use.

Chart 39, taken from Wood and Freeman 9 shows the percentage of teachers reporting on the favorable and unfavorable influences of the typewriter on spelling from December 1929 through May 1931.


CHART 39. Teachers' Judgments of the Influence of the Classroom Typewriter on Spelling

(After Wood and Freeman)

<table>
<thead>
<tr>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 10 20 30 40 50 60 70 80 90 100</td>
</tr>
</tbody>
</table>

Dec. 1929

- Favorable 70%
- Unfavorable 1%

May, 1930

- Favorable 85%
- Unfavorable 1%

May, 1931

- Favorable 87%
- Unfavorable 0

The Chart reads: The black bars show the proportions of teachers that judged the typewriter had favorable influences; the short, cross-hatched bars show the proportions of teachers that reported unfavorable influences. The percentage not reporting is not shown on chart.
... in December, 1929, only three months after beginning the use of the classroom typewriter, 70 per cent of the teachers reported that they had observed favorable influences of the machine on spelling. In the last two questionnaires, more than 80 per cent reported favorable influences. In the first two questionnaires, only one teacher gives an answer classified as unfavorable; none of the 116 two-year teachers reported any unfavorable influence in the last questionnaire, and the increase of the number of teachers who observed positive influences with increased experience with the typewriters are significant.

To quote several of the Experimental teachers we find such statements as:

"Typewriting has aided greatly in teaching spelling, as the letters were learned in typing and the frequent repetition in writing, fixed many words of first-grade vocabulary without further study." Another statement was, "Typewriting aids in visualizing words."

Another similar experiment was that carried on by Tate regarding the use of the typewriter as an instrument of learning in remedial reading and language in the elementary school classroom. He states:

The retarded pupils in the intermediate grades constitute a serious problem. A number of these pupils already have repeated one or more grades and have developed protective coatings of indifference.

Almost all elementary-school pupils, dull and bright alike, are keenly interested in the typewriter.

... The purpose of this experiment was to determine the usefulness of the typewriter in remedial instruction in reading and language in the intermediate grades.

Tate, M. W., "Use of the Typewriter in Remedial Reading and Language", The Elementary School Journal, April, 1943, pp. 485-486.
Although the results are not statistically reliable, it is rather evident that the typewriter is of some value in the remedial teaching of spelling and language usage.

In Table III, taken from Tate we find a consistent average gain in spelling.

### TABLE III

*Average Gains on Parts of Stanford Achievement Test Made By Experimental and Control Groups During Four Months When Experimental Groups Used the Typewriter (After Tate)*

<table>
<thead>
<tr>
<th></th>
<th>Average Gain in Grade Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Paragraph Meaning</td>
</tr>
<tr>
<td><strong>Groups</strong></td>
<td></td>
</tr>
<tr>
<td>Grade IV</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>.57</td>
</tr>
<tr>
<td>Control</td>
<td>.58</td>
</tr>
<tr>
<td>Grade V</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>.51</td>
</tr>
<tr>
<td>Control</td>
<td>.45</td>
</tr>
<tr>
<td>Grade VI</td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>.63</td>
</tr>
<tr>
<td>Control</td>
<td>.57</td>
</tr>
</tbody>
</table>

11 Ibid., p. 486
Unzicker, in her experiment on the effect of the use of the typewriter on beginning reading, draws the following conclusions:

That the results of all tests and subjective evidence used to define achievements in beginning reading indicate a trend of slight but constant superiority on the part of pupils who used typewriters.

That the pupils who used typewriters showed the most outstanding superiority in the following reading abilities: to recognize words, to perceive words, to read rapidly and fluently, to deal in certain ways with word elements, and, by the end of the year, to gain comprehension.

That the children in the lower ranges of intelligence were the ones whose progress in reading was most aided by the use of the typewriters. On the upper and middle ranges of intelligence there was not much difference between the groups.

These data indicate that the beginning reading of children who do typewriting is slightly superior in every noticeable respect to that of pupils who do not use typewriters.

Of the experiment conducted at the Owen D. Young Central School, Van Hornesville, New York, regarding the effect of directed typing practice on pupils' ability to read and spell, Templeton writes, "Possibly results have been poor, because, while the studies have been


extensive, they have attempted to evaluate too many things, and they have used the typewriter merely as motivation and not as a tool worthy of complete mastery . . . little or no instruction in the proper use of the machine was provided."

To the writer's knowledge, no studies have been published on the value of the typewriter as a medium for the improvement of spelling in the high school, and at the same time for the instruction of the student in complete mastery of touch typing at the machine. Thus there is a need for scientific research which can help education to decide just how the typewriter affects improvement in spelling, whether it is affected only when conscious attention is directed toward its improvement, or whether it is notably improved when there is no teacher-directed instruction. In the present investigation an attempt is made to answer certain questions (see Chapter I, page 3) through controlled experimentation and careful interpretation of the findings.
CHAPTER III

INTERPRETATION OF THE RESULTS

Equality of the Groups

Two groups of students as nearly equal as possible in ability were needed for the fulfillment of the purpose of this study or experiment. The purpose of the study, as stated in Chapter I, was to try to find whether improvement in spelling results from the typing of hundreds of words in learning to type efficiently, or whether it is necessary to use special instruction and drills to secure an appreciable improvement in spelling. One group received fifteen minutes special spelling instruction daily during the regularly scheduled typing class period; the other group did not have spelling emphasized in any way.

The students in three classes of beginning typing at the Dallas High School were given an initial spelling test of two hundred words. Two groups were equated by the matching of each pupil selected for one group with a pupil of similar spelling ability for the other group. Twenty-one pairs were then selected for the two groups. Other criteria which were considered in the pairing for the two groups were chronological age and sex. One group was designated as the Experimental group; the other, the Control group.
The purpose of this chapter is to summarize and chart the data collected.

Table I shows the chronological age and sex of the pupils in the two groups.

**TABLE I**

Arrangement of Sections E and C as determined by Chronological Age, and Sex of the Groups

<table>
<thead>
<tr>
<th>Pupil</th>
<th>Chron. Age</th>
<th>Sex</th>
<th>Pupil</th>
<th>Chron. Age</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1E</td>
<td>17-5</td>
<td>M</td>
<td>1C</td>
<td>17-5</td>
<td>M</td>
</tr>
<tr>
<td>2E</td>
<td>17-1</td>
<td>F</td>
<td>2C</td>
<td>17-4</td>
<td>F</td>
</tr>
<tr>
<td>3E</td>
<td>16-9</td>
<td>M</td>
<td>3C</td>
<td>16-8</td>
<td>M</td>
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<td>16-5</td>
<td>F</td>
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<td>11C</td>
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<td>F</td>
</tr>
<tr>
<td>12E</td>
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<td>F</td>
<td>12C</td>
<td>16-4</td>
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</tr>
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<td>19C</td>
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<td>F</td>
<td>20C</td>
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<td>15-5</td>
<td>M</td>
<td>21C</td>
<td>15-5</td>
<td>M</td>
</tr>
</tbody>
</table>

The mean age in years and months for the Experimental group was 16 years and 4 months; the mean for the Control group was 16 years and 5 months. The standard deviation for the Experimental group was 5.02 months; for the
Control group, 5.25 months. The difference of one month between the means is held to be insignificant for the purposes of this experiment.  

Although the students were not matched in mental age, the two groups were practically equivalent in this criterion as is shown in the following table.

TABLE II

Mean Mental Age in Years and Months for E and C Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of Pupils</th>
<th>Mean Age in Years and Months</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>21</td>
<td>17 yr. 10 mo.</td>
<td>2.05 yrs.</td>
</tr>
<tr>
<td>Control</td>
<td>21</td>
<td>17 yr. 11 2/3 mo.</td>
<td>1.85 yrs.</td>
</tr>
</tbody>
</table>

The mean mental age in months and years for the Experimental group was 17 years and 10 months, with a standard deviation of 2.05 months. The mean for the mental age of the Control group was 17 years, 11 and 2/3 months, with a standard deviation of 1.85 months. The difference in mental age between the two groups was small, but was in favor of the Control group.

14 For a discussion of the reliability of measures, see Garrett, Henry, E., Statistics in Psychology and Education, Longmans, Green & Company, New York, 1930, Chapter III.
The scores made on the initial test, given in October on Forms I and II of Bixler's High School Spelling Test, were used for the pairing of the students for the two groups and as a basis for comparison with later tests. These scores are listed in the table which follows.

TABLE III

Arrangement of Sections E and C as Determined by the Composite Scores on Forms I and II of Bixler's High School Spelling Test

<table>
<thead>
<tr>
<th>Pupil Form I</th>
<th>Form II</th>
<th>Comp. Score</th>
<th>Pupil Form I</th>
<th>Form II</th>
<th>Comp. Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1E</td>
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<td>80</td>
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<tr>
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<tr>
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<tr>
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<td>16C</td>
<td>86</td>
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<tr>
<td>17E</td>
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<td>81</td>
<td>17C</td>
<td>41</td>
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<tr>
<td>18E</td>
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<td>18C</td>
<td>78</td>
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<tr>
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<td>89</td>
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<tr>
<td>20E</td>
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<td>93</td>
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<tr>
<td>21E</td>
<td>68</td>
<td>70</td>
<td>138</td>
<td>21C</td>
<td>68</td>
</tr>
</tbody>
</table>

15op. cit.
The mean of the composite individual scores on Forms I and II of Bixler's High School Spelling Test\textsuperscript{16} as listed in Table III was computed for each group. The standard deviation and the probable error were then found for each group, as the groups were small and the findings needed to be checked against normal tendencies.\textsuperscript{17}

The mean of the Experimental group was 140.05, with a probable error of 4.8 and a standard deviation of 31.8; the mean for the Control group was 139.95, with a probable error of 4.8 and a standard deviation of 31.8.

Although the difference between the means of the Experimental and Control groups was small, a test for significance of the data was made. The quotient found was 2, \textsuperscript{18} which according to Garrett, is insignificant. (To be significant means that the relationship would remain the same if the groups were tested again and again.) Less than 4 means that the relationship between the two groups might change if they were tested again. Because the difference between the two groups is so small, the conclusion that the two groups were approximately equal in their ability to spell at the beginning of this experiment is valid.

\textsuperscript{16} Bixler, Harold H., op. cit.


\textsuperscript{18} Garrett, op. cit.
As was previously mentioned, the groups were equated as to sex, as is shown in Table I, there being sixteen couples of girls and five couples of boys.

The foregoing data indicate that at the beginning of the experiment the two groups were practically equivalent with respect to chronological age, spelling ability, and sex, and with an equivalent mental age between the groups, although the individual students were not matched in this one criterion.

Analysis of the Experimental Problem

An attempt will now be made to ascertain the answers to the questions inherent in the statement of the problem, which is herewith reviewed.

1. Is typing a medium through which spelling is notably improved, even though no conscious attempt is made to improve spelling habits?

2. Is the use of the typewriter an incentive to better spelling?

3. Is spelling improvement through specific instruction and drill in the typing class worth while?

   a. Does the emphasis and drill for the improvement of spelling lessen the student's interest in typing?

   b. Does the time taken from the regular typing exercises for the emphasis upon spelling improvement cause a decrease in typing efficiency because of the shortened time for completing the regular typing assignment?
The answer to the first and third questions as stated in the analysis of the problem could be found only by using different methods and procedures in teaching typing to the two groups. The length of the class period was the same for each group, but the Experimental group used fifteen minutes of the forty-five minute period for special spelling drill. Unusual words were defined, used in sentences, and then the sentences were typed several times. Once a week spelling tests were given on the special words typed during the week.

The Control group and the Experimental group were assigned the same typing exercises, however, there was no mention of spelling or any drill in this subject in the Control group. Many of the words that were given to the Experimental group for special spelling drill were contained in the exercises typed by both groups. All of the words that appeared in the final spelling test were found a number of times in the exercises. The Control group had the whole period in which to type the exercises and drills that the Experimental group had to do in thirty-minutes—therefore, the Control group could repeat the typing exercises.

Forms III and IV of Bixler's High School Spelling Test were given to the groups in May, 1943. These tests were equivalent in difficulty to those given in October, 1942.
The individual scores that the students made on the tests given in May, 1943 are listed in the following table.

**TABLE V**

Results of Bixler's High School Spelling Test Forms III and IV given May, 1943

<table>
<thead>
<tr>
<th>Pupil</th>
<th>Form III</th>
<th>Form IV</th>
<th>Comp. Score</th>
<th>Pupil</th>
<th>Form III</th>
<th>Form IV</th>
<th>Comp.</th>
<th>Pupil</th>
<th>Form III</th>
<th>Form IV</th>
<th>Comp.</th>
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</thead>
<tbody>
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<td>195</td>
<td>1C</td>
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<td>82</td>
<td>166</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2E</td>
<td>70</td>
<td>71</td>
<td>141</td>
<td>2C</td>
<td>42</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>72</td>
<td>142</td>
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<td></td>
<td></td>
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<td>75</td>
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<td>40</td>
<td>98</td>
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<td>84</td>
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<td>96</td>
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<td>18C</td>
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<td>76</td>
<td>158</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19E</td>
<td>99</td>
<td>100</td>
<td>199</td>
<td>19C</td>
<td>87</td>
<td>92</td>
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<td>71</td>
<td>139</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The mean of the composite scores of the Experimental group was 170.05, with a standard deviation of 18.8 and a probable error of 2.8; the mean of the composite scores of the Control group was 144.3, with a standard deviation of 29.0 and a probable error of 4.2. The difference between
the mean of the Experimental group and that of the Control group was 25.7. The probable error of this difference was 5. Although this difference between the mean of the Experimental group and that of the Control group was much greater than the difference between the mean of the two groups on the initial test, a test for significance was made. The quotient obtained was 5, which indicated that the difference between the two groups—the Experimental and the Control—was significant. In other words, the Experimental group will always show greater improvement than the Control group, if the groups were tested many times.

A fact revealed by the individual scores in Table V was that all 21 pupils who made up the Experimental group increased their scores from the initial to the final test, while five students in the Control group not only failed to increase their scores but decreased them.

Table VI shows the average gains made by the Experimental and Control groups.
TABLE VI

Average Gains on Spelling Tests
Made by Experimental and Control Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Initial Test</th>
<th>Final Test</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>140.0</td>
<td>170.0</td>
<td>30.0</td>
</tr>
<tr>
<td>Control</td>
<td>139.9</td>
<td>144.3</td>
<td>4.3</td>
</tr>
</tbody>
</table>

The mean score made on the final test by the Experimental group was 170.0 and the mean score on the initial test was 140.0. The difference between the two means was the average gain made by the Experimental group; this difference was 30. This gain was large enough that it seemed it should be significant, however, a test was made to see if really were significant. The quotient obtained was 5, which indicated that the gain made by the Experimental group was significant and that if they were tested many times that the results would always show improvement.

The mean score made on the final test by the Control group was 144.33 and the score on the initial test was 139.9. The difference between the two means was 4.3. This gain was very small and the test for significance gave a quotient of less than 1, which shows that the gain made by the Control group was not significant. If this
group were tested many times, they might show improvement and again they might not.

Table VII, as shown below, lists the individual gains in spelling improvement, after Bixler's High School Spelling Test had been administered in May, 1943

### TABLE VII

Individual Gains at End of Experimental Year

<table>
<thead>
<tr>
<th>Pupil</th>
<th>Amt. of Imp.</th>
<th>Poss.</th>
<th>% of Gain</th>
<th>Pupil</th>
<th>Amt. of Imp.</th>
<th>Poss.</th>
<th>% of Gain</th>
</tr>
</thead>
<tbody>
<tr>
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<td>88.4</td>
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<td>43</td>
<td>20.9</td>
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<td>122</td>
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<td>76</td>
<td>71.1</td>
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<td>77</td>
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<td>61.9</td>
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<td>-41.9</td>
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<td>55</td>
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<td>48</td>
<td>70.8</td>
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<td>47</td>
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<td>41</td>
<td>53.7</td>
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<td>28</td>
<td>82.2</td>
<td>15C</td>
<td>-3</td>
<td>28</td>
<td>-10.7</td>
</tr>
<tr>
<td>16E</td>
<td>18</td>
<td>29</td>
<td>62.1</td>
<td>16C</td>
<td>-9</td>
<td>29</td>
<td>-31.0</td>
</tr>
<tr>
<td>17E</td>
<td>62</td>
<td>119</td>
<td>52.1</td>
<td>17C</td>
<td>17</td>
<td>119</td>
<td>14.2</td>
</tr>
<tr>
<td>18E</td>
<td>5</td>
<td>43</td>
<td>11.6</td>
<td>18C</td>
<td>1</td>
<td>43</td>
<td>2.3</td>
</tr>
<tr>
<td>19E</td>
<td>20</td>
<td>21</td>
<td>95.2</td>
<td>19C</td>
<td>1</td>
<td>22</td>
<td>4.5</td>
</tr>
<tr>
<td>20E</td>
<td>9</td>
<td>15</td>
<td>60.0</td>
<td>20C</td>
<td>0</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>21E</td>
<td>22</td>
<td>62</td>
<td>35.5</td>
<td>21C</td>
<td>0</td>
<td>61</td>
<td>0</td>
</tr>
</tbody>
</table>

Table VIII shows the percentage of gain made by the Experimental group and the Control group.
TABLE VIII

The Percentage of Gain of the Experimental and Control Groups at End of Experimental Year

<table>
<thead>
<tr>
<th>Groups</th>
<th>Poss. Imp.</th>
<th>Actual Imp.</th>
<th>% of Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>1257</td>
<td>714</td>
<td>57</td>
</tr>
<tr>
<td>Control</td>
<td>1257</td>
<td>107</td>
<td>8</td>
</tr>
</tbody>
</table>

The percentage of gain was computed on the basis of actual gain as related to possible gain. There were 21 pupils in the Experimental group, and the highest possible score was 200 points on each test. Hence the 21 pupils might have made a total score of 4200 points. They could have made a possible improvement of 1257 points, however their actual improvement was 714 points. Their total scores of 2,941 on the initial test and 3,655 on the final test made the per cent of gain 57. The 21 pupils in the Control group could also have made 4200 points on each test. Their possible gain was 1,257 points, but their actual gain was only 107 points; so the per cent of gain is 8.
Gains in Typing Speed for Experimental and Control Groups

The net gain of the Experimental group in speed on the typewriter is significant when we consider that fifteen minutes daily was taken from the time for their regular typing drill assignments and speed tests. Three five-minute writes were taken during the first week in December, 1942, the average taken for each student. The initial average for the Control group was 20.4 and for the Experimental group 22.5. In May, 1943, three more five-minute writes were given and the average taken. They showed the Control group had an average of 30.5 w.p.m., only a 10.1 word improvement, while the Experimental group had an average of 39.5, or 17-word improvement.

This fact seems to answer the subordinate question (b) under Question 3.

Does the time taken from the regular typing exercises for the emphasis upon spelling improvement cause a decrease in typing efficiency because of the shorter time allowed for the completing of the regular typing assignment?
CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary of Results

The primary purpose of this experiment was to discover whether efficiency in spelling can be acquired unconsciously as students learn to type, or whether greater efficiency is produced when daily drills are given in spelling, with the use of the typewriter as a medium of instruction.

The gain of one Experimental group of twenty-one students receiving teacher-directed spelling drills was compared with that of a matched Control group of a like number receiving the same typing assignments, with no special spelling drill.

The usual steps were taken in planning and carrying out the experiment to secure results of statistical reliability. Care was taken to obtain comparable groups from the point of view of chronological age, spelling ability, and sex. In these criteria the students were carefully equated. The mean mental age of the two groups was equivalent; however, the individual students were not paired in this criterion.

Care was also taken to keep the teaching procedure constant with the exception of the 15-minute daily spelling drill in the Experimental class. The effort to keep
the Experimental and Control groups comparable in all of these respects succeeded in the main, and such slight variations as were found to exist were given consideration in drawing the conclusions. The experiment ran through the complete school year of 1942-43 and was conducted in regular typing classes at the Dallas High School, in Dallas, Oregon.

Conclusions and Implications

The following concluding statements about and implications drawn from this experimental study seem justified by the data and the statistical results.

1. It seems evident that the study of typewriting is of little or no value as a medium through which the student's spelling may be improved incidentally as he learns to type.

2. Significant improvement in the ability to spell may be expected when a systematic program for the teaching of spelling is used. The improvement made by the pupils in the Experimental group, who had the advantage of teacher-directed drill in spelling, was significantly greater than that made by the Control-group pupils.

3. Pupils of all levels of spelling ability may be expected to benefit from a remedial program based on individual needs.
4. The Experimental group seemed to show more interest in their typing work and appeared to appreciate the opportunity of improving their spelling ability. Several pupils in this group remarked that they were not making as many spelling errors in their English themes.

5. Although fifteen minutes were taken from the class period of the Experimental group for special drill in spelling, it is interesting to note that this fact did not decrease but rather increased the typing rate of this group.

5. The subject of typing may be used to furnish the student with an incentive for improving his spelling.

7. It would appear then, that if the use of the typewriter is as favorable as is indicated by the results of the present study, typing teachers and supervisors who are concerned with remedial spelling in the high school should incorporate spelling drill with typing instruction.
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APPENDICES

MEASURING INSTRUMENTS
Measuring Instruments

Before choosing the Bixler High School Spelling Test as the measuring device in this experiment, the writer examined several published spelling tests, but found the Bixler Test the most satisfactory for her purpose. She reached this conclusion for the following reasons:

1. The Bixler Spelling Test is designed to furnish a reliable, valid, and comparable measure of achievement in spelling.

2. This test may be used equally well in Junior and Senior high schools and in Colleges.

3. The words included in the Bixler Test are selected from the Standard High School Spelling Scale. This Scale contains the 2560 words most frequently misspelled by high-school students.

4. The reliability of the Bixler Test is satisfactory as shown by the fact that the reliability coefficient for a group of 132 eighth-grade pupils was .93.

The Terman-McNemar Test of Mental Ability which was used in this experiment was known in its original form as the Terman Group Test of Mental Ability, which test was first published in 1920. Perhaps its fundamental soundness is indicated by its widespread and continued usage--more than 11,000,000 copies have been distributed during the period 1920--1941.
The test is designed primarily for use in Grades 7 through 12, although it may be used also in Grade 6 and with first-year college students. There are two forms, C and D, each composed of seven subjects and 162 items. The authors have made an attempt to use equivalent materials in the two forms.

The reliability of the Terman-McNemar Test is satisfactory as shown by the fact that the reliability coefficient for a group of 239 cases in Grades 7 and 9, in which Forms C and D were equated was .95.

The best evidence of the validity of the test is to be found in its successful use over the period of years since the test was first used.