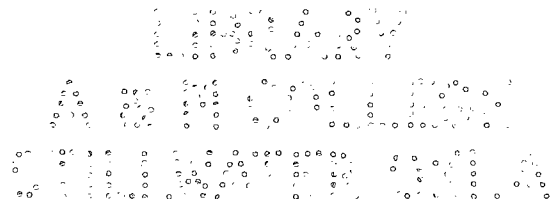


A STUDY OF
THE ATTAINMENTS OF FIRST-YEAR TYPEWRITING STUDENTS
IN THE STATE OF OKLAHOMA AT FIVE-WEEK INTERVALS
DURING THE YEAR 1940-41

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The members of Beta Chapter of Delta Pi Epsilon.


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Chapter I

INTRODUCTION

On June 26, 1940 Beta Chapter of Delta Pi Epsilon, a national fraternity for graduate students in business education, voted to sponsor annually some worth-while research project in the field of business education. At this same meeting a brief discussion as to the type of research which should be undertaken first led to the consensus that a project to determine first-year typewriting attainments would be apropos. This study presents the results of the first annual project sponsored by Beta Chapter of Delta Pi Epsilon.

Purpose

The purpose of this study is to determine the attainments of first-year high school typewriting students in the State of Oklahoma at five different periods during the school year of 1940-41. Attainments will be measured in terms of gross words a minute and per cent of accuracy on straight-copy tests.

Comparison will be made of the attainments between boys and girls and to a certain extent between those students with vocational and non-vocational objectives.

Insofar as the data will permit, norms will be set up which may be used as standards for typewriting classes in the future.

Scope

The tests used in this study were given in beginning typewriting classes in twenty-two high schools, all of which were in the State of Oklahoma, and the students participating were those who had had no instruction in typewriting previous to the 1940-41 school year. Although all teachers whose students participated were not members of Delta Pi Epsilon, a member of Delta Pi Epsilon did teach in the school and was instrumental in securing the cooperation of the typewriting instructor.

Enrollment in the schools ranged from 45 to 3,400 students. The average enrollment for all the schools was 752 while the median enrollment was 378. Eleven of the schools opened on September 2, and the remaining eleven began on September 9, 1940. (The tests were given during the thirteenth, eighteenth, twenty-third, twenty-eighth, and thirty-third week of school which meant that they were given at different dates in different schools; nevertheless, the students had received the same number of weeks of instruction. All of the schools devoted only one period a day to any one class in typewriting. With the exception of four, all of the schools participating had instructional periods of fifty-five minutes; of these four, one had a forty minute period, two had forty-five minute periods, and the other had a sixty-five minute period.

Twenty of the schools used Twentieth Century Typewriting by Lessenberry and Jevon as a text, the other two schools used Gregg Typewriting by Sorelle-Smith-Foster-Blanchard.

The twenty-two schools were widely scattered throughout the state. (See appendix for a list of the schools used and their total enrollment.)

Eleven of the schools had only one instructor in typewriting, six had two instructors, two had three instructors, and three had four instructors.

Procedure

A committee of Delta Pi Epsilon members was appointed to supervise and advise in all matters pertaining to this research project. This committee decided upon the use of straight-copy tests alone because the results of this type of test are much easier tabulated and compared. It was also pointed out that speed and accuracy on straight-copy tests are principal bases upon which a large number of teachers determine their grades.

All members of Beta Chapter teaching in high schools in the State of Oklahoma were sent a general information sheet (see appendix for a copy) which they were asked to fill out and return if the typewriting classes in their school could be used in securing data for the study. From these data sheets it was determined approximately the

number of students that would participate and also the number of copies of the tests that would be needed for each school.

Straight-copy tests were secured from the Gregg Publishing Company. (Copies of each test given may be found in the appendix.) These tests were chosen because it was quite unlikely that they would be familiar to any first-year typewriting student in the state. Information concerning the tests was furnished by Florence Ulrich, circulation manager of the Gregg Writer, in a personal letter dated November 18, 1940.

The Competent Typist Tests are not "manufactured" as typing speed tests, but they constitute literary matter taken from various sources (shown by the credit line), slightly edited where necessary. This editing usually constitutes the elimination of too many figures, capital letters, etc. The tests are counted in standard words of five strokes, and the subject matter is chosen from the standpoint of fluency as well as interest content. Each test is tried out in this office before it is sent to the editors for student's use.

The first test was given during the thirteenth week after the beginning of school and was five-minutes in length, while the remaining four tests of ten-minutes in length were given in succeeding five-week intervals. The second test was given during the eighteenth week; the third test during the twenty-third week; the fourth test during the twenty-eighth week; and the last test during the thirty-third week of school.

A complete set of instructions for administering the tests, also a copy of the 1939 International Typewriting Rules accompanied the first test. (See appendix for copies) The same instructions were followed in giving all five tests except that the length of the test was changed from five to ten minutes. This change was made because as the student's skill increases, the length of the test is usually increased.

Each student was asked to put the following information at the top of his test paper either before or after taking the test: (1) The Code Number by which the school was known, (2) Age, (3) Grade in School, (4) Sex, (5) Strokes, (6) Gross Words, (7) Errors, (8) Net Words, (9) Words Per Minute, and (10) Per Cent of Accuracy. He was also asked to answer the following question on the back of his paper: What use do you expect to make of your ability to operate a typewriter?

The test papers were first checked by the student or one of his classmates. Tests one, two, and three were then sent to Oklahoma Agricultural and Mechanical College and rechecked by various business education groups and faculty members on the campus. Test four was rechecked by the individual teachers giving the tests or by the Delta Pi Epsilon member sponsoring the tests in that school. Test number five was rechecked by the author of this study. All results were obtained by using 1939 International Typewriting Rules.

As soon as all papers from one test were received, they were classified according to the objectives of the individual

students, namely, vocational and non-vocational. A rather liberal definition of vocational was used and will be used throughout this study. Any student who stated that he intended to use his ability to operate a typewriter to secure a job or to make a living was considered as having a vocational objective. It was necessary to set up a special group for students who failed to indicate their objective. After the papers were classified, each group was then re-divided according to sex.

The gross words a minute and per cent of accuracy for all students in each group were then tabulated. The use of gross words a minute and per cent of accuracy as units of measurement make it possible for the reader to determine any other information which he may desire pertaining to the scores on the tests with a minimum amount of calculation. The following is the method used in determining gross words a minute and per cent of accuracy:

$$\begin{aligned} \text{Strokes} + 5 &= \text{Gross Words} \\ \text{Errors} \times 10 &= \text{Penalty} \\ \text{Gross Words} - \text{Penalty} &= \text{Net Words} \\ \text{Net Words} \div \text{Gross Words} &= \text{Per Cent of Accuracy} \\ \text{Gross Words} \div \text{Length of Test} &= \text{Gross Words a Minute} \end{aligned}$$

From the tabulations of gross words a minute and per cent of accuracy the frequency tables which are used in chapter two were set up. Various statistical formulae were applied to obtain and verify results.

Related Study

A study, made at New York State College for Teachers in 1930,¹ sought to determine the speed and accuracy achievements on straight-copy tests at the end of one year of typewriting in high school.

Ten-minute copying tests were given 4,576 students in about fifty towns and cities of various sizes in more than twenty states. One test was given at the end of the first semester and one at the end of the second semester. Tests were marked according to International Rules.

The findings may be summarized as follows: In the first test boys wrote an average of eleven words a minute with seven errors; girls, fifteen words a minute with six errors; boys and girls combined, fourteen words a minute with six errors. In the second test, boys wrote twenty-three words a minute with eight errors; girls wrote twenty-six words a minute with seven errors; boys and girls, twenty-five words a minute with seven errors, an improvement of seventy-five per cent during the second semester.

Dr. Blackstone makes the following evaluation of this study:²

The discussion of standards set up by various courses of study indicates decided lack

¹Owens, D. B., A Survey of Typewriting Achievements at the End of First-Year, Speed Attained and Errors Made. Masters Thesis, New York State College for Teachers, 1930.

²Blackstone, E. G., "Commercial Education Research Abstracts", Business Education World, December 1933, Page 201.

of agreement as to what should be achieved.
There is a wide distribution of students involved
and probably an adequate sampling.

Chapter II

FINDINGS

In chapter one the purpose of this study was stated and the scope and procedure used were briefly outlined.

This chapter will present the findings. Insofar as it is possible, all results will be displayed in table form and the discussion will point out the more significant findings. No attempt will be made to consider the implications of the findings since this will be done in chapter three.

Test 1 Given During the Thirteenth-Week of School

The first test given was sent to the respective teachers near the end of the twelfth week of school with the request that it be given sometime during the thirteenth week. A complete set of instructions and a copy of the 1939 International Typewriting Rules accompanied this test. The papers were graded by the students taking the test and rechecked by business education students and faculty members on the A. and M. campus.

The test papers were divided into three groups, vocational, non-vocational, and those for which no objective was indicated. This division was made on the basis of a statement by the student. Vocational students were defined arbitrarily as those who stated that they planned to use their ability to operate a typewriter in some manner similar to the following: In a career, to make a living, get a job, or become a secretary or stenographer.

Frequency tables for gross words a minute and per cent of accuracy were set up for these groups and the various statistical formulae applied.

The papers were then divided according to sex and the same procedure outlined in the preceding paragraph was repeated.

Tables I and II (see pages 11 and 12) present the findings of this first test. Since the statistical method employed is somewhat complicated, a rather detailed analysis of the first two tables will be given.

The mean, which is commonly called the average, is given directly below the total number of students in each particular group. However, the chances are that the scores of few, if any students, will coincide exactly with the mean, therefore, some measure was needed that would show the dispersion or scatter of the scores around the mean. The standard deviation is a measure of this scatter. In a satisfactory sample, more scores will be grouped closely around the mean than around any other point. In a satisfactory sample, if the standard deviation is added to and subtracted from the mean, approximately two-thirds of the items, or scores, in the group will fall between these two points.

To illustrate in a more practical way, examine Table I. In the right-hand column it can be seen that 1,956 students took the first test. The average gross words a minute for this group was 25.81. The standard deviation was found to be 7.3. Adding 7.3 to 25.81 gives 33.11; subtracting 7.3

T A B L E I

Test 1

ATTAINMENTS IN TERMS OF GROSS WORDS A MINUTE
FOR 1,956 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE THIRTEENTH WEEK

Gross Words A Minute	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
7- 9	1	3	2	3	3	6
10-12	5	19	6	21	9	30
13-15	13	54	9	51	25	76
16-18	68	125	17	105	105	210
19-21	97	186	29	137	175	312
22-24	130	196	39	148	217	365
25-27	107	174	30	107	204	311
28-30	96	97	28	71	150	221
31-33	56	63	19	29	109	138
34-36	43	55	24	32	90	122
37-39	35	46	14	18	77	95
40-42	15	11	11	4	33	37
43-45	3	7	5	2	13	15
46-48	4	6	1	2	9	11
49-51	2	0	0	0	2	2
52-54	1	0	1	0	2	2
55-57	2	0	0	0	2	2
58-60	1	0	0	1	0	1
TOTAL	679	1042	235	731	1225	1956
Mean	26.69	24.88	27.76	25.39	27.14	25.81
Standard Deviation	7.26	6.96	8.14	6.62	7.37	7.30
Critical Ratio	5.14			10.99		

This table reads across as follows: One student with a vocational objective, three with non vocational objectives, and two that did not indicate their objective wrote between seven and ten gross words a minute. Three boys and three girls wrote between seven and ten gross words a minute and the total number of students who wrote between seven and ten gross words a minute was six. Tables II through X are read in the same manner.

T A B L E I I

Test 1

ATTAINMENTS IN TERMS OF PER CENT OF ACCURACY
FOR 1,956 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE THIRTEENTH WEEK

Per Cent of Accuracy	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
0	86	162	18	116	150	266
1- 10	21	17	4	17	25	42
11- 20	28	41	10	31	48	79
21- 30	30	69	12	48	63	111
31- 40	55	72	13	56	84	140
41- 50	58	93	22	66	107	173
51- 60	79	114	29	71	151	222
61- 70	92	170	33	98	197	295
71- 80	92	132	51	111	164	275
81- 90	94	104	26	72	152	224
91-100	44	68	17	45	84	129
TOTAL	679	1042	235	731	1225	1956
Mean	52.22	49.79	56.98	49.01	53.03	51.53
Standard Deviation	31.01	31.34	28.09	31.76	30.32	22.28
Critical Ratio	1.59			2.77		

from 25.81 gives 18.51. It may then be said that approximately two-thirds of the 1,956 students wrote between 18.51 and 33.11 gross words a minute. All standard deviations throughout this chapter may be interpreted the same way.

If Table I is examined more in detail, it would appear that at the end of thirteen weeks of training the vocational students wrote about two gross words a minute faster than the non-vocational students; and that girls wrote about 3.5 gross words a minute faster than boys. Only 679 students indicated a vocational objective, whereas 1,042 indicated a non-vocational objective. The question might be asked: If as many vocational students had been tested as non-vocational, would the difference between the means still exist? In other words, is the difference between these groups due to the different number of cases in each group, or could that difference be expected regardless of the number of cases? This calls for the use of another statistical technique known as the critical ratio which is a measure of the reliability of the apparent difference between two groups.³ A critical ratio of more than three indicates that the difference between the means of the two groups being compared would not be likely to occur just by chance; in other words, a critical ratio of more than three is usually accepted as sufficient evidence that the difference is not due to an accident in sampling, but, if

³All statistical formulae used are listed in the appendix.

the test were repeated with other groups, the same or a greater difference would very likely be found.

In Table I it may be noted that students with a vocational objective did type faster than those with a non-vocational objective. The critical ratio indicates that this difference is not due to chance but is significant of a real difference between vocational and non-vocational students during the thirteenth week of school. Similarly, girls wrote faster than boys by about 3.5 gross words a minute. This difference is also significant.

Table II may be interpreted in the same manner as Table I with the exception that the per cent of accuracy is used as a basis. It should be noted that the average for all students was only 51.53 per cent of accuracy. The vocational students appear to have a higher per cent of accuracy, but the critical ratio indicates that the difference may not be accepted as significant. If the test was repeated, there would be no assurance that a significant difference would exist. There is also no significant difference between the per cent of accuracy of boys and that of girls.

To summarize the findings of test one, the following facts seem to be most important: A total of 1,956 students representing twenty-two high schools took this test. The mean gross words a minute written by them was 25.81 and about two-thirds of them wrote between 18.51 and 33.11 gross words a minute. Their mean per cent of accuracy was 51.53

with a standard deviation of 22.28. Vocational students wrote faster than non-vocational, and girls wrote faster than boys but there was no significant difference in the per cent of accuracy of either.

Test 2 Given During the Eighteenth Week

The second test was given during the eighteenth week of school. One thousand five hundred sixty-seven students from the twenty-two high schools participated; of this number, 550 were boys and 1,017 were girls. The mean gross words a minute is 30.46. (See Table III, page 16). The standard deviation is 7.30. This may be interpreted as meaning that about two-thirds of the 1,567 students wrote between 23.16 and 37.76 gross words a minute.

It appears at first that students with vocational objectives wrote slightly faster than those with non-vocational objectives; however, this difference is not indicative of a significant difference between vocational and non-vocational students since the critical ratio is only 2.47.

The apparent difference in gross words a minute between boys and girls is significant as borne out by the critical ratio of 6.51.

Table IV (page 17) shows the attainments in terms of per cent of accuracy for test two. The average per cent of accuracy is 58.64; however, the standard deviation of 26.86 is an indication that the scores are widely scattered around the mean. In order to include approximately two-thirds of the scores, the range would have to be from 31.78 per cent

TABLE III

Test 2

ATTAINMENTS IN TERMS OF GROSS WORDS A MINUTE
FOR 1,567 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE EIGHTEENTH WEEK

Gross Words A Minute	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
7-12	0	3	2	3	2	5
13-18	9	25	27	29	32	61
19-24	48	100	132	128	152	280
25-30	131	203	192	202	324	526
31-36	120	168	133	122	299	421
37-42	48	77	77	51	151	202
43-48	18	18	22	13	45	58
49-54	2	2	7	0	11	11
55-60	0	0	2	1	1	2
61-66	0	0	1	1	0	1
TOTAL	376	596	595	550	1017	1567
Mean	31.38	30.27	30.07	28.86	31.32	30.46
Standard Deviation	6.71	7.00	7.87	7.07	7.28	7.30
Critical Ratio		2.47			6.51	

TABLE IV

Test 2

ATTAINMENTS IN TERMS OF PER CENT OF ACCURACY
FOR 1,567 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE EIGHTEENTH WEEK

Per Cent of Accuracy	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
0	17	47	33	39	58	97
1- 10	6	18	10	16	18	34
11- 20	9	26	15	21	29	50
21- 30	16	27	25	24	44	68
31- 40	27	40	40	30	77	107
41- 50	39	69	58	61	105	166
51- 60	46	59	82	65	122	187
61- 70	54	86	100	88	152	240
71- 80	67	97	115	102	177	279
81- 90	67	100	81	75	173	248
91-100	28	27	36	29	62	91
TOTAL	376	596	595	550	1017	1567
Mean	61.13	55.70	59.29	56.76	59.23	58.64
Standard Deviation	25.66	28.48	25.67	27.53	26.45	26.86
Critical Ratio	3.08			1.73		

to 85.50 per cent. Reading across the table, it can be seen that the standard deviations for all groups are large. The accuracy of vocational students is significantly higher than that of non-vocational. There is no significant difference between the accuracy of boys and girls.

Test 3 Given During the Twenty-third Week

Test three was given during the twenty-third week of school in each of the twenty-two schools cooperating in this study. A total of only 905 papers were received. This is believed to have been due to illness and bad weather which occurred at about that time; however, there are no facts to prove that this was true.

Since the sample is small as compared with the other tests, it will not be treated in as complete a manner as are the others. The mean gross words a minute for all the students is 33.19. The standard deviation is 8.17. (See Table V, page 19).

Only 166 students indicated their objective for taking typewriting; therefore the results are placed on the table for comparative purposes only and should be viewed with the understanding that they are probably not an adequate sample upon which to base judgment.

Boys wrote an average of 30.96 gross words a minute and girls wrote 3.43 gross words a minute faster, or 34.39. This difference is significant. The critical ratio of 6.22 will bear out this statement.

T A B L E V

Test 3

ATTAINMENTS IN TERMS OF GROSS WORDS A MINUTE
FOR 905 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE TWENTY-THIRD WEEK

Gross Words A Minute	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
7-12	0	0	2	1	1	2
13-18	2	7	15	15	9	24
19-24	1	9	92	54	48	102
25-30	7	24	193	93	131	224
31-36	25	32	241	86	212	298
37-42	18	24	134	50	126	176
43-48	2	6	42	13	37	50
49-54	1	2	9	2	10	12
55-60	0	5	8	2	11	13
61-66	0	1	1	0	2	2
67-72	0	0	2	0	2	2
TOTAL	56	110	739	316	589	905
Mean	35.07	34.22	32.90	30.96	34.39	33.19
Standard Deviation	6.32	9.81	7.99	7.78	8.12	8.17
Critical Ratio	.673			6.22		

T A B L E V I

Test 3

ATTAINMENTS IN TERMS OF PER CENT OF ACCURACY
FOR 905 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE TWENTY-THIRD WEEK

Per Cent of Accuracy	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
0	2	3	30	11	24	35
1- 10	0	0	16	6	10	16
11- 20	0	2	21	15	8	23
21- 30	1	8	20	13	16	29
31- 40	4	6	40	22	28	50
41- 50	4	5	52	20	41	61
51- 60	9	10	92	35	76	111
61- 70	6	13	112	45	86	131
71- 80	8	27	135	61	109	170
81- 90	13	24	165	61	141	202
91-100	9	12	56	27	50	77
TOTAL	56	110	739	316	589	905
Mean	68.5	66.91	63.65	62.30	65.44	64.34
Standard Deviation	23.62	24.10	25.51	26.12	24.74	25.25
Critical Ratio	.41			1.75		

In Table VI (page 20) is found the per cent of accuracy attainments of the 905 students who took the third test during the twenty-third week of school. The mean per cent of accuracy for the entire group is 64.34 but the standard deviation is large, 25.25. The difference in the mean per cent of accuracy of boys and girls is not enough to be significant.

In summarizing, it may be said that the mythical average student wrote 33.19 gross words a minute with an accuracy of 64.34 at the end of the twenty-third week of school. There was no difference in the speed of vocational and non-vocational students but girls wrote faster than boys. No one group of students wrote more accurately than any other group.

Test 4 Given During the Twenty-eighth Week

Tables VII and VIII (pages 22 and 23) show the results obtained from test four which was taken by 1,455 students. Only about one-third of them gave their objective for taking typewriting and of that number 288 were non-vocational and 208 were vocational.

The results for the entire group show the mean gross words a minute to be 37.18 with a mean per cent of accuracy of 66.57. There was no significant difference between vocational and non-vocational students in either gross words a minute or per cent of accuracy. Girls did write significantly faster than boys but with no greater degree of accuracy.

TABLE VII

Test 4

ATTAINMENTS IN TERMS OF GROSS WORDS A MINUTE
FOR 1,455 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE TWENTY-EIGHTH WEEK

Gross Words A Minute	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
7-12	0	0	1	1	0	1
13-18	0	3	1	0	4	4
19-24	2	9	37	30	18	48
25-30	18	49	150	85	132	217
31-36	77	97	314	179	309	488
37-42	68	79	258	116	289	405
43-48	27	36	139	41	161	202
49-54	11	13	48	10	62	72
55-60	4	2	10	3	13	16
61-66	1	0	1	0	2	2
67-72	0	0	0	0	0	0
TOTAL	208	288	959	465	990	1455
Mean	38.44	36.54	37.09	35.17	38.12	37.18
Standard Deviation	6.91	7.35	7.50	6.93	7.44	7.41
Critical Ratio	2.94		7.37			

TABLE VIII

Test 4

ATTAINMENTS IN TERMS OF PER CENT OF ACCURACY
FOR 1,455 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE TWENTH-EIGHTH WEEK

Per Cent of Accuracy	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
0	3	6	31	16	24	40
1- 10	5	3	19	9	18	27
11- 20	0	5	26	10	21	31
21- 30	3	13	32	19	29	48
31- 40	10	14	47	26	45	71
41- 50	10	20	53	31	52	83
51- 60	18	27	89	49	85	134
61- 70	35	45	152	78	154	232
71- 80	50	66	198	94	220	314
81- 90	54	72	228	99	255	354
91-100	20	17	84	34	87	121
TOTAL	208	288	959	465	990	1455
Mean	70.18	66.52	65.80	64.13	67.72	66.57
Standard Deviation	21.17	22.62	24.92	24.75	24.01	24.02
Critical Ratio	1.84			2.6		

Test 5 Given During the Thirty-third Week

The final test was given during the thirty-third week of school. It should be borne in mind that these results were determined with three weeks of school remaining.

A total of 1,232 students took this test. Only 360 of them indicated an objective and slightly more than half of these were non-vocational. There were about two girls to one boy who indicated a vocational objective.

At the end of the thirty-third week of school the mean gross words a minute for all students was 40.69. (See Table IX, page 25). The standard deviation was 8.15, meaning that approximately two-thirds of the students were writing between 32.54 and 48.84 gross words a minute.

The mean per cent of accuracy with which the students wrote, as shown by Table X (page 26), was 73.43 with a standard deviation of 21.24.

There was no significant difference between vocational and non-vocational students in the gross words a minute written, or in the accuracy with which they wrote.

Girls were writing almost four words a minute faster than boys and that difference is statistically significant. Girls also wrote with a significantly higher per cent of accuracy than boys.

A resume of test five indicates that, at the end of the thirty-third week, the average student was writing about 40.69 gross words a minute, with an accuracy of approximately 73.43 per cent. There was little difference between

T A B L E I X

Test 5

ATTAINMENTS IN TERMS OF GROSS WORDS A MINUTE
FOR 1,232 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE THIRTY-THIRD WEEK

Gross Words A Minute	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Ve- cational	No Indi- cation	Boys	Girls	
13-18	0	0	1	0	1	1
19-24	2	4	11	10	7	17
25-30	10	24	72	57	49	106
31-36	38	50	200	128	160	288
37-42	56	56	271	134	249	383
43-48	38	38	177	60	193	253
49-54	15	18	93	28	98	126
55-60	3	3	37	7	36	43
61-66	1	4	7	1	11	12
67-72	0	0	3	0	3	3
TOTAL	163	197	872	425	807	1232
Mean	40.63	39.66	40.94	38.15	42.03	40.69
Standard Deviation	7.21	8.36	8.26	7.46	8.19	8.15
Critical Ratio	1.18			8.33		

T A B L E X

Test 5

ATTAINMENTS IN TERMS OF PER CENT OF ACCURACY
FOR 1,232 STUDENTS ON A STRAIGHT-COPY TEST DURING
THE THIRTY-THIRD WEEK

Per Cent of Accuracy	Classification According to:					TOTAL
	Objective			Sex		
	Voca- tional	Non-Vo- cational	No Indi- cation	Boys	Girls	
0	1	2	16	10	9	19
1- 10	1	0	16	9	8	17
11- 20	2	1	13	6	10	16
21- 30	1	10	6	11	6	17
31- 40	3	5	20	13	15	28
41- 50	6	12	42	25	35	60
51- 60	10	23	52	38	47	85
61- 70	27	24	94	52	93	145
71- 80	43	54	193	102	188	290
81- 90	48	57	263	103	265	368
91-100	21	9	157	56	131	187
TOTAL	163	197	872	425	807	1232
Mean	74.84	69.76	73.99	69.55	75.47	73.43
Standard Deviation	17.60	19.31	22.16	23.56	19.60	21.24
Critical Ratio	2.6			4.45		

vocational and non-vocational students, either in gross words a minute written, or in the per cent of accuracy with which they wrote. Girls wrote faster than boys and with a higher degree of accuracy.

Comparison of Attainment by Tests

Table XI (below) presents the findings in terms of gross words a minute and per cent of accuracy for all the students taking each test. It should be noted that the number of students taking test three was smaller than the number taking any other test. In this case, however, the number is large enough to give a fairly accurate idea of the attainments of students at that time.

T A B L E X I

AVERAGE GROSS WORDS A MINUTE AND PER CENT OF ACCURACY FOR ALL STUDENTS ON EACH OF THE FIVE TESTS

Test	Total Students	Week of School	Gross Words		Per Cent	
			Mean	Standard Deviation	Mean	Standard Deviation
I	1956	13	25.81	7.30	51.53	22.28
II	1567	18	30.46	7.30	58.64	26.86
III	905	23	33.19	8.17	64.34	25.25
IV	1455	28	37.18	7.41	66.67	24.02
V	1232	33	40.69	8.15	72.43	21.24

A point that should not be overlooked is the standard deviation. If a representative or satisfactory sample is taken of any group, approximately two-thirds of the cases will be expected to fall within one standard deviation above and below the mean. During the thirteenth week of school we may therefore expect about two-thirds of the students to write between 18.51 and 33.11 gross words a minute.

Another factor that must be considered is the relatively large standard deviation of the per cent of accuracy. For example, the standard deviation of per cent of accuracy on test one was 22.28, which means that in order to include two-thirds of the students in one group, the range must be from 29.25 to 73.81 per cent of accuracy. This may be interpreted as meaning that the per cent of accuracy varies a great deal at the beginning of school, therefore, the per cent of accuracy, if used alone, is not a sound basis for grading. The standard deviation of the per cent of accuracy decreases only slightly, to 21.24 per cent, during the thirty-third week.

Table XII (page 29) may be referred to in order to group the attainments in a more understandable manner. From this, the general progress in gross words a minute and per cent of accuracy may be followed from one test to the next.

For a comparison of students with different objectives, namely, vocational and non-vocational and also a comparison of boys and girls see Table XIII (page 30).

In general, there was no difference between vocational and non-vocational students in gross words a minute after the eighteenth week. Vocational students did write with a greater per cent of accuracy than non-vocational during the eighteenth week; but after that, there was no difference. To generalize even further, it may be said that there usually was no difference between vocational and non-vocational

TABLE XII

CUMULATIVE FREQUENCY TABLE SHOWING THE PER CENT
OF ALL STUDENTS MAKING ABOVE CERTAIN SCORES AT
FIVE-WEEK INTERVALS

Gross Words A Minute	Test				
	1	2	3	4	5
Over 66			.2		.2
Over 60		.1	.4	.1	1.2
Over 54	.2	.2	1.9	1.2	4.7
Over 48	.4	.9	3.2	6.2	14.9
Over 42	1.7	4.6	8.7	20.1	35.4
Over 36	8.5	17.5	28.2	47.9	66.5
Over 30	21.8	44.3	61.1	81.4	89.9
Over 24	49.0	77.9	85.8	96.3	98.5
Over 18	83.6	95.8	97.1	99.6	99.9
Over 12	98.2	99.7	99.8	99.9	100.0
Over 6	100.0	100.0	100.0	100.0	

Per Cent of Accuracy					
Over 90	6.6	5.8	8.5	8.3	15.2
Over 80	18.1	21.6	30.8	32.6	45.0
Over 70	33.2	39.4	49.6	54.2	68.5
Over 60	48.3	54.7	64.1	70.1	80.3
Over 50	59.6	66.6	76.3	79.3	87.2
Over 40	68.4	77.2	83.0	85.0	92.0
Over 30	75.6	84.0	88.5	89.4	94.3
Over 20	81.3	88.4	91.7	93.2	95.7
Over 10	85.3	91.6	94.3	95.3	97.0
Zero and Over	100.0	100.0	100.0	100.0	100.0

Total Students					
Taking Test	1956	1567	905	1455	1232

This table should be read as follows: On test one 8.5 per cent of the 1,956 students taking the test wrote more than 36 gross words a minute. On test two, 17.5 per cent of the 1,567 students wrote more than 36 gross words a minute, etc. Per cent of accuracy may be interpreted in the same manner.

T A B L E X I I I

THE SIGNIFICANT DIFFERENCE IN GROSS WORDS A MINUTE AND PER CENT OF ACCURACY BETWEEN GROUPS CLASSIFIED ACCORDING TO OBJECTIVE AND SEX

T E S T	OBJECTIVE				SEX			
	Gross Words A Minute		Per Cent of Accuracy		Gross Words A Minute		Per Cent of Accuracy	
	Non- Voca- tional	Voca- tional	Non- Voca- tional	Voca- tional	Boys	Girls	Boys	Girls
I	Vocational sig- nificantly high- er		No significant difference		Girls signi- ficantly higher		No signifi- cant differ- ence	
II	No significant difference		Vocational sig- nificantly high- er		Girls signi- ficantly higher		No signifi- cant differ- ence	
III	No significant difference		No significant difference		Girls signi- ficantly higher		No signifi- cant differ- ence	
IV	No significant difference		No significant difference		Girls signi- ficantly higher		No signifi- cant differ- ence	
V	No significant difference		No significant difference		Girls signi- ficantly higher		Girls signi- ficantly higher	

students in gross words a minute or per cent of accuracy during the first year of typewriting.

In every instance, girls wrote more gross words a minute than boys. The results of all five tests bear out this statement. However, only on the last test, given during the thirty-third week, did girls write with a significantly greater degree of accuracy than boys. To summarize, girls may normally be expected to write faster than boys but with no greater accuracy.

Tables XIV through XVII (see following pages) compare the progress of the different groups of students in gross words a minute and per cent of accuracy from test to test.

It should be reemphasized that the figures given in Table XI and throughout this study are norms or averages and can only be used as such. To classroom teachers these norms undoubtedly appear quite low at first, but it must be remembered that there are approximately as many students above a norm as there are below it. The norms therefore should not be used as desirable standards of attainment for individual students.

T A B L E X I V

CUMULATIVE FREQUENCY TABLE SHOWING THE PER CENT OF VOCATIONAL AND
NON-VOCATIONAL STUDENTS MAKING ABOVE CERTAIN SCORES
AT FIVE-WEEK INTERVALS

Gross Words A Minute	Test									
	1		2		3		4		5	
	Voc-	Non	Voc-	Non	Voc-	Non	Voc-	Non	Voc-	Non*
Over 66										
Over 60						.9	.5	.7	.6	2.0
Over 54	.4					5.4	2.4	5.2	2.5	3.5
Over 48	.8		.5	.3	1.8	7.2	7.7	17.7	11.7	12.6
Over 42	1.8	1.2	5.3	3.3	5.4	12.7	20.7	45.1	35.0	31.9
Over 36	9.2	6.7	18.1	16.2	37.6	34.5	53.3	78.8	69.4	60.4
Over 30	23.9	18.0	50.0	44.4	82.1	63.6	90.3	95.9	92.7	85.8
Over 24	53.8	44.0	84.8	78.5	94.6	85.4	99.0	99.0	98.8	98.0
Over 18	87.2	80.7	97.6	95.3	96.4	93.6	100.0	100.0	100.0	100.0
Over 12	99.1	97.9	100.0	99.5	100.0	100.0				
Over 6	100.0	100.0								
Total Students										
Taking Test	679	1042	376	596	56	110	208	288	163	197

*Abbreviations are for: Voc- Vocational
Non Non-Vocational

This table should be read as follows: On test one 9.2 per cent of the 679 students taking the test wrote more than 36 gross words a minute. Only 6.7 per cent of the 1042 non-vocational students wrote more than 36 gross words a minute on test one. Similar comparisons may be made on each of the five tests. Tables XV, XVI, and XVII may be read in the same manner.

T A B L E X V

CUMULATIVE FREQUENCY TABLE SHOWING THE PER CENT OF VOCATIONAL AND
NON-VOCATIONAL STUDENTS MAKING ABOVE CERTAIN SCORES
AT FIVE-WEEK INTERVALS

Per Cent of Accuracy	Test									
	1		2		3		4		5	
	Voc-*	Non	Voc-	Non	Voc-	Non	Voc-	Non	Voc-	Non
Over 90	6.5	6.5	7.4	4.5	16.1	10.9	9.6	5.9	12.9	4.6
Over 80	20.4	16.5	25.1	21.3	39.3	32.7	35.5	30.9	42.3	33.5
Over 70	33.9	29.2	42.8	37.6	53.6	57.2	59.5	53.8	68.7	60.9
Over 60	47.4	45.5	57.1	52.0	64.3	69.0	76.3	69.4	85.3	73.1
Over 50	59.0	56.5	69.3	61.9	80.4	78.1	85.0	78.8	91.4	84.8
Over 40	67.6	65.4	79.7	73.5	87.5	82.7	89.8	85.8	95.1	90.9
Over 30	75.7	72.3	86.9	80.2	94.6	88.2	94.6	90.7	97.0	93.4
Over 20	80.1	78.9	91.2	84.7	96.4	95.5	96.1	95.2	97.6	98.5
Over 10	84.2	82.8	93.6	89.1	96.4	97.3	96.1	96.9	98.8	99.0
Over 0	87.3	84.4	95.2	92.1	96.4	97.3	98.5	97.9	99.4	99.0
Zero and Over	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Students	679	1042	376	596	56	110	208	288	163	197

*Abbreviations are for: Voc- Vocational
Non Non-Vocational

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T A B L E X V I

CUMULATIVE FREQUENCY TABLE SHOWING THE PER CENT OF BOYS AND
GIRLS MAKING ABOVE CERTAIN SCORES
AT FIVE-WEEK INTERVALS

Gross Words A Minute	Test									
	1		2		3		4		5	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Over 66						.3				.3
Over 60			.2			.6		.2		1.7
Over 54	.1	.2	.4	.1	.6	2.5	.6	1.5	1.9	6.2
Over 48	.1	.5	.4	1.1	1.2	4.2	2.8	7.8	8.5	18.3
Over 42	.6	2.3	2.8	6.3	5.4	10.5	11.6	24.1	22.6	42.2
Over 36	3.6	11.3	12.1	21.0	21.2	31.9	36.5	53.3	54.1	73.1
Over 30	11.9	27.5	34.3	50.3	48.4	67.9	75.0	84.5	84.2	92.9
Over 24	36.4	56.4	71.0	82.0	77.8	90.2	93.3	97.8	97.6	99.0
Over 18	75.4	88.4	94.3	96.8	94.9	98.3	99.8	99.6	100.0	99.9
Over 12	96.7	99.0	99.5	99.8	99.7	99.8	99.8	100.0		100.0
Over 6	100.0	100.0	100.0	100.0	100.0	100.0	100.0			
Total										
Students	731	1225	550	1017	316	589	465	990	425	807

T A B L E X V I I

CUMULATIVE FREQUENCY TABLE SHOWING THE PER CENT OF BOYS AND
GIRLS MAKING ABOVE CERTAIN SCORES
AT FIVE-WEEK INTERVALS

Per Cent of Accuracy	Test									
	1		2		3		4		5	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Over 90	6.2	6.9	5.3	6.1	8.5	8.5	7.3	8.8	15.2	16.5
Over 80	16.0	19.3	18.9	23.1	27.8	32.4	28.6	34.6	37.4	49.1
Over 70	31.2	32.7	37.4	50.5	47.1	50.9	48.8	56.8	61.4	72.4
Over 60	44.6	48.8	53.4	55.4	61.3	65.5	65.6	72.4	75.6	83.9
Over 50	54.3	61.1	65.2	67.4	72.4	76.4	76.1	81.0	82.5	89.7
Over 40	63.3	69.8	76.3	77.7	78.7	85.4	82.8	86.5	88.4	94.0
Over 30	71.0	76.7	81.8	85.3	85.7	90.2	88.4	90.8	91.5	95.9
Over 20	77.6	81.8	86.2	89.6	89.8	92.9	92.5	93.7	94.1	96.7
Over 10	81.8	85.7	90.0	92.5	94.6	94.3	94.7	95.3	95.5	97.9
Over 0	84.1	87.8	92.9	94.3	96.5	96.0	96.6	97.6	97.6	98.9
Zero and Over	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Students	731	1225	550	1017	316	589	465	990	425	807

CHAPTER III

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose, scope, procedure, and findings of this study were presented in Chapters I and II. In this chapter the summary and conclusions will be presented, limitations of the study will be indicated and a few recommendations will be made.

Beta Chapter of Delta Pi Epsilon voted in June 1940 to sponsor a research project in business education. The committee appointed to supervise the project decided that a study of first-year typewriting attainments in the State of Oklahoma would be beneficial to teachers at this time. The author of this study was appointed to take charge of the undertaking and the committee served in an advisory capacity.

Straight-copy tests were secured from the Gregg Publishing Company and were given to students in twenty-two high schools in the state. A member of Delta Pi Epsilon was on the faculty in each of these high schools but was not necessarily teaching typewriting.

The first test was given during the thirteenth week of school and was five minutes in length. The remaining four tests were ten minutes in length and were given during the eighteenth, twenty-third, twenty-eighth, and thirty-third weeks of school.

The tests were first checked by the students and then rechecked by various business education groups, by the teachers, or by the author of this study.

The results of these tests were tabulated and have been presented in terms of gross words a minute and per cent of accuracy.

On the back of each test paper the student was asked to answer the following question: What use do you expect to make of your ability to operate a typewriter? The answers to this question were used as a basis for classifying the students. A group was set up for vocational students, one for non-vocational, and one for those students who failed to answer the question. A vocational student was defined as one who intended to use his ability to operate a typewriter to secure a job or make a living.

After the results were tabulated for each of the above groups, the papers were redivided according to sex.

First the findings for the total number of students taking each test were presented then the attainments of vocational and non-vocational students were compared, also the attainments of boys and girls.

A summary of the more important findings of this study follow:

1. At the end of the thirteenth week of school the mean gross words a minute written was 25.81. Approximately two-thirds of the students were writing between 18.51

and 31.11 gross words a minute. During this same period the mean per cent of accuracy was 51.53 and about two thirds of the students ranged between 29.25 and 73.81 per cent of accuracy.

- a. Vocational students were writing significantly faster than non-vocational but with about the same accuracy.
- b. Girls were writing significantly faster than boys but there was no significant difference in the per cent of accuracy of the two groups.

2. At the end of the eighteenth week of school, the close of the first semester, the mean gross words a minute written was 30.46 with about two-thirds of the students ranging from 23.16 to 37.76. Similarly, the per cent of accuracy varied between 31.78 and 85.50 with a mean of 53.64.

- a. There was no significant difference between vocational and non-vocational students in gross words a minute written but vocational students wrote with a significantly greater per cent of accuracy than non-vocational.
- b. Girls wrote significantly faster than boys but with about the same degree of accuracy.

3. During the twenty-third week the average gross words a minute was 33.19. Approximately two-thirds of the students were writing between 25.02 and 41.36 gross

words a minute. The average per cent of accuracy at the end of the twenty-third week was 64.34 with two-thirds of the students writing with an accuracy between 39.09 and 89.59 per cent.

a. The number of students who indicated vocational or non-vocational objectives was so small that no statement will be made regarding their attainments on test three.

b. Girls were still writing significantly more gross words a minute than boys but with no greater accuracy.

4. During the twenty-eighth week the average number of gross words a minute was 37.18. About two-thirds of the students were writing between 29.77 and 44.59 gross words a minute. Approximately two-thirds of the students had a per cent of accuracy between 42.53 and 90.57 with a mean per cent of accuracy of 66.57.

a. There was no significant difference between vocational and non-vocational students, either in gross words a minute or per cent of accuracy.

b. Girls were writing significantly faster than boys but there still was no significant difference in the accuracy of the two groups.

5. During the thirty-third week of school, the average gross words a minute was raised to 40.69. Approximately two-thirds of the students were writing between 32.54 and 48.84 gross words a minute. In like manner the range for

per cent of accuracy was from 52.19 to 94.67 with a mean per cent of accuracy of 73.43.

- a. There was no significant difference in gross words and per cent of accuracy of vocational and non-vocational students.
- b. Girls were significantly superior to boys, both in gross words a minute and per cent of accuracy.

It has been assumed throughout this study that the sample from which the data were drawn was representative of the entire state. If this be the case, it follows that the findings listed above hold true for the state as a whole. The conclusions which may be drawn from this study will therefore be:

1. The findings summarized in points 1, 2, 3, 4, and 5 above are indicative of the attainments of all first-year typewriting students in the state of Oklahoma.
 - a. After the eighteenth week of school there was no significant difference between vocational and non-vocational students.
 - b. Girls wrote significantly faster than boys in every instance but there was no significant difference in the per cent of accuracy of these two groups.

It should be reemphasized that the figures given throughout this study are norms or averages and can only be used as such. To the classroom teacher these norms

undoubtedly appear quite low at first but it must be remembered that there were approximately as many students whose attainments were above a norm as there were whose attainments fell below the norm.

Some classroom teachers may wish to use the findings of this study to evaluate the attainments of their own students. If this is done, the norms should be used with caution because when a small group of data are used, the chance of error due to an inadequate sample is great.

Certain limitations of this study are natural ones due to the selection of the schools. They were selected as a result of the cooperation of the members of Beta Chapter of Delta Pi Epsilon who are found in the larger institutions of the state, since the membership of this organization is made up of business teachers who have some maturity and experience in teaching. Insofar as the number of students is concerned, the sampling used in the study is adequate as borne out by the results obtained from the application of statistical formulae; however, the study may not be representative of the different size schools in the state. (See Table B in the appendix showing the per cent of students representing different size schools used in the study)

Since a greater number of students who were tested attended large high schools, the results would more nearly represent attainments in these schools. A study should be made to determine whether or not such differences exist.

If there are no significant differences in the typewriting attainments of students in large high schools and small high schools, the results of this study may be accepted as having general applicability. However, if there are significant differences between the attainments of first-year typewriting students in large and small high schools, the findings of this study would need to be qualified.

There are at least two other studies that might be made from the data collected for this study. First, some type of error analysis might be of value. Second, a study might be made to determine whether the age of the student has any effect upon his typewriting attainments. This study might also determine if the year in school in which typewriting is taken effects attainments.

Another study which should be made necessitates the collection of new data. This study would have as its purpose to determine the attainments of first-year typewriting students using some type other than a straight-copy test.

This study should give teachers an opportunity to compare their students with the averages or norms already presented. This comparison should lead to an evaluation on the part of teachers of the classroom procedures and techniques employed by them. If this is done, the purpose of Beta Chapter of Delta Pi Epsilon in sponsoring this study will have been achieved.

Bibliography

1. Owens, D. B., A Survey of Typewriting Achievements at the End of First-Year, Speed Attained and Errors Made.
2. Blackstone, E. G., "Commercial Education Research Abstracts", Business Education World, December 1933, page 201.
3. Waugh, Albert E., Elements of Statistical Method, Pages 41, 76, 134, 149, 150.

APPENDIX

Table A

GENERAL INFORMATION CONCERNING SCHOOLS PARTICIPATING

School	Total Highschool Enrollment	Commerce Department Enrollment	Typewriting Instructors
Tulsa: Central High	3400	2100	4
Oklahoma City: Central Classen	2300 1997	(No Count) 1500	3 2
Enid	1200	702	4
Ponca City	1000	498	4
Stillwater	968	252	2
Lewton	800	300	1
Sapulpa	732	288	2
Bristow	566	219	1
Idabel	559	166	1
Stilwell	386	117	1
Hugo	370	122	2
Heavener	350	115	1
Bixby	350	150	2
Oklahoma City: Northeast	320	175	2
Cleveland	300	128	1
Pryor	380	120	1
Yukon	235	45	1
Sayre	190	107	3
Dale	135	65	1
Pleasant Hill Con. Dist 65 Southeast of Drumright	50	20	1
Foraker	45	20	1

PER CENT OF STUDENTS REPRESENTING DIFFERENT SIZE SCHOOLS

Total Enrollment	Number Schools	Per Cent of Total Enrollment		Per Cent of Total Papers Received				
		In All Schools	In First Year Type-writing	Test 1	Test 2	Test 3	Test 4	Test 5
1000 & Over	5	59.5	51.0	39.7	38.3	31.7	47.1	36.3
500 - 999	5	21.8	23.4	25.7	15.0	12.5	15.0	17.1
200 - 499	8	16.2	20.8	21.7	17.7	26.4	21.6	28.7
0 - 199	4	2.5	4.8	3.9	4.7	3.5	5.4	5.3
Papers Unaccounted For:				9.0	24.3	25.9	10.9	12.6
TOTAL	22	100.0	100.0	100.0	100.0	100.0	100.0	100.0

This table should be read as follows; Five of the twenty-two schools had an enrollment of 1,000 or over. Enrollment in these five schools represented 59.5 per cent of the enrollment in all the twenty-two schools and enrollment in first-year typewriting in these five schools was 51 per cent of the enrollment in first-year typewriting in the twenty-two schools. This group contributed 39.7 per cent of the papers on test one; 38.3 per cent on test two; 31.7 per cent on test three; 47.1 per cent on test four; and 36.3 per cent on test five.

Table B

Dear Delta Pi Epsilon Member:

If you were present at some of the summer meetings, you are probably aware that Delta Pi Epsilon is sponsoring some research in first-year high school typewriting during the current school year.

We plan to give a series of tests to the first-year students at consecutive intervals. Some members have already consented to cooperate. We need the help of every member who is teaching typewriting in the high school. However, if you are not teaching typewriting, but can see that the tests are given to the typewriting classes in your high school, we would like for you to do so. If you are in a position to help, please fill in the information sheet found in this letter and return it to me at once in the stamped envelope that is enclosed. It is imperative that these be returned within the next week so that the tests may be ordered.

If you have more than one class in typewriting, you will only need enough tests for your largest class as one set of tests can be used in all your classes.

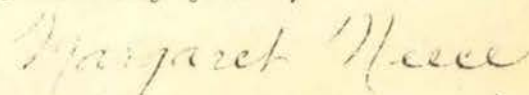
We formerly had planned to give a test at the end of each six week period, but since there has been some difficulty in getting test material you will probably not receive a set of tests until about the eighth week. After that time you will receive a set each six weeks. Five tests will be given during the year. This plan will prevent the last test interfering with the activities at the close of school.

You will note in filling in the information that the only students that are to participate in this project are those who are enrolled in beginning typewriting in the high school for the first time.

A complete set of instructions for administering the tests will accompany them.

We solicit your cooperation in returning this information blank promptly.

Sincerely yours,



(Mrs.) Margaret Neece
In charge of research

No. _____
(Do not write here)

GENERAL INFORMATION

Name of School _____

Name of Teacher _____

Location of School _____ County _____

Date School Began _____ Length of term _____

Number of periods per day used for each class in beginning typewriting _____ Are they consecutive periods?
_____.

How many minutes are there in each period? _____

Give the author and title of the textbook used in your beginning typewriting classes:

_____ Title _____ Author _____

Give the total number enrolled in beginning typewriting for the first time in your school. (Do not count repeaters or those who have had any typewriting before.)
_____.

How many students are enrolled in each section of beginning typewriting? _____

How many copies of the tests will you need? _____

What is the total enrollment in your high school? _____

How many students are enrolled in your commercial department? _____

How many instructors teach classes in beginning typewriting? _____

INSTRUCTIONS AND PROCEDURE

Please read this page carefully before attempting to administer the tests:

Instructions

This is the first test to be used in the research for Delta Pi Epsilon. Five tests in all will be sent to you during the year to be given to the first-year typewriting students in your school. Please do not send in papers for any students who have had any formal or informal training in typewriting prior to September 1940.

1. Save these instructions as they are to be followed in administering each test. Another copy will not be sent to you unless requested.
2. Use the International Typewriting Rules that accompany these instructions for giving and grading the tests. Students may consult the instructions for grading found at the top of each copy of the test.
3. Information as to which week the test is to be given and the length of the test will accompany each set of tests. The tests must be given sometime during the week specified.
4. Each test is to be taken only one time.
5. Please follow the steps of procedure for administering the tests exactly as they are given below:

Procedure

1. Give a short warm-up period on material other than the test to be taken.
2. Have each student place a clean sheet of typewriting paper (8½" x 11") in his machine and type the following form at the extreme top of his paper: (Instructor Note: An explanation of the items in the headings is made at the bottom of this page.)¹
No. ___ Age ___ Grade _____ Sex _____
Strokes _____ Gross _____ Errors _____ Net _____ W.P.M. _____
3. Be sure that each machine is set for double spacing and a 70 space line.
4. Pass out copies of the test. Give the test. Be accurate in your timing.
5. Instruct the students to check their own papers and fill in the information asked for in the form at the top of their paper. Consult the International Typewriting Rules to settle questions regarding the grading. Any error caused by a poorly adjusted machine will be counted an error. The teacher does not need to recheck the papers.
7. Have each student write, in one sentence, the answer to the following question on the back of his paper: What use do you expect to make of your ability to operate a typewriter?
8. Place all test papers and copies of the test given in the envelope provided for that purpose. Also be sure to fold and return the envelope in which you received your copies of the test.
9. Merely fasten the flap down on the envelope, (do not seal), call the express man to pick up the package and send it express collect.

¹ No. is the code number of your school
Age -- pupil's age
Grade -- Fr., Soph., Jr., Sr.

Gross -- gross words
Net -- Net words
W.P.M. -- Words per minute

INTERNATIONAL TYPEWRITING CONTEST RULES¹

1. Line Spacing. Single space all paragraph and short timed practice unless otherwise directed. Double space all timed tests of 5 minutes or longer.
2. Length of Line. A line averaging 70 spaces in length (not less than 64 nor more than 76 spaces) is preferred; but a line averaging 60 spaces (not less than 54 nor more than 66 spaces) is allowable if you prefer it. The longer line will enable you to type more words in timed tests because the number of carriage returns is reduced.
3. Length of Page. Except for the last sheet of a timed test, at least 26 double-spaced lines must appear on a page 8 $\frac{1}{2}$ by 11 inches. This rule applies only to timed tests of 5 minutes or longer. On other work, including short timed-test practice, fill the page with single-spaced copy to within approximately an inch of the bottom edge.
4. Paragraphing. Indent paragraphs 5 spaces, starting on the sixth space.
5. Spaces and Punctuation Marks. An error in spacing or in punctuation is considered an error in the preceding work unless that word has already been penalized.
6. Spacing after Punctuation. Except as noted below, space once after all punctuation marks within sentences or within word groups not forming sentences, and space twice after all punctuation marks that close sentences or groups of words not forming sentences.

There is good authority for following the above rule when spacing after the colon, but there is equally good authority for (a) always spacing twice after a colon, or (b) spacing twice when the colon is followed by a complete sentence beginning with a capital letter and once in all other cases. Charge an error for every failure to space consistently according to one of these three rules.

It is better form to omit the space in small-letter abbreviations, such as a.m., i.e., f.o.b., etc. Many authorities prefer no space in capital-letter abbreviations (except initials of personal names), such as O.K., M.D., P.M., PH.D., etc., but a space after the period following each letter in all abbreviations is quite acceptable in all school work. Failure to be consistent in a given test is an error.

7. The Dash. Two hyphens with no spaces before or after are commonly used, but either one or two hyphens with a space before and after may be used. Be consistent.
8. Cut Characters. Any word written so close to the top, bottom, or side of the sheet that any portion of a letter is cut off is an error. If the paper feed on your machine does not hold the paper securely at the top and bottom of the sheet, or if the line-space mechanism is out of adjustment, so that the level of the line shifts during typing, do not charge an error.

9. Incorrectly Divided Words. A word divided incorrectly at the end of any line constitutes an error. Follow any standard dictionary for correct division.
10. Faulty Shifting. A shifted character (capital) is acceptable only when the entire capital letter can be discerned and when no part of the lower-case character on that type bar is visible. If most of the shifted characters are raised or lowered, that is, out of line with the lower-case letters, an error should be charged for every failure to place a shifted character squarely on the writing line, until you form the habit of shifting correctly.
11. Lightly Struck Letters. If a character can be seen, even though it is very light, it is correct. If you habitually strike the keys too lightly, however, you should charge an error for every lightly struck character until you form the habit of striking all keys more forcefully.
12. Transposition. One error is charged for each transposition, either of letters or of words. Mistakes within transposed words must be marked as additional errors.
13. Rewritten Matter. Charge one error for the rewriting and an additional error for each mistake in both the first and the second writing.
14. Omitted Words. (See Rule No. 24).
15. Inserted Words. (See Rule No. 24).
16. Crowding. Any word occupying less than its proper number of spaces is an error. However, if your typewriter is poorly adjusted or the table on which it stands is subject to any vibration, "crowding" and "Piling" of letters may not be your fault. If possible, have your typewriter adjusted and placed on a solid table.
17. Piling. When two characters or a space and a character are so crowded that they are printed on top of one another, or if any portion of their bodies overlap or would overlap were a letter typed in the adjoining space, the machine is said to have "piled". If piling occurs at the end of a line, make sure that your right margin stop is properly set and test the machine to see whether the keys lock when the carriage reaches the margin stop. If they do not, piled letters at the ends of lines should not be penalized until your machine is properly adjusted. (See Rule No. 16).
18. Left-Hand Margin. All characters at the beginning of lines, except at paragraph indentations, must be struck at the same point on the scale. Poorly adjusted machines will cause the margin to "jump over" to the left or to "bounce in" to the right. Do not charge these errors until your machine is properly adjusted.
19. X'ing. Work in which material is x'd will not be accepted.
20. Erasing. Erasing is not allowed.

21. Errors in Printed Copy. Errors in the printed copy may either be corrected or written as in the copy.

22. Last Word. Stop when time is up. An uncompleted last word, otherwise correct, is not an error.

23. One Error per Word. Only one error may be charged in any one word.

24. General Rule. Every word omitted, inserted, misspelled, or in any manner changed from the printed copy (except in transposed and rewritten matter) must be penalized.

25. Penalty. If your instructor wishes you to calculate your "net words" or "net words a minute", use the following method:

Deduct ten words for each error from the gross number of words typed. The result will be your total "net words". Divide your total net words by the number of minutes (length of test) to find your "net words a minute" (net rate).

How to Calculate Net Rate

Example: Suppose you type 103 gross words in 5 minutes, making 6 errors.

6 (total errors) x 10 (penalty) = 60 (total penalty)
103 (gross words) - 60 (penalty) = 43 (total net words)
43 (net words) ÷ 5 (the number of minutes typed) = 8.6 your
final net words a minute (net rate)

Note: The only accurate measure of a typist's speed on straight matter is his "gross words a minute" (total gross words divided by the number of minutes); and the only accurate measure of his accuracy is his "error rate" (total errors divided by the number of minutes).

26. Gross Words. Determine the gross number of strokes by referring to the printed copy. The stroke count is given at the end of each line. Divide the total gross strokes by 5 to find the number of gross words you type. (A "standard word" is defined as 5 strokes). Strokes in rewritten matter are not to be counted in the gross. Take credit for every stroke typed.

Strokes or spaces are counted as though the entire test were written in one continuous line, with no paragraphs, but with proper spacing after words and punctuation marks. This means that the gross strokes equal the number of spaces occupied by the typing at any given point. Shifted characters count as one stroke. No allowance is made for carriage returns and other similar operations. Hyphens inserted at the ends of lines to divide words, except when required for compound words, are not counted, because they would be unnecessary if the matter were typed in a continuous line.

September Competent Typist Test

Use double spacing in typing this test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct 10 words for each error to get net words written. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	<i>Strokes</i>
Look upon the work you have to do as an object of interest, and, if you can rise to it, an object of affection.	50
This simple act solves many of the problems encountered on the job. What is more natural than that the things which you esteem should linger in your mind after the day's work is done, and, as you mull over them, ideas for better ways of doing the work and for getting results form themselves.	113
Our interest is necessary in any subject if we are to concentrate on it. A student who fails in his examination usually laments his bad memory, when what really happens is that lack of thoroughness and interest in the preparation of his studies caused temporary failure to recall. He forgot because he never really knew. Not having given the matter sufficient attention, the impressions were not made deeply enough in his mind.	169
	230
	289
	348
	408
	465
	521
	578
	639
	701
	760
	819
	840
Suppose you read a review of a book dealing with ghosts and seances. You come across the word "ectoplasm," used to describe the whitish substance said to emanate from the body of the medium in a state of trance. Afterward you wish to recall this word in speaking to a friend, but you fail to do so—not because your memory is poor, but because you did not give yourself time to master the word. You were too much interested in the narrative of what happened in the room. If you had spent enough time on that word you would have had no difficulty in recalling it.	889
	948
	1003
	1059
	1118
	1174
	1231
	1287
	1344
	1408
	1464
	1524
	1583
	1635
Even in education the spirit of hustle is everywhere. Our	1694

October Competent Typist Test

Use double spacing in typing this test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct 10 words for each error to get net words written. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	<i>Strokes</i>
With that, the things of the world shrank to nothing.	55
In the southern sky, opposite the waning sun, the night,	112
already settled over the pole, was pushing forth a bulging	171
shadow, blue-black and threatening as a storm sky. Could	229
one see in it the first nervous movements of the aurora	285
australis? One could not be sure. A frozen nose and cheeks	346
sent me below before I had time to find out. But while	402
sliding down the ladder, I was sure of something else,	457
which gave me a bad turn; and that was that in helping	512
the tractor men stow the sledges I had fallen and	562
wrenched my shoulder.	585
In the shack I stood for a long minute, rubbing the	637
shoulder. Bad business, I reproached myself. Here you	693
are starting the biggest job of your life, and yet you have	753
blundered and crippled yourself. For things were in an	809
awful mess. The tunnels were a jumble of boxes and fuel	866
drums, and it would probably take weeks to put them	918
straight. Well, I could not live that way even at an	972
advance base. Only one pair of shoulders was available	1028
for all the lifting and moving and shoveling; and they	1083
were fifty per cent out of commission.	1123
But there was no time just to sit and mope. Using one	1178
arm as best I could, the job of cleaning up my own Augean	1236
Stable began. Absorbed in the task, the ache in my	1288
shoulder was completely forgotten. The hours melted	1341
away; it was past midnight before I thought of stopping.	1399
I paused only long enough to brew a pot of tea and to	1453
munch a few crackers. Although there was little to show	1510
for the day's work, one could at last move around in the	1567
tunnels without tripping over duffel bags, food tins, and	1625

November Competent Typist Test

Use double spacing in typing this test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct 10 words for each error to get net words written. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	<i>Strokes</i>
Breakfast did not count. I rarely took more than tea	54
and a whole-wheat biscuit. Luncheon was habitually an	109
out-of-the-can affair, consisting usually of tomato juice,	168
Eskimo biscuits, and frequently a cold meat or fish—either	228
corned beef, tongue, or sardines. These were prepared in	286
masterly fashion. But supper, by rights the high spot in	344
the day of an explorer and the one hot meal toward which	401
a cold and hungry man looks with mounting anticipation,	457
was a daily fiasco for a while.	490
I have only to close my eyes to witness again the suc-	543
cession of culinary disasters. Consider what my diary has	602
to say about the incident of my making corn meal for the	659
first time. I dumped what seemed a moderate quantity of	716
meal into a boiler, added a little water, and stood it on	774
the stove to boil. That simple formula gave birth to a	830
hydra-headed monster. The stuff began to swell and dry	886
up, swell and dry up, with fearful blowing and sucking	941
noises. All innocently I added water, more water, and still	1002
more water. Whereupon the boiler erupted like Vesuvius.	1060
All the pots and pans within reach could not begin to	1114
contain the corn meal that overflowed. It oozed over the	1172
stove. It spattered the ceiling. It covered me from head	1231
to foot. If I had not acted resolutely, I might have been	1290
drowned in corn meal. Seizing the container in my mit-	1344
tened hands, I rushed it to the door and hurled it far into	1404
the food tunnel. There it continued to give off deadly	1460
golden lava until the cold finally stilled the crater.	1516
There were other disasters of the same order. My diary	1572
reports soberly on the day I tried to cook dried lima beans.	1634
How much water lima beans can absorb, and how long it	1688

December Competent Typist Test

Use double spacing in typing this test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct 10 words for each error to get net words written. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	<i>Strokes</i>
Time sloughed off the last implication of urgency, and	55
the days moved imperceptibly one into the other. The few	113
world news items which were read to me from time to time	170
seemed almost as meaningless and blurred as they might	225
to a Martian. My world was insulated against the shocks	282
running through distant economies. My advance base was	338
geared to different laws. On getting up in the morning, it	398
was enough for me to say to myself: Today is the day to	455
change the barograph sheet or to fill the stove tank. The	514
night was settling down in earnest. Days when the wind	570
brooded in the north or east, the barrier became a vast	626
stagnant shadow surmounted by swollen masses of clouds,	682
one layer of darkness piled on top of the other.	732
Out of the deepening darkness came the cold. For the	786
first time the canvas boots failed to protect my feet. One	846
heel was nipped, and I was forced to return to the hut and	905
change to reindeer mukluks. That day I felt miserable;	961
my body was racked by shooting pains exactly as if I had	1018
been gassed. All day long I kept two primus stoves burning	1078
in the tunnel. My fingers agonized over the thermograph,	1136
and I was hours putting it to rights.	1175
Out of the cold and out of the east came the wind. It	1230
came on gradually, as if the sheer weight of the cold were	1289
almost too much to be moved. The night was as black as	1345
a thunderhead when I made my first trip topside, and a	1400
tension in the wind, a bulking of shadows in the night	1455
indicated that a new storm center was forming. Next morn-	1512
ing, glad of an excuse to stay underground, I worked a long	1572
time on the escape tunnel by the light of a red candle stand-	1632
ing in a snow recess. That day I pushed the emergency exit	1692

Test 5 Given During the Thirty-third Week

April Competent Typist Test

Use double spacing in typing this ten-minute test

(To find the gross number of words you write, divide gross number of strokes by 5; then deduct ten words for each error to get net words written. The number of strokes is indicated at the end of each line in order to facilitate counting the gross number of strokes written.)

	<i>Strokes</i>
An employer can have little patience with a secretary	54
who is dilatory about responding to his summons. This	109
means that the secretary herself must have extra patience	167
at this point. He is not impatient with the secretary per-	227
sonally. He has something at the very front of his mind	284
which he must give over to her before he can turn his	338
attention to the next pressing matter. He may need a cer-	397
tain memorandum from her files before he can make some	452
vital decision. He may need the name and address of a	507
company from her card index before he can dismiss a	559
caller with whom he is conferring. Because of information	618
that he has just received he may need to catch a certain	675
letter before it goes out into the mails. When the buzzer	734
rings, you are in mystery as to his necessity, but you know	794
that there is a reason for his calling.	835
From your first day in an office you must learn to	886
take this buzzing as a matter of course, without a sense	943
of annoyance. It is, after all, the only sensible method.	1003
Your employer cannot very well shout your name; he can-	1059
not keep a messenger at his side to run to fetch you. There	1120
are many practical necessities in an office about which	1176
the secretary need have no false pride, no hurt feelings.	1235
The girl who is overdignified, who is looking for extraor-	1294
inary respect, has usually failed to understand the rea-	1352
son for her employer's ways and thus to accept them	1404
quietly in the run of the day. If you can interrupt your	1462
work graciously at the ring of a bell, you need not be	1517
afraid of your dignity; you then have dignity indeed.	1572
When you go away for the week end, there are cer-	1622
tain things that you know you will need. Experience has	1679
shown you what these are. When you go in to take dic-	1734

STATISTICAL FORMULAE USED IN THIS STUDY

Mean

$$\bar{X} = A + \frac{\sum f d' i}{N}$$

Standard Deviation

$$\sigma = i \sqrt{\frac{\sum f d^2}{N} - \left(\frac{\sum f d}{N}\right)^2}$$

Standard Error of the Mean

$$\sigma_m = \frac{\sigma}{\sqrt{N}}$$

Standard Error of the Difference

$$\sigma_{diff} = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$$

Critical Ratio

$$= \frac{\bar{X}_1 - \bar{X}_2}{\sigma_{diff}}$$