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Eugene A. Nifenecker

To cite this article: Eugene A. Nifenecker (1920) Grade Norms for the New York City Penmanship Scale, *The Journal of Educational Research*, 2:5, 808-838, DOI: [10.1080/00220671.1920.10879118](https://doi.org/10.1080/00220671.1920.10879118)

To link to this article: <http://dx.doi.org/10.1080/00220671.1920.10879118>

Published online: 15 Dec 2014.

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GRADE NORMS FOR THE NEW YORK CITY PENMANSHIP SCALE

EUGENE A. NIFENECKER

Director of Bureau of Reference, Research and Statistics, Department of Education, New York

In February, 1915, the New York Board of Education adopted a uniform style of letters to be taught in all schools and authorized the teaching of the muscular-movement method of writing which had been tried out in a number of schools for several years.

The next step taken was the construction of a scale from the product of this system of penmanship. This was undertaken by Messrs. Lister and Myers, instructors in the Brooklyn Training School for Teachers. It was adopted by the Board of Education in February, 1918.

The setting up of grade norms for each element measured by the scale was undertaken by the Bureau of Reference, Research, and Statistics in June, 1919, and is the subject of this report.

THE NEW YORK CITY PENMANSHIP SCALE

The New York City Penmanship Scale possesses certain characteristics which distinguish it from the scales that preceded it. In the first place it is a scale constructed from the product of the system of penmanship it is intended to measure. In the standardization of any educational product it is of fundamental importance to know "that the pupils have received the instruction in the field of knowledge covered by the scale or the test. Unless scales or the standards derived from standard tests are based on the results achieved by children after proper instruction, then standards established on the basis of the results from such tests are unsatisfactory as measures of instruction." (Ballou)

The second characteristic of the scale is the fact that it is analytic. In judging ability in penmanship there are so many things to be considered that a scale based only on general merit is of little assistance to the average teacher. The scale should help the teacher to look for the essentials in judging a given specimen of writing. Legibility, ease in writing or freedom of movement, good letter formation, uniformity of size, uniformity of slant, clear

and uniform spacing, neatness, and an easy, fluent appearance—all these make up the value of writing. The authors of this scale considered it possible and practicable to group most of these qualities under three headings.

Accordingly, as they say: "Under the caption *Form*, it was decided to consider accuracy in letter formation, with the standard letter forms adopted for the schools of New York City as the basis, uniformity of size, and regularity of correct slant.

"Under *Movement*, the specimens were judged as to quality of line. As is well known to students of penmanship, heavy, tremulous, and broken lines are evidence of either finger movement or muscular movement that is too slow and deliberate to produce skill; and clear-cut, smooth lines are evidence of the use of the easy-flowing muscular movement that is desired.

"Under *Spacing* the writing was judged as to correct and uniform spacing between letters, between parts of letters, and between words."¹

As to the construction of the scale, the authors say in the same article: "The scale represents the average judgment of 21 teachers and penmen, experts in the muscular system of penmanship, and 4 psychologists. From 9 schools of Greater New York, representative of the best, medium, and poorest product of the muscular system of penmanship, 3,550 specimens were selected from at least one entire class of each grade from 3B to 8B inclusive."

Figure 1 illustrates the resulting scale. The adjacent specimens are two steps apart.

Figure 1. The Scale Illustrated

The scale consists of twenty-four specimens arranged in parallel columns—eight under *Form*, eight under *Movement*, and eight under *Spacing*. The scale values of the specimens under each element are 90, 80, 70 . . . 20. Four specimens under each element are reproduced below. These represent alternate steps beginning with 90.

¹ Lister, Clyde C., *The New York City penmanship scale* (Bulletin of the Brooklyn Training School for Teachers, no. 3, January, 1919, p. 4).

FIGURE 1. FORM

30 One must exercise in work and is
play Active play and almost all kind
of work which children have to do a
good form of exercise. Long walks
once or twice a week are good, but

This is good elementary school penmanship. Note the uniformity of size, slant, and alignment. The x is crossed carelessly.

70 One must exercise in
work and play Active
play and almost all kinds
of work which children
have to do, are good forms

Good form. The curvature between letters is slightly exaggerated. Note the approach to a, d, and m.

50

One must exercise in work and in play. Active play and almost all kinds of work which children have to do are good forms of exercise. Long

This writing slants too much. The t should not be looped. Note the careless tendency in completing h.

30

One must exercise in work and in play. Active play and almost all kinds of work which children have to do are good forms of

This writing slants too much. The loops are too long and narrow. The t should not be looped. The a and d are poor.

FIGURE 1. MOVEMENT

90 One must exercise in work and in Active play and almost all kinds of work which children have to do, a good form of exercise. Long walks or twice a week are good, but they are

The quality of line shown above is evidence of an easy muscular movement, which is produced by the muscles of the arm.

70 One must exercise in work and in Active play and almost all kinds of in which children have to do, are good of exercise. Long walks once or twice a week are good, but they are not quite so good as

This shows good movement and fairly good control throughout. Note the sharp, clear-cut quality of line.

One must exercise and work and play! Active play and almost all kinds of work which children have to do, are good forms of exercise. Long walks once or twice a

The smooth and uniform quality of line indicates fairly good movement. The n, r, s, and k are poorly formed.

One must exercise in work as in play. Active play and almost all kinds of work which children have to do, are good forms of exercise. Long walks once or twice a week

Although the movement is poor, this writing shows a better quality of line than the specimen below.

FIGURE 1. SPACING

90 One must exercise in work and play. I
play and almost all kinds of work which
children have to do, are good forms of exer-
cise. Long walks once or twice a week are good, -
they are not quite so good as regular exer-

This specimen shows a high degree of excellence in spacing. The writing, however, is too small.

70 One must exercise in work and in
play. Active play and almost all
kinds of work which children
have to do are good forms of exer-
cise. Long walks once or twice

This spacing is quite clear, but it is too variable. Compare One, kinds, and once.

50 One must exercise in work
and in play. Active play and
almost all kinds of work
which children have to do
are good forms of exercise.

This spacing is clear, but variable both within and between the words. The slant is variable.

30 Active play and all mus-
all kinds of work which chil-
dren do are good forms of
exercise. Long walks. Once
twice a week or good, but it

The separations between letters and between words are not clear. Some lines look like a long word.

TABLE I. AVERAGE DEVIATIONS PER SPECIMEN FROM "EXPERT" SCORES FOR 86 PROSPECTIVE JUDGES—PRACTICE SAMPLES

Element	Average Deviations																Average	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		17
Form.....	1	.....	.....	4	8	16	12	25	14	2	1	1	.....	.....	1	.....	1	7.9
Movement.....	.....	.....	.....	.....	3	8	3	14	15	15	17	3	3	1	1	1	2	10.1
Spacing.....	.....	.....	1	2	11	24	20	18	1	5	2	2	.....	.....	.....	.....	.....	7.4
Total.....	1	.....	1	6	22	48	35	57	30	22	20	6	3	1	2	1	3	8.3

TABLE II. DEVIATION ACCORDING TO AMOUNT

DEVIATIONS	FORM		MOVEMENT		SPACING		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Zero deviations.....	300	26.9	171	15.2	216	18.0	687	20.0
5 points ($\frac{1}{2}$ step).....	288	25.9	374	33.2	543	45.3	1,205	35.1
10 points (1 step).....	290	26.0	239	21.2	215	18.0	744	21.6
15 points ($1\frac{1}{2}$ steps).....	124	11.1	136	12.1	162	13.5	422	12.3
20 points (2 steps).....	112	10.0	205	18.2	63	5.2	380	11.0
Total.....	1,114	99.9	1,125	99.9	1,199	100.0	3,438	100.0

The specimens were divided into four piles according to general merit, and 300 were then selected at random, about the same number being taken from each pile. The 25 judges arranged them in eight piles on the basis of equal intervals in merit. Each judge ranked the specimens three times—namely, as to form, movement, and spacing.

The next procedure is described as follows: "On the basis of the average rank assigned each specimen, the best and the poorest were selected as the top and the bottom of the scale. Therefrom the exact numerical rank which the other six samples should have was determined. The specimens whose average ranks are the same as these determined positions, or are nearest them were selected. Without exception all the samples on the scale are less than .1 from the *determined* position."²

MEASURING ACHIEVEMENT IN PENMANSHIP

Conduct of tests.—In the penmanship survey undertaken by the Bureau of Reference, Research and Statistics, particular care was taken to secure uniform conditions. The tests were given by thirty students from the New York Training School for Teachers who had taken a course in educational measurements and the normal course in muscular-movement penmanship. These girls were familiar with the various scales in penmanship and had had some experience in giving standardized tests. They also received special practice in giving this penmanship test, considerable attention being given to "timing."

The children memorized on the day before the test the sentence, "One must exercise in work and in play." The test consisted in writing this sentence repeatedly for two minutes. The class teachers took no part in the testing, although they were present at the time.

The test was given in fifteen schools involving five hundred classes and eighteen thousand children in grades IV to VIII.³ The schools were chosen as representative of the whole system. About twelve thousand specimens were scored in full.

Training the judges.—The scoring of these twelve thousand samples of penmanship in each of the elements of form, movement,

² Lister, C. C. and Myers, G. C., "An analytic scale of handwriting," *Journal of Educational Psychology*, 9:417-31, October, 1918.

³ In New York, A classes are low and B classes high divisions of the yearly grades.

spacing, and speed represented an enormous task. It was undertaken by Dr. Hamilton and Miss Scheuermann of the New York Training School for Teachers and by Mr. Lister of the Brooklyn Training School for Teachers. The services of training-school students were enlisted.

While a penmanship scale in the hands of trained scorers reduces variability in judgment, in the hands of untrained persons it gives no guarantee that judgments will be reliable. Nor does a knowledge of the theories underlying educational measurements or of the statistical derivation of scales insure accurate scoring. Likewise expertness in teaching penmanship while of some help does not imply reliability in scoring. To obtain accuracy in scoring there must be training in the use of the scale.

The training-school students who acted as judges had the following qualifications: (1) They had been instructed in the muscular-movement method. (2) They had taken the normal course in teaching that method. (3) They had taken the course in educational measurements at the training school.

It was arranged to give these students specific training for three weeks or longer through actual practice in judging specimens. For use in training the judges, standard specimens of writing were scored for form, movement, and spacing by one of the authors of the scale and by four of his associates. The specimens were coded so that the students were unaware of the "expert" score. In scoring these practice samples and subsequently in scoring the test papers the ascending-descending method was used.

It was planned to give the student judges an initial test in scoring and at the end of the practice period a final test. The data resulting from these tests would afford a measure of the reliability of each prospective judge and a basis for eliminating some of the students from participation in scoring the test papers. Unfortunately school conditions and other circumstances prevented us from carrying out our program in its entirety. We were, however, able to get an initial test for all the student judges and a final test for part of the group.

Table I shows for the initial test the distribution of the judges according to their average deviation per specimen from the expert scores. The table reads: In judging form one person deviated on the average 1 to 2 points from the expert scores, four

deviated 4 to 5 points, etc. From the last column it is evident that the greatest variation occurred in judging movement.

Details not shown in Table I indicate that scores above and below those of the experts were about equally frequent and of about the same range. Without regard to direction the amounts of the deviations at the time of the initial test were as given in Table II. Here as elsewhere a "point" is a unit of the scale. A step is the difference between successive samples on the printed scale and this difference is always ten points.

Under *Form* it will be seen that 878 or 78.8 percent of the judgments differed by one scale step or less from the standard or expert scores. In movement 69.6 percent of the judgments deviated one step or less, and in spacing 81.3 percent. In other words about three-quarters of the judgments either agreed with those of the experts or assigned values to form, movement, or spacing corresponding to the adjacent samples on the scale.

After the practice periods even this amount of unreliability was reduced. Complete data were secured for 56 of our 86 prospective judges. Their average deviation from the expert scores was reduced from 7.5 points, or three-quarters of a scale step, to 4.2 points, or less than half a scale step. Forty-two of them improved with practice, three remained stationary, and eleven lost ground—the last in each case but by a small amount.

Although the bulk of the papers were scored in each case by a single judge, an extensive study of the reliability of the ratings was made by having the papers of about 15 percent of the classes scored by three judges. A detailed analysis was made of the results for 20 classes, from which 753 specimens had been secured. It was found that on the average a judgment by one judge on an individual specimen varied less than four-tenths of a scale step from the median of three independent judgments. When individual results were combined in classes, it was found that the average error was less than three-tenths of a scale step. Since the object was not to secure results for individual pupils nor even for classes, but for larger grade groups of about 1,000 pupils in each case, it is believed that the trained judges rendered a reliable verdict for the intended purpose.

General results.—Table III shows the median scores obtained by each grade group throughout the city in each of the elements

measured by the scale, in form, movement, spacing and rate of writing.

TABLE III. CITY-WIDE MEDIAN SCORES BY GRADES FOR FORM, MOVEMENT, SPACING, AND RATE

GRADES	FORM		MOVEMENT		SPACING		RATE		NUMBER OF PUPILS
	Median	S. D.	Median	S. D.	Median	S. D.	Median	S. D.	
VIII B	61	11.5	62	12.2	65	10.7	82	19.3	988
VIII A	57	13.1	61	14.1	63	12.4	83	18.4	1,117
VII B	54	12.2	56	12.7	59	11.1	79	19.2	1,225
VII A	55	12.3	56	12.9	59	11.6	78	17.4	1,327
V B	54	11.9	56	12.7	58	11.3	72	20.3	1,481
V A	51	12.4	53	13.1	56	11.7	69	18.1	1,414
IV B	49	12.6	49	13.2	54	12.1	69	17.6	1,327
IV A	45	11.5	45	12.2	51	11.9	66	17.8	1,529
III B	43	10.7	43	11.5	48	11.2	63	15.6	1,110
III A	38	11.1	40	11.7	48	11.0	58	13.6	241
City	51.3	12.0	52.9	12.5	56.4	11.5	72.5	18.5	11,759

Figure 2 shows the medians of Table III graphically. Both the scale values and the rate in letters per minute are shown on the vertical axis. The horizontal axis shows the grades. For the city as a whole the median score for all the pupils tested was (without regard to grade) 51.3 in form, 52.9 in movement, and 56.4 in spacing. This means that 50 percent of the pupils tested, without regard to grade, obtained these scores or better. The table also shows that 50 percent of all the pupils wrote at a rate of 72.5 or more letters per minute.

The product of the school may be best judged by the work done in the highest grade. Figures 3, 4, and 5 indicate approximately the results obtained in the upper eighth grade. If we arranged all the samples from this grade in order from the best performance to the poorest, and if we counted down one-quarter of the way from the best toward the poorest we should reach a sample like Sample A of Figure 3. The point thus reached is called the upper (third) quartile. Similarly Sample B of Figure 4 represents the median or the point reached by counting down half way; and Sample C of Figure 5 represents the so-called lower

(first) quartile or the point reached by counting down three-quarters of the way.⁴

Table IV gives for each grade⁵ the median rate, the upper and lower quartiles and the range of the middle 50 percent. It also gives, for comparative purposes, the standards set up by Ayres and by Freeman and the results obtained in the Cleveland survey. Figure 6 shows the facts graphically.

TABLE IV. GRADE MEDIAN RATES, UPPER AND LOWER QUARTILES

Grades	IVB	VA	VB	VIA	VIB	VIIA	VIIIB	VIIIA	VIIIB
Q ₃	73.0	77.3	79.3	79.8	86.7	91.8	93.7	95.4	94.4
M	63.3	66.3	69.1	68.7	72.2	77.8	79.4	82.5	81.5
Q ₁	51.4	53.1	57.5	56.3	59.3	68.0	68.1	70.9	67.7
Range Middle 50 percent	21.6	24.2	21.8	23.5	27.4	23.8	25.6	24.5	26.7
Standards:									
Freeman	56	65		72		80		90	
Ayres	56	64		70		76		80	
Cleveland		60		70		76		80	

⁴ The abbreviation for the lower or first quartile is Q₁; for the upper or third quartile, Q₃.

⁵ The IVA data are omitted because of the few cases.

FIGURE 3. SAMPLE A, ILLUSTRATING THE TYPICAL PRODUCT OF THE BETTER HALF OF THE UPPER EIGHTH GRADE

One must exercise in work and
in play. One must exercise in work
and in play. One must exercise in
work and in play. One must exercise
in work and in play. One must
exercise in work and in play.
One must exercise in work and in
play. One must

	Form	Movement	Spacing	Speed
Sample A.....	70	70	70	92
Q ₃	69	70	71	94

This sample was equaled or surpassed by 25 percent of the pupils of the upper eighth grade.

FIGURE 4. SAMPLE B, ILLUSTRATING THE TYPICAL PRODUCT OF THE UPPER EIGHTH GRADE

in work and in play. One must exercise
One must exercise in work
and in play. One must exercise in
work and in play One must exercise
in work and in play One must exer-
cise in work and in play. A ne must
exercise in work and in play A ne
must exercise in work X

	Form	Movement	Spacing	Speed
Sample B.....	60	60	65	82
Median.....	61	62	63	82

This sample was equaled or surpassed by 50 percent of the VIII^B group.

FIGURE 5. SAMPLE C, ILLUSTRATING THE TYPICAL PRODUCT OF THE POORER HALF OF THE UPPER EIGHTH GRADE

*One must exercise in work
and in play. One must exercise in
work and in play. One must
exercise in work and in play.
One must exercise in work
and in play. One must X*

	Form	Movement	Spacing	Speed
Sample C.....	55	50	55	64
Q1.....	53	53	53	68

This sample was equaled or surpassed by 75 percent of the pupils of the upper eighth grade.

It appears that the median rate of writing increases irregularly from grade to grade, rising from 63 letters per minute in the IVB grade to 82 in the second half of the eighth grade. There is no gain shown in the VIA grade over the VB, while in the VIIIB the rate is slightly lower than that of the grade below. The greatest gain appears in the VIIA.

New York children are by no means slow writers. Their rates are higher than the scores obtained in other surveys and exceed in all years the standards set up by Ayres. With the exception of the last three half years, the median scores are higher than the standards fixed by Freeman which represent the average of the better half of the cities tested by him.

There is an astonishing variation within grades in respect to rate of writing. Even when classes rather than pupils are considered and median scores rather than individual scores, the range is still conspicuous. The typical performance of one class of the lower fifth grade was 32 words per minute, of another 88 words per minute. In the upper sixth grade one class scored but 39 while another scored 98. Even in the upper eighth grade the class scores ranged from 48 to 96.

The condition is such as to indicate an absolute lack of grade standards. It probably shows that no particular attention has been paid to controlling the rate at which children write. Those who began as slow writers doubtless continued as slow writers throughout the grades, with only such increase as comes with maturity. The fast writers in the lower grades probably continue likewise to write at a rapid rate throughout.

While writing of a good quality is a prime requirement, instruction should also seek to improve the rate of writing, particularly

that of the slower writers. Less than 80 letters per minute is slow writing. The presence in the last year of the course of numbers of pupils who fail to attain a speed of 60 letters per minute indicates the failure of our instruction to give pupils about to leave school writing habits which will meet the requirements of the outside world. The presence of pupils in all grades who write at very rapid rates again indicates the need of control so that the quality of the writing of such pupils may not be sacrificed for the sake of speed. Rapid writing must be accompanied by satisfactory quality.

Quality of writing.—Since the New York scale records quality under three aspects—form, movement, and spacing—we shall devote a table to the most significant grade scores for each of these characteristics. Table V deals with *form*, Table VI with *movement*, and Table VII with *spacing*. Attention is called to certain facts which each of these tables exhibits:

1. The range from the median of the lower fourth grade to that of the upper eighth grade is small, amounting to about two steps on the scale or merely to the difference between adjacent samples in Figure 1.

2. The range of the middle 50 percent in each grade is almost as great as the range between the medians of the highest and lowest grades represented in the tables. In other words the difference between the performances of two fairly representative pupils of the same grade may be as great as the difference between the performances of two pupils one of whom is typical of the fourth grade and the other of the eighth.

3. Grades are scarcely distinguishable. This is shown not only by the small intervals between grade medians—intervals too small to be perceived on the scale—but also by the large degree of overlapping.

The extent of this overlapping may be roughly indicated by a comparison of the *upper* quartile of a grade with the medians of higher grades and by a similar comparison of the *lower* quartile of a grade with the medians of lower grades. These comparisons may be made directly from Tables V, VI, and VII. Table VIII shows for the element of *form* how the comparisons may be arranged.

In Table VIII the medians for the various grades are given across the top, the lower quartile is shown in the left-hand column, and the upper quartile in the last column on the right.

TABLE V. GRADE MEDIANS, UPPER AND LOWER QUANTILES IN FORM

Grade	IVA	IVB	VA	VB	VIA	VIB	VIIA	VIIIB	VIIIA	VIIIB
Q ₃	47.1	49.8	53.4	58.2	59.5	62.3	63.6	62.9	67.8	68.8
Median.....	37.9	43.2	45.4	49.2	50.5	53.7	54.5	54.0	57.0	60.8
Q ₁	30.0	35.8	38.3	40.9	42.4	45.2	45.6	45.4	47.7	52.6
Range of middle 50%.....	17.1	14.0	15.1	17.3	17.1	17.1	18.0	17.5	20.1	16.2
Intervals between medians	5.3	2.2	3.8	1.3	3.2	0.8	0.5	3.0	3.8	

TABLE VI. GRADE MEDIANS, UPPER AND LOWER QUANTILES IN MOVEMENT

Grade	IVA	IVB	VA	VB	VIA	VIB	VIIA	VIIIB	VIIIA	VIIIB
Q ₃	48.9	53.1	54.6	59.7	63.3	65.3	65.5	64.7	69.9	69.6
Median.....	39.9	43.3	44.8	49.3	52.9	56.1	56.0	55.7	60.8	62.0
Q ₁	33.3	35.7	36.4	39.8	43.1	46.3	45.9	46.4	49.2	52.9
Range of Middle 50%.....	15.6	17.4	18.2	19.9	20.2	19.0	19.6	18.3	20.7	16.7
Intervals between medians	+3.4	+1.5	+4.5	+3.6	+3.2	-0.1	-0.3	+5.1	+1.2	

TABLE VII. GRADE MEDIANS, UPPER AND LOWER QUANTILES FOR THE ELEMENT OF SPACING

Grade	IVA	IVB	VA	VB	VIA	VIB	VIIA	VIIIB	VIIIA	VIIIB
Q ₃	58.7	56.3	58.4	62.5	64.6	65.9	66.9	66.6	70.7	71.6
Median.....	47.7	47.7	50.5	54.0	56.2	57.7	58.7	58.7	63.2	64.8
Q ₁	40.3	40.6	42.2	45.0	48.2	50.8	51.0	51.6	54.3	57.5
Range of middle 50%.....	18.4	15.7	16.2	17.5	16.4	15.1	15.9	15.0	16.4	14.1
Intervals between medians	0.0	+2.8	+3.5	+2.2	+1.5	+1.0	0.0	+4.5	+1.6	

TABLE VIII. COMPARISON OF QUANTILES WITH MEDIAN TO SHOW OVERLAPPING

[illegible]

The figures to the right of the series of blank compartments which run diagonally across the table show how much the upper quartile of a given grade exceeds the median of the grades above. The figures to the left show how much the lower quartile of a given grade falls below the median of lower grades. For instance, reading horizontally across from VB we note that the lower 25 percent of the VB group fails to reach the median of the IVB grade by 2.3 points and the median of the VA grade by 3.6 points. The figures on the same line to the right of the diagonal of blank compartments show that the upper quartile of the VB exceeds the VIA median by 7.7 points, the VIB median by 4.5 points, the VIIA median by 3.7 points, the VIIB median by 4.2 points, and the VIIIA median (five grades above) by 1.2 points.

Relation of speed and quality.—Hitherto we have considered speed and quality separately; we shall now consider the relation between them. It is possible to set up grade norms for the various elements of quality, norms which may be achieved only at the expense of speed. We may also establish certain norms for speed which may likewise be attained only at the expense of quality. Satisfactory quality must be attained, but it must be accompanied by satisfactory rates of writing.

From Table III which showed the medians in each characteristic of quality and also in rate, it may be noted that speed increased with one or two exceptions from grade to grade. At the same time the median scores in form, in movement, and in spacing also increased from grade to grade. There was thus a certain degree of correspondence as far as the whole grade groups were concerned, between the median speed and the median quality from grade to grade.

Does such relation hold within the grades? In order to determine this the average speed was determined for each scale score in each grade in form, movement, and spacing. Table IX shows for each grade the average speed at which each quality in form was written. This table reads: In the IVB grade 91 pupils scored 20 in form and their average rate of writing was 63 letters per minute, etc.

For each grade there was a general tendency toward decrease of speed as *form* improved. From data not here reproduced similar facts were discovered with reference to *movement* and *spacing*.

TABLE IX. AVERAGE RATE IN EACH GRADE FOR EACH STEP ON SCALE IN FORM

Grade	SCORE IN FORM																	
	20		30		40		50		60		70		80		90			
	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate	No.	Aver- age Rate
IVB	91	63	321	64	431	63	195	62	52	59	17	49	3	48	.....	.....	.....	.....
VA	94	73	346	71	509	66	313	62	124	59	45	52	8	45	3	48	.....	.....
VB	58	76	235	72	404	72	362	67	169	63	92	60	7	61	.....	.....	.....	.....
VIA	35	75	211	71	440	72	394	69	213	65	106	63	15	58	.....	.....	.....	.....
VIB	23	82	140	77	397	75	482	73	295	68	126	62	18	56	.....	.....	.....	.....
VIIA	25	87	119	85	336	82	408	80	297	76	121	73	20	73	1	45	.....	.....
VIIIB	26	104	103	90	325	85	398	79	234	76	122	75	17	75	.....	.....	.....	.....
VIIIA	8	95	87	90	238	89	320	83	237	82	193	75	31	77	3	65	.....	.....
VIIIB	2	115	41	83	126	86	300	82	310	79	178	77	31	77	.....	.....	.....	.....

But although both rate and quality improved from grade to grade, we have no satisfactory answer to the general question of the relation between rate and quality of handwriting among school children. The correlation coefficient is the most exact expression of the relationship. Accordingly it was computed (by the product-moment formula) for each pair of characteristics. Instead of treating all the data involved in the scores of the 12,000 pupils, two sets of 1,000 specimens each were selected by a process of sampling. The results are shown in Table X.

TABLE X. COEFFICIENTS OF CORRELATIONS BETWEEN
THE SEVERAL ELEMENTS

Elements	First Sampling		Second Sampling	
	r	P. E.	r	P. E.
Form and movement.....	+.75	.0093	+.749	.009 ²
Form and spacing.....	+.73	.0094	+.738	.0097
Movement and spacing...	+.72	.0101	+.716	.0103
Speed and form.....	-.056	.02	-.054	.0 ²
Speed and movement.....	-.036	.02	-.029	.0 ²
Speed and spacing.....	-.013	.0213	-.016	.0213

The correlations between speed and the elements of form, movement, and spacing are negligible. The fact that the probable error is as large as or larger than r indicates the unreliability of our result. It appears then that there is little relation between speed and the different elements of quality in writing. The fast writers write a good hand as well as the slow writers. The good writers write rapidly as may also the poor writers.

In the case of the other elements a high degree of positive correlation is shown. This indicates that an increase in form would be accompanied by an increase respectively in movement and in spacing, and vice versa.

Quality and speed in different schools.—The results already presented have clearly indicated the variability of achievement in the various classes and grades. It has been shown that there is apparently an absolute lack of uniform standards. In this section data will be presented showing the relative emphasis placed upon speed and upon quality in some of the schools tested.

In order to show the development in penmanship through the grades, the progress in quality and the progress in speed were shown in one diagram. For quality the grade-median scores in form, movement, and spacing were averaged to obtain a single score. The resulting curves would not be materially different if we were to take only one element at a time.

Figure 7 shows the progress from grade to grade in three selected schools. The horizontal axis shows speed, and the vertical axis quality. In interpreting the diagrams we must bear in mind that the distance between the adjacent horizontals measures only ten points or one step on the penmanship scale, and that distance between the verticals represents but ten letters.

The reader would do well to trace the curious paths from IVB to VIII B as shown in Figure 7. For example at the school represented by the top section of the figure we start from IVB to VA by going backwards in speed, while making some (but not much) headway in quality. From VA to VB the lost ground in speed is more than recovered and there is a further gain in quality; VIA adds little in either quality or speed; VIB shows a loss in speed with very little gain in quality; etc. From such representations as these—and space alone limits our presentation of others—we get the impression of haphazard results. The condition is what might be expected in the absence of standards and of means of control.

TENTATIVE GRADE STANDARDS

The aim of penmanship in our elementary schools is to give the pupil a certain degree of writing skill. The course of study at New York prescribes that seventy-five minutes a week be devoted to penmanship in the IA to VIB grades, and that in that time the child be trained to write with legibility, ease, and speed. Such aims, however, are vague and indefinite and offer no material guidance to the teacher or principal in his work in penmanship.

Prior to the derivation of scales for objective measurement, our aims in penmanship, as in other subjects, were necessarily expressed in general statements rather than in definite terms. Now that we have such scales and means of measurement, we can formulate exactly the degree of writing skill that a pupil should attain as a result of the elementary course.

FIGURE 7. RELATION OF CLASS SCORES IN QUALITY AND IN SPEED FOR SELECTED SCHOOLS

The end product of our school training is represented by the VIII B pupil who is about to graduate. How well should a pupil in the VIII B write? At what speed? Immediately we answer such questions by asking other questions. How well need he write? How fast need he write? We find our answers in the demands of society upon the pupil and in the needs of his later life.

A number of investigations have been conducted to determine the degree of writing skill required by the outside world in various lines of endeavor. Such studies, however, were reported in terms of the Ayres scale so that the results could not be used in setting up norms for the New York scale. An independent attempt was made with the New York scale, to obtain under test conditions samples of handwriting of clerical employees in several large department stores. The group tested numbered 161, distributed as follows: 98 salesclerks, 17 billers, 39 checkers, and 7 clerks and bookkeepers. In all these positions legible, rapid writing was considered essential.

Table XI presents the median scores in each element for each of the above groups in comparison with the median scores of our VIII B pupils.

TABLE XI. MEDIAN SCORES OF GROUPS OF CLERICAL EMPLOYEES IN DEPARTMENT STORES

Group	Number	FORM		MOVEMENT		SPACING		SPEED	
		Me- dian	Differ- ence from VIII B	Me- dian	Differ- ence from VIII B	Me- dian	Differ- ence from VIII B	Me- dian	Differ- ence from VIII B
VIII B Pupils	988	61	.....	62	.....	65	.....	82	.....
Salesclerks.....	98	53	- 8	68	+ 6	61	-4	107	+25
Billers.....	17	49	-12	56	- 6	59	-6	128	+46
Checkers.....	39	58	- 3	66	+ 4	67	+2	95	+13
Bookkeepers.....	7	65	+ 4	74	+12	63	-2	99	+17
Entire outside group.....	161	54	- 7	66	+ 4	63	-2	106	+24

The data in Table XI are presented in Figure 8 in terms of the amounts by which each employee group exceed or fall below the

VIII B medians. It will be noted that in the three elements of quality the VIII B pupils did quite as well as the salespeople. In speed, however, the employee group greatly exceed the rate of the VIII B pupils, the salespeople writing at the rate of 107 letters per minute or 25 letters above the VIII B median, the billers 128 letters or 46 above, the checkers 95 or 13 above, and the bookkeepers 99 or 17 letters above the VIII B rate.

The data presented above while suggestive are not regarded as conclusive, and it is planned to continue the investigation. Meanwhile, Table XII presents the grade standards proposed for

each element. They are shown in Figures 9 and 10 in comparison with the upper quartiles and city-wide medians.

FIGURE 9
TENTATIVE
GRADE
STANDARDS

TABLE XII. TENTATIVE STANDARDS IN PENMANSHIP FOR THE NEW YORK PENMANSHIP SCALE

Grade	Form	Movement	Spacing	Speed
IVB	43	46	48	56
VA	47	48	51	59
VB	51	50	54	63
VIA	54	53	57	67
VIB	57	56	60	71
VIIA	59	59	63	75
VIIIB	61	62	65	80
VIIIA	63	65	67	85
VIIIB	65	67	69	90

For the VIIIB standard in form the average of the scores attained by the classes which exceeded the city-wide grade median was taken. This score of 65 is already reached by 35 percent of the VIIIB groups tested or by 10 of the 33 classes involved. The lower end of the curve was begun at 43, the city-wide median for the IVB. The curve of the grade standards was raised from the median curve, in some places arbitrarily, and in other places through smoothing to the points indicated. In the VIB, VIIA, and VIIIB, the grade medians were on a level, whereas the "Standard" curve maintains an even progress. The same procedure was followed in the elements of movement and spacing.

For speed the standards adopted are taken from those set up by Freeman. Figure 10 shows that in the lower grades such speed norms are below the grade medians.

The above standards are frankly tentative; but when the achievements of the better schools are considered they are not regarded as unreasonable nor difficult of accomplishment. The schools are working under a uniform time allotment and what is accomplished in some of the schools ought to be attainable elsewhere.