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A Scale for Measuring the Quality
of Handwriting of School Children

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A SCALE FOR MEASURING THE QUALITY OF HANDWRITING OF SCHOOL CHILDREN

During the past few months the Division of Education of the Russell Sage Foundation has been conducting a study of handwriting with the purpose of producing a scale for measuring the quality of the handwriting of school children of the upper elementary grades. This report describes the investigation and presents the scale which it has produced.

The investigation consisted of a study of the legibility of 1578 samples of the handwriting of children of the upper elementary grades of forty school systems in thirty-eight states. The degree of legibility of the samples was ascertained by a series of 15,780 accurately timed readings made by ten paid investigators.

The quality of each sample of writing was determined by its degree of legibility as shown by these readings, the assumption being that that writing is best for practical purposes which can be most easily read.

The scale itself is a sheet of paper measuring 9 by 36 inches and having eight divisions from end to end. In each division are samples of handwriting. As one proceeds along the strip from left to right these samples are progressively better. They have been so chosen that each one is as much better than the one before as that is better than the preceding. That is to say, all of the steps are equal (to within one-tenth of one step). These samples or steps have been assigned the values 20, 30, 40, 50, 60, 70, 80, and 90. These values have been chosen rather than any others because teachers are familiar with them as marks used in scoring children's school work.

In order to measure the value of any given sample of writing all that is necessary is to slide it along the scale until a writing of the same quality is found. By looking at the top of the scale the number corresponding to the quality of the writing will be found and this number represents the value of the writing being measured.

In order to facilitate this measuring there have been placed at each point samples of vertical, medium slant and extreme slant writing, all of equal value. Thus, the sample being measured may be compared with samples on the scale written in the corresponding style of slant. The three slants used on the scale include over 95 per cent of the ordinary writings of school children.

In order to facilitate comparison with the ordinary writings of school children the scale has been printed in blue ink, which, as nearly as possible, matches the color of the ink most commonly used in the public schools. For the same reason, the scale has been printed on paper corresponding in color with the paper ordinarily used in schools.

In conducting the investigation several important facts have been brought to light. The most significant of these is that the factors of most importance in determining legibility of handwriting are, first, the spacing between the words, and second, the spacing between the lines. Many handwritings which look well but are so spaced that the words run into each other are very difficult to read, and, on the other hand, writings well spaced but having somewhat irregular letters are frequently quite readily legible.

With respect to the styles of writing the investigation shows that vertical writings are in general the most legible, medium slants next, and extreme slants least legible.

The present scale is not presented as offering a standard, but as furnishing a means for measuring so that teachers, principals and supervisors may measure the results of the pupils' work, discover which methods produce the best results, and on the basis of such study and experiment erect their own standards to which pupils may be expected to attain.

THE THORNDIKE SCALE

This is not a pioneer piece of work in this field, although it is different in method from anything of the sort previously attempted. The credit of developing the first measuring scale for handwriting belongs to Professor Edward L. Thorndike of Teachers College, Columbia University. The publication, in March, 1910, of his handwriting scale constituted a most important contribution not only to experimental pedagogy but to the entire movement for the scientific study of education.

As Professor Thorndike says in his introduction, previous to that time educators were in the same condition with respect to handwriting as were students of temperature before the discovery of the thermometer. Just as it was then impossible to measure temperature beyond the very hot, hot, warm, cool, etc., of subjective opinion, so it had been impossible to estimate the quality of handwriting except by such vague standards as one's personal opinion that given samples were very bad, bad, good, very good, etc. Professor Thorndike's scale for the handwriting of children is based on the average or median judgments of some 23 to 55 judges who graded samples of writing into groups by what they considered equal progressive steps in general merit.

LEGIBILITY AS A CRITERION

The method by which the present scale has been produced, and the criterion on which it rests as a basis, differ radically from those adopted by Professor Thorndike. The difference in the bases is that in the present case legibility has been adopted as a criterion for rating the different samples in place of "general merit" used as the basis of Thorndike's scale. This change substitutes function for appearance as a criterion for judging handwriting.

There are two arguments for adopting the new criterion. In the first place the prime purpose of writing is to be read, and hence it has seemed worth while to adopt "readability" as the basis for rating samples of handwriting. In the second place legibility possesses the advantage of being measurable in definite quantitative units through finding the amount of time required to read with a given degree of accuracy a given amount of matter written in the handwriting being studied. The criterion of general merit is not susceptible of any such exact evaluation.

The method whereby the new scale has been produced differs from the method employed in producing the previous scale in that it is based on the distribution of the recorded times required on the average by a number of readers to read the samples of writing, rather than on the average of their judgments concerning what they considered equal steps in general merit.

Preliminary experimenting, begun in November, 1911, showed that the most satisfactory way to discover the relative legibility of different samples of handwriting is through finding the rate in words per minute at which it is possible to read each sort of

writing. In order to secure a large number of samples of the writing of school children of the upper elementary grades of such a character that they could be justly rated by means of this method, it was necessary to observe rigidly a number of exacting conditions. The first step was to secure the co-operation of superintendents of schools in a number of different cities in different parts of the country so that the samples of writing should so far as possible represent a random selection and not be typical merely of the writings of pupils of a given city or section. This was done through correspondence which resulted in securing the co-operation of the superintendents of schools in the following cities:

Aberdeen, South Dakota	Manchester, New Hampshire
Albuquerque, New Mexico	Milwaukee, Wisconsin
Ardmore, Oklahoma	Mobile, Alabama
Atlanta, Georgia	Nashville, Tennessee
Baltimore, Maryland	Newark, New Jersey
Bloomington, Indiana	New Orleans, Louisiana
Charleston, South Carolina	Newton, Massachusetts
Cheyenne, Wyoming	New York City, New York
Cleveland, Ohio	Omaha, Nebraska
Connersville, Indiana	Peoria, Illinois
Danbury, Connecticut	Providence, Rhode Island
Denver, Colorado	Raleigh, North Carolina
Des Moines, Iowa	Reno, Nevada
Elmira, New York	Roanoke, Virginia
Harrisburg, Pennsylvania	St. Paul, Minnesota
Houston, Texas	Salt Lake City, Utah
Jackson, Mississippi	Springfield, Massachusetts
Kalamazoo, Michigan	Washington, D. C.
Lewiston, Maine	Wheeling, West Virginia
Louisville, Kentucky	Wilmington, Delaware

CONDITIONS UNDER WHICH THE SAMPLES WERE SECURED

The next requisite was that all of the samples of handwriting should be produced under conditions as uniform as possible. This end was attained by having all the writing done on sheets of unruled paper of uniform size and quality furnished to the different school systems from the office of the Foundation. At the top of each sheet of paper were 15 lines of typewritten material from which the pupils in every case copied as much as they could at their ordinary rate of writing in just ten minutes. These 15 lines of typewriting were not composed of ordinary prose.

They were made up of material selected from Washington Irving's "Rip Van Winkle" and "The Legend of Sleepy Hollow," and in each case the first 20 words were in the original order while the rest of the 15 lines of the material was composed of words thrown out of context in such a way as to convey no meaning. The object of having the first 20 words in their original order was to secure sensible samples for the final scale. It was afterwards found that this feature was of doubtful value. The object of having the rest of the material thrown out of context was to secure samples such that the readers would be in no way aided by the context but would have to decipher each word separately.

A further object was to secure material which the readers could not memorize. To insure this even more fully the material was put together in the different copies in varied combinations so that there were used in all some 30 different sets of copy, all of which were made up from the same general material. As a further precaution very unusual words and difficult names were omitted from the copy.

Uniform sheets of instructions were supplied to the superintendents and teachers co-operating in the investigation and care was taken to avoid securing samples from either the best or worst classes in any city. The teachers were also warned against suggesting to the children that they attempt to write either unusually well or unusually rapidly. The co-operation of both superintendents and teachers was gratifyingly prompt, and in general it was evident that the instructions were faithfully followed.

CONDITIONS UNDER WHICH THE SAMPLES WERE READ AND SCORED

As a result of these preliminaries 1578 satisfactory samples of children's handwriting were selected from those secured. When they were received at the New York office each sample was given a serial number and on each sheet was placed the imprint of a stamp having spaces designed to receive all of the different data concerning that particular sample. The next step was to sort the specimens into groups of 25 in such a way that there were no duplicates. These packages were then turned over to a group of ten readers who in turn read each sample, recorded by means of a stop-watch the exact time required to complete the reading, and entered the result in the

appropriate space. This reading in each case included only the material which had been thrown out of context; that is to say, the first 20 words were omitted in the readings.

No volunteer assistance was utilized in any of the processes, all of the readers being employed and the work done under close supervision. The same ten readers were employed during the entire investigation. This force consisted of four men and six women and included the author of the present report, his secretary, three university students, a statistician, a stenographer, a clerk, a former teacher and a writer on sociological subjects.

After each sample of writing had been read by the entire ten people and a record made of the exact time required by each, the sum of these times was found and the average time computed. This average time was recorded in seconds and another computation was required to express the seconds in a decimal fraction of a minute. For example, if the average reading time for a given sample was 77 seconds this was converted into 1.283 minutes.

A careful count was then made of the exact number of words contained in the sample and this number was divided by the decimal expression of the average time required to read it. The result gave the rate in words per minute at which the reading had been done. For example, in the case just cited where the average of the reading times was 1.283 minutes, if the number of words in the sample were, say, 193 the resulting rate secured by dividing 193 by 1.283 would be 150.4 words per minute.

The student familiar with the mathematics of speeds and rates will note that this process does not give the same result as that which would have been secured by getting the average of the rates at which each person read instead of the average of the times of the several readings. The method used was adopted as giving a truer reflection of the relative degrees of legibility of the different samples of writing.

As each reader read each sample a record was kept not only of the time required but of the number of words not deciphered. In the final computations samples were thrown out in which the number of such omissions exceeded on the average one per minute.

The process described was gone through with for each one of the 1578 samples of writing. This work entailed a total of 15,780 timed readings, 1578 additions each made twice, the counting of some 181,304 words twice, and 3156 divisions to the

third decimal place. The principal result was a figure on each sample giving the rate in words per minute at which it had been read by the ten readers.

At the conclusion of the work of making the readings a study was made to discover to what extent the readers had increased their average speed through practice. This brought to light the fact that there had been a distinct though small increase after the initial stages. Accordingly the first 75 papers were re-read by the ten readers and the new times substituted for the old ones.

CLASSIFICATION BY STYLE

The next step consisted of classifying the samples according to the style of the letters. The first attempt was to rate according to the heaviness or thickness of the lines used in forming the letters. This was found to be impracticable. Among each hundred samples the readers chose only about three as being written in notably light lines and only about four as being written with exceptionally heavy strokes.

Another attempt was made to classify the samples as being written with large, flowing letters, medium ones, and small, compact letters. This again was found to be impracticable. Considerable variations in the size of the letters were common, but less than 10 per cent of the whole number of samples could fairly be classified as being written in letters either notably small and compact or large and flowing. A similar result was found when the attempt was made to classify the writings according as the letters were characteristically angular or circular.

The final solution of the matter came through basing the classifications of style on the slant of letters. Five classes were defined on the basis of the judgments of a number of competent judges who were asked to classify several hundred samples into groups according as in their opinions the writings were "vertical," "medium slant," "extreme slant," "back hand" and "mixed."

On the basis of these groupings "vertical writing" was defined as writing in which the characteristic slant of the letters lay between 90° and 80° from the horizontal. The limits of "medium slant" were defined in a similar way as lying between 80° and 55° , and those of "extreme slant" as ranging from 55° to 30° . "Back hand" was defined as being any writing in which the characteristic slant of the letters was to the left of vertical, and "mixed" was a writing composed of a combination of two

or more styles. For purposes of convenient classification vertical writing was designated as "A", medium slant as "B", extreme slant as "C", back hand as "D" and mixed as "E".

On the basis of this classification protractors were constructed of transparent celluloid and with their aid each one of the 1578 samples was rated on the basis of the slant of the letters and the sample marked with the appropriate symbol to indicate to which of the five classes it belonged. The results of this classification were as follows:

SLANT	NUMBER	PER CENT
Class A (vertical).....	255	16.2
Class B (medium slant).....	670	42.5
Class C (extreme slant).....	580	36.7
Class D (back hand).....	27	1.7
Class E (mixed slants).....	46	2.9
	<hr/> 1578	<hr/> 100.0

LOCATING EQUAL STEPS ON THE SCALE

When the entire 1578 samples had been scored and each marked with the rate at which it had been read by the ten readers, they were arranged in order in one long series beginning with the sample having the lowest rating and proceeding on through the entire group to the final sample having the highest rating of all. This arrangement showed that there were only a few very bad samples that had been read very slowly, many samples of medium grade that had been read at medium rates and only a few of the highest grade that were so clear and regular that they had been read at the most rapid rates.

The next step was to study the distribution further to discover its characteristics. By counting half way through the distribution the point was found at which exactly half the cases lay below and the other half above. The sample at this point was rated 175.7, indicating that it was read at the rate of 175.7 words per minute. As it was exactly at the central point, one half of the samples were read more slowly and the other half more rapidly. In the same way the samples one-quarter and three-quarters of the way through the distribution were located and found to be rated at 162.8 and 186.9 respectively. This gave the following:

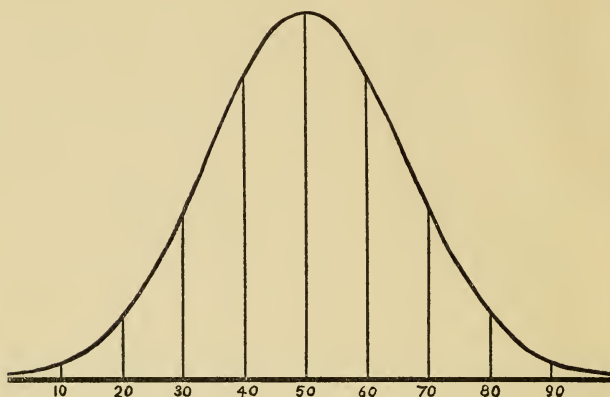
POINT IN DISTRIBUTION	RATING OF SAMPLE
One quarter.....	162.8
One half.....	175.7
Three quarters.....	186.9

The immediately noticeable feature of these figures is that the difference between the rating of the sample at the one-quarter point and that at the one-half point is greater than the difference between the rating of this second sample and that of the one at the three-quarters point. In the first case it is 12.9, while in the second it is only 11.2. This taken together with the fact that in the distribution as a whole we found few samples with very low ratings, many with medium ones, and few with very high ones suggested the possibility that we were here dealing with what is termed a "normal distribution" and that equal steps on the scale on which it was based were expressed in progressively smaller numbers of words read per minute.

Normal distributions are familiar to students of social, anthropological and biological problems. The characteristics of such a distribution may be illustrated by supposing that we gather data as to the heights of a great many adult men of a given nationality. Now suppose we arrange these heights in the order of their magnitude. What we shall always find is that at about the middle point between the extremes will be found a large number of approximately equal heights crowded together. This expresses the truism that most men are of "about average height." A little on each side of the middle point will be found a good many measures although not so many as nearer the central point. This expresses the fact that there are a good many men of something less than average height and a considerable number somewhat above the average height. As we get further away from the central point this process continues in a diminishing scale of proportion until as we get near the extreme ends of the scale the numbers thin off rapidly and become exceedingly small. This expresses the fact that there are very few dwarfs and very few giants. Many similar examples might be cited of normal distributions in other fields. The laws which govern such distributions have been most accurately determined through searching investigations extending over many years.

Assuming that the distribution of the ratings of our 1578 samples of handwriting was a normal distribution plotted on a base line running from 0 to 100, the locations of the points 10, 20, 30, and so on were determined and the corresponding samples found. This is illustrated in graphic form in the accompanying diagram which represents a normal distribution of 1578 cases plotted on a base line on which 0 is the location of the sample

having the lowest rating and 100 that of the one having the highest rating.



Curve of normal distribution plotted on base line from 0 to 100 with median at 50.

The average falls at the point marked 50 on the base line; that is to say, it is half way between the lower extreme and the higher. The curve cutting the axis erected at this point for a time remains almost parallel to the base line on both sides of the axis. This expresses the fact that near the average there are a large number of values approximately equal. After a time it begins to slope away rapidly toward the base line. This expresses the fact that the cases soon begin to grow less common as we get away from the average on either side. The curve is symmetrical on both sides, expressing the fact that there are equal deviations away from the average both above and below. At each one of the points along the scale an upright has been erected, dividing the distribution into ten parts. The number of cases falling within each of the divisions thus made may be computed in the normal distribution and used as the basis for locating the corresponding points in our distribution of ratings. This gave the following results:—

POINT ON SCALE	RATING IN WORDS PER MINUTE OF SAMPLE FOUND AT EACH POINT
90.....	209.6
80.....	202.9
70.....	195.8
60.....	186.1
50.....	175.7
40.....	163.5
30.....	149.4
20.....	131.2

The characteristic of this series is that it proceeds, not by even steps, but by steps that are progressively larger as we move from the upper end of the scale to the lower one. This means that the successive downward steps on the scale represent progressively greater departures from the most readily legible sort of writing.

A study of the figures shows that the ratio of each descending step to the preceding is approximately 117.2 per cent. This gave a series according to theory and one according to actual count as follows:—

POINT ON SCALE	SERIES OF SAMPLES ACCORDING TO ACTUAL COUNT	SERIES OF SAMPLES ACCORDING TO THEORY
90.....	209.6	209.2
80.....	202.9	202.7
70.....	195.8	195.1
60.....	186.1	186.2
50.....	175.7	175.7
40.....	163.5	163.4
30.....	149.4	149.1
20.....	131.2	132.2

The agreement between the two series is so close as to warrant substituting the theoretic series for the one produced by actual count.

The practical application of all this in the present instance is that equal ascending steps in legibility are reflected by progressively smaller increments in the rate at which the writings can be read. Conversely, equal descending steps in legibility are reflected by progressively greater decreases in the rate of reading. A little reflection will show how reasonable and in accord with daily experience this is. An almost illegible writing can be deciphered only extremely slowly. An only slightly better one can be read perhaps twice as fast. A still better specimen can be read somewhat more rapidly, but this time the rate cannot by any possibility be doubled. Thus, as we proceed

to increasingly better writings, our reading rate increases by smaller and smaller increments, until finally we reach writings so excellent that no increase in the rate of reading short specimens can be detected.

In the present case, the steps on the scale indicate relative positions in the distribution of a relatively random selection of writings of school children of the upper elementary grades. Quality 50 is such a quality that one-half of the writings are worse than that quality, and the other half better. Qualities 60 and 40 are respectively equal distances above and below the 50 point. The proportion of the total number of samples lying between qualities 40 and 50 is equal to the proportion lying between 50 and 60. Similar conditions fix the positions of each pair of steps as we proceed up and down the scale away from the central point.

With respect to the zero point on this scale, it may appear that the zero point on a scale for the legibility of writing ought to represent a writing entirely unreadable. The reason why it is not so in this case is that this is a scale for the measurement of the writings of school children of the upper grades, and in the nature of the case the worst school writings in upper grades can never be entirely illegible. Hence, an entirely unreadable writing is not the zero point for a scale of this sort. In the same way, the writing at point 100 would be the most legible writing found among the writings of school children and not an ideally perfect one.



GENERAL APPEARANCE AND LEGIBILITY

The investigation developed several important facts as to the relation between legibility and the general appearance of handwritings. The most important of these is that, whereas extremely legible writings are almost invariably of good appearance, many writings of good appearance are of relatively low degrees of legibility.

Analysis of good-looking writings of low degrees of legibility shows that their most common shortcoming is the crowding together of the words on the line. This indicates that those systems of penmanship are vicious that teach children to space their words so closely that the final stroke of the last letter of one word extends over the initial stroke of the first letter of the following word. Next to too close spacing horizontally

comes too close spacing between the lines as a characteristic making for illegibility.

Another common fault of good-looking writings that are difficult to read is the breaking of lines in the middle of words in such a way as to make one word look at first glance like two words. The absence of dots over the i's and crosses on the t's is also a common and important shortcoming of good-looking writings that are difficult to read.

The practical application of all this is that we shall obtain the best results in teaching writing by striving to conform to types that are most readily legible. By so doing, we shall obtain writings that are at once the most useful and the best looking.

SLANT AND QUALITY

A preliminary study of the relation between the several slants and the quality of the writings indicates that in general the vertical writings are the most legible, the medium slants next and the extreme slants next. The number of samples of back hand and mixed slants is so limited as to render the data with respect to the speed of reading these two styles of doubtful value. The following figures show median rates in words per minute at which the writings of each style were read:—

	NUMBER OF SAMPLES	MEDIAN RATE OF READING IN WORDS PER MINUTE
Vertical ("A")	255	180
Medium Slant ("B")	670	176
Extreme Slant ("C")	580	172
Back Hand ("D")	27	168
Mixed ("E")	46	174

SLANT, SPEED, AND QUALITY

The conditions under which the samples were obtained preclude any extensive study as to speeds for the reason that the writing was done from copy in which the words were thrown out of context. This made the copying of the material a most unusual exercise for the children, and renders dangerous any conclusions from these data as to the comparative writing rates of children of different grades and cities. Nevertheless, comparisons between speeds, slants and qualities may be tentatively made, since the writing conditions were equal for all the children.

This comparison shows that there is a slight but steady falling off in the average number of words written per minute as we pass

from the poorer writings to the better ones. The following figures give the comparison:—

	NUMBER OF SAMPLES	TOTAL NUMBER OF WORDS	AVERAGE NUMBER OF WORDS WRITTEN IN TEN MINUTES
First quarter of distribution (poorest writings).....	394	46,535	118.1
Second quarter of distribution.....	395	46,592	117.9
Third quarter of distribution.....	395	45,449	115.1
Fourth quarter of distribution (best writings)	394	42,728	108.4
Total.....	1578	181,304	114.9

The figures with respect to slants and speeds are as follows:—

	NUMBER OF SAMPLES	TOTAL NUMBER OF WORDS	AVERAGE NUMBER OF WORDS WRITTEN IN TEN MINUTES
Vertical ("A").....	255	29,402	115.3
Medium Slant ("B").....	670	76,779	114.6
Extreme Slant ("C").....	580	67,369	116.1
Back Hand ("D").....	27	2,726	101.0
Mixed ("E").....	46	5,028	109.3
Total.....	1578	181,304	114.9

The foregoing figures make an even showing for the different styles which comes as a distinct surprise to the writer of the present report. The comparison of qualities showed that the vertical writings are the most legible of the different styles. The figures just cited show that the extreme slant writings are a little ahead of the other styles with respect to speed of writing. In short, the meaning of the figures is that the different writings are surprisingly equal as to legibility and the speed at which they are written.

Final conclusions, however, as to this and other problems of import in the applied pedagogy of handwriting should not be reached until many careful studies of children's writing have been made. Such investigations should include inquiries to determine the best types of writing and the most successful methods of teaching. The present scale has been produced with the express object of furnishing an instrument to facilitate the conduct of such studies and to evaluate the results.

Some Publications on Measurements in Education*
Issued by the Division of Education
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- NO. 61. THE RELATION OF PHYSICAL DEFECTS TO SCHOOL PROGRESS. Leonard P. Ayres, Ph.D.

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A critical study of these tests as used in American schools, and suggestions as to their adaptation to our conditions.

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Evidence from three investigations bearing on the problem "What is the best age to send a child to school?"

- NO. 116. THE MEASUREMENT OF EDUCATIONAL PROCESS AND PRODUCTS. Leonard P. Ayres, Ph.D.

An account of the development of the quantitative method in education.

* A charge of five cents a copy is made for these publications.

Some Books on Education Published by the Russell Sage Foundation

Medical Inspection of Schools. Luther H. Gulick, M.D., and Leonard P. Ayres, Ph.D. 276 pp. Price, postpaid, \$1.00. Charities Publication Committee, 105 East 22nd Street, New York City.

Gives in convenient form information about the historical, educational, administrative, and legal phases of the work. (Now in process of revision.)

Laggards in our Schools. Leonard P. Ayres, Ph.D. 236 pp. Price, postpaid, \$1.50. Charities Publication Committee, 105 East 22nd Street, New York City.

A study of the over-age child, the child who repeats grades, and the falling out of school of pupils before the completion of the course in American city school systems. It is illustrated with some forty charts and diagrams, and its inter-city comparisons are set forth in nearly one hundred tables. Third edition.

Wider Use of the School Plant. Clarence Arthur Perry. Introduction by Luther H. Gulick, M.D. 423 pp. Price, postpaid, \$1.25. Charities Publication Committee, 105 East 22nd Street, New York City.

All the activities, from evening schools to social centers, now carried on after school hours in school buildings are described in this book. It shows them in actual operation, outlines the various forms of administration and gives pertinent details as to cost, development, and the social amelioration which they are effecting. Fully illustrated and helpfully indexed. Second edition.

Seven Great Foundations. Leonard P. Ayres, Ph.D. 79 pp. Price, postpaid, 35 cents. Department of Child Hygiene, Russell Sage Foundation, 400 Metropolitan Tower, New York City.

Information concerning the origin, purposes, activities and history of the following foundations: Peabody Education Fund, John F. Slater Fund for the Education of Freedmen, Carnegie Institution of Washington, The General Education Board, Carnegie Foundation for the Advancement of Teaching, Russell Sage Foundation, and the Anna T. Jeanes Foundation.

Open Air Schools. Leonard P. Ayres, Ph.D. 171 pp. Price \$1.20 (postage 12 cents). Doubleday, Page & Co., New York.

This volume gives the important and significant American and foreign material with respect to outdoor schools. It describes the English, German and American types, gives the results and furnishes definite information with respect to clothing, food, cost, administration, etc. It has more than 70 pages of illustrations and diagrams. Bibliography.

MEASURING SCALE

	20	30	40	50
A	Heard, his rusty fowler and army of name he who demanded hat coc he wil disement his of	victed have I as much all cream and milk of bou wasted and shad broiled pears and peaches, and plur moreover and beef smoked his pumpkin and pie peas then and cakes sweet cr	The appearance of Rip, heard, his rusty fowler and the army of name I who demanded hat coc wildernment of his mada	Fain would I pause to dwell burst upon the enraptured ge every to justice ample did I great so in not was here on on get to eager too am an
B	The great error in Rip's composition kind of profitable labor it could not be conditioned worse than was it yet potatoes, as left more little was there until acre by a had a lot to patronize his through that.	very refused had a rider fawn's a his of steel favorite been fact in- judge may be if they his in me tle and fire a of glum the had other the but special ba- bus with knotted and tangled were tail. nick ewe a with shaggy and mountain	The hair of the frightened ped terror. What was to be done? a utter not could he and mo torque his but time psalm to him within sink to legs other his quickened however leaving of hopes in steel hi	His school was a low building Constructed of logs the window partly strong the of those the of back off burden the ta
C	parlor the painting, & figures the of Rip remiss then in vices with shot stocking veld feather and hanger and belt spread	It was toward evening that he from of which he found the of unworthy as home broke need his of risk constant a of kinds all to given an	The gallant hero now ap- hour at his toilet brush his best country the in- her in devil looking looked he, as down bro, unto spirit own his of so, had and rider furious a ch	Ishabod pride himself much as upon his soul not a fibre about expl himself make to recit and fiction becoming

FOR HANDWRITING

60	70	80	90
He entered the house, where had always kept in the General characters large and hat cocked a with receptacle a of instead has	his by-called city gave the upon eye gardias terprises his of scenes this in permitted been	The appearance of Rip, with his rusty, fowling piece, his uncor of name his was what an ed hat cocked the in man midst the in. Man another	We had not been home long as was heard from the distance A good before way gave soon the Daughters their with romped the with gossiped cottage and
It is remarkable that the I have mentioned is not inhabitants of the valley vegetation families same the find still not should	At length he reached to us opened through the cliffs atre but no traces of for beard his found he actor some the do to involu gesture this of recurrence	As Ichabod jogged way his eye, ever a town of ordinary as with delight Kudos	We had not been home of music was heard of of country cheer good by guests the of backfury
Ichabod pride himself much as upon his limb, not a fibre abo hero the himself in his of little the in	strange appearance square built familia awe inspired that about incompreh	On nearer approach surprised at the se stranger's appearance square built fair and awe inspired	Your mere puny stri at the flourish of it passed by with in claims hankers

To measure the quality of a sample of handwriting slide it along the scale until a writing of corresponding quality is found. The number in black at the top of the scale above this represents the value of the writing being measured.

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