ATTENDANCE AND PROGRESS FACTORS IN TEST NORMS

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ATTENDANCE AND PROGRESS FACTORS IN TEST NORMS

THESIS

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ATTENDANCE AND PROGRESS FACTORS IN TEST NORMS

CHAPTER I

THE PROBLEM OF THE SURVIVAL RATE FACTOR

1. Basis of This Study

The main problem of this investigation is to make a critical study of the influence on educational test norms of the important variables of (1) the percentage of scholastics in average daily attendance, or the ratio between the number of scholastics on the census roll and the actual number who are in average daily attendance, and (2) the age-grade status of a school, or the amount of retardation and acceleration.

A prominent place is being given to standardized tests in our educational system, and the general feeling is that their place is secure. In the past twenty years there have been great developments in the improvement and popularization of measurement in education, and on the whole the progress in the field has been substantial and real. However, there are many problems related to testing which are still unsolved.

One of the outstanding problems in educational measurements is the use and interpretation of test norms. An analysis of most educational test norms reveals that they are influenced by many uncontrolled factors. Grade norms and age norms have for some time been considered seriously unreliable. Harry A. Greene, in his introduction to the University of Iowa Studies in Education, Research Bulletin number 1, states that

> Grade norms are generally considered seriously unreliable. Age norms may improve the situation somewhat but the analysis of typical practices in the derivation of such norms indicates that there are still many variables which are not controlled. Age norms based upon the re-grouping of the same students who are used in the derivation of age norms introduce many unusual conditions. Surely age is not the only factor which must be controlled. Does the mental ability of the individual or the educational progress have any influence on expected age or grade scores? Is the ability of the twelve-year old in the fifth grade the same as that of the twelve-year old in the seventh grade? The answer is obviously in the negative.[1]

J. R. Crawford[2] has made a comprehensive study of the influence on educational test norms of three important variables: namely, chronological age, mental age, and the school progress of the individuals used in the derivation of the norms. He has also suggested that similar studies should be made for the purpose of investigating all phases of the effects of these and other possible factors on test norms.

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1. University of Iowa. Studies in Education. Research Studies in Education, I, p. 5.

2. Crawford, J. R., Age and Progress Factors in Test Norms. Doctor's dissertation, 1934, University of Iowa. (Abstract in: University of Iowa. Studies in Education. Research Studies in Education, I.)

This study introduces what may be termed the "survival rate factor," by which is meant the nature and extent to which the percentage of scholastics in average daily attendance and the age-grade status of a school system affect test norms. The problem was suggested by an article which appeared in The Texas Outlook for December, 1936, written by the authors of the New-South Achievement Tests. Rather than make comparisons by the use of means or averages, which would mean that most pupils in the grade would have to be considered either above-grade or below-grade, the authors established score-zones for the various grades within which a child is considered at-grade.

> Each zone is about one and one-half grades wide and overlaps about a half grade upon the next grade above. For a given grade, the normal score for the time of school year determines the center of the zone. ...
>
> These zones permit the classification of all pupils as either above-grade, at-grade, or below-grade. Numbers falling into these classifications may be converted to percentages, and comparisons may be made between schools or with normal expectations.[3]

When comparisons of percentages of above-grade, at-grade, and below-grade pupils were made on the basis of three types of schools (namely, small independent districts, large city schools, and rural or county schools), it was found that the following conditions existed:[4]

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3. Gray, Hob, and Votaw, David F., "Making Reports of Test Results Meaningful," The Texas Outlook, Vol. 20, no. 12 (December, 1936), p. 21.

4. Ibid., p. 21.

Percentages

	Above-grade	At-grade	Below-grade
Small Independent	31.2	35.4	33.4
Large Independent	15.9	31.3	52.8
Rural or County	11.5	27.9	60.6

The authors of this article do not fail to emphasize that these data should never be taken as an absolute criterion for judging the efficiency of a school system, for this would mean that the small independent districts are more efficient than the large city schools, an inference that the writer agrees would be highly doubtful upon such little evidence.

> Such data should never be taken as an absolute criterion of the efficiency of a school system. There are other measures of efficiency. For example, the large city schools may have a very high survival rate in the grades; i. e., they may keep all their children in school. Surely a high survival rate is a mark of efficiency, but it invariably reduces a school's average test scores below the average possible for it to maintain by forcing children of low abilities out of school by means of high scholastic pressure and retardation. Where possible, test results should be coupled with age-grade studies, grade-progress studies, or survival rate studies to give fuller meaning.[5]

The difference in the performance of the three types of schools is perhaps largely attributable to factors not considered in the norming of the test. If there are factors operating to cause the differences among the three types of schools, it seems reasonable to believe that some of these factors operate to cause differences

5. Ibid., p. 22.

among the various schools within each type. This study will be limited to only one of the forementioned types of schools, that of the small independent districts.

2. Other Investigations in the Same Field

Other than Crawford's dissertation entitled Age and Progress Factors in Test Norms, the writer was unable to find any manuscripts or bulletins similar to the present study. A careful study of the literature in the field and of published lists of theses and bulletins revealed that only a small percentage of all investigations in the field of tests and measurements conducted in the last five years deals in any way with test norms.[6] Many studies have

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6. The following list was selected from the Bibliography of Research Studies in Education, 1928-1929, 1930-1931, and 1934-1935, prepared by Ruth A. Gray in the Library Division, United States Department of the Interior, Office of Education:

1. Bergman, Walter G., Influence of Various Standards of Attainment on Certain Standardized Tests. 1928. University of Michigan, Ann Arbor.

2. Bobbitt, Joseph Matthew, II, A Compilation of Norms on Several Tests of Learning. Master's thesis, 1933, University of Southern California.

3. Culver, Mary Marjorie, Preparation of a Norm for "the Junior High School Mechanical Aptitude Test" for Grade 7-1. Master's thesis, 1935, Syracuse. 59 p. ms.

4. Edson, Robert Clay, The Influence of Variations of Administration Upon the Norms of the Seashore Pitch Discrimination Test. Master's thesis, 1934, University of Colorado. (Abstract in: University of Colorado studies. Abstracts of Theses for Higher Degrees, 1934: 19-20.)

been made recently on the uses of tests. A few of these studies deal with the use of tests for making comparisons of some type. It is evident that there is still a need for research that will investigate the influence of various possible uncontrolled factors upon test norms.

3. Uses of Tests

Although teachers have always endeavored to measure the progress of their pupils, it was not until about 1908 that any method other than the teacher's judgments of all traits and abilities was employed.

There are several important reasons why the vast change in educational measurements occurred. For one thing, the use of tests in the army during 1917 and 1918 gave a new impetus to the movement; the use of the test results in placing men where they were of greatest service demonstrated the usefulness of the new test methods. Educators then began to realize that these new-type tests could be of great value in the classroom to estimate the quality and effectiveness of classroom work. Investigations were made that revealed that teachers' marks and ratings could not be relied upon as being accurate.[7] Lincoln and

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7. For a summary of these early studies of marks, consult Starch, Daniel, Educational Psychology, chap. 22. New York. The Macmillan Company. 1924.

Workman summarize the reasons for such a vast change by saying

> With the unreliability of teachers' marks and judgments clearly indicated by the results of many investigations, and the need for reliable measuring instruments keenly felt, it is not surprising that the growth of the testing movement has been very rapid.[8]

The testing movement, although comparatively new, has made the use of educational tests for the general purpose of improving instruction almost as commonplace as the use of textbooks. Millions of tests have been given throughout the country, and students of education have become extremely conscious of the importance and extent of this relatively new device. Of what value are these tests in the solving of teaching and administrative problems? If the tests are merely given because it seems the popular thing to do, then the procedure is exceedingly unwise and expensive. Pressey and Pressey state that many times it appears as though tests were given for no other reason than because every one else was doing so.

> The writers have known several school superintendents who bought--at considerable expense--blanks for a survey of their system, made the survey at the cost of much time and effort on the part of all concerned, and then--filed the papers and made no use whatever of the results.[9]

There should always be a definite purpose back of every testing program.

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8. Lincoln, E. A., and Workman, L. L., <u>Testing and the Uses of Test Results</u>, p. 27.

9. Pressey, S. L., and Pressey, Luella, <u>Introduction to the Use of Standard Tests</u>, p. 20.

There are many ways to classify the uses of tests. For example, Lincoln and Workman classify the use of standard tests under the following headings:[10]

1. Survey
2. Experiment
3. Individual diagnosis
4. Drill

The Review of Educational Research mentions the following uses of tests:[11]

1. Determining and evaluating administrative policies, including the classification of pupils, provision for individual differences, standardization of teachers' marks, curriculum construction, and supervisory activities.

2. Setting up objectives and evaluating the products of the educational program.

3. Evaluating methods of teaching.

4. Improving learning through a discovery of learning difficulty, the sources of motivation, and the uses of self-teaching test materials.

Doubtless there are many more ways of classifying the uses of standard tests, for every book has a slightly different plan. The main purpose here, however, is to show that the uses of tests affect educational theory and practices in many ways. One of the major uses, and the one that will concern this discussion chiefly, is that of furnishing a basis for making comparisons and evaluations. Under the Lincoln-Workman classification mentioned above,

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10. Lincoln, E. A., and Workman, L. L., op. cit., p. 27.

11. Review of Educational Research, Vol. 3 (December, 1933), p. 50.

this would be known as the survey use. The purpose of the survey is to study groups rather than individuals; that is, to decide whether or not the classes, grades, and schools of a community are attaining the levels of accomplishment established by the norms of the tests. Comparisons may be made between one grade and another within the same school, between a grade and the norms given for that grade, between individuals and the norms, between one school and another, and so on. Thus it is evident that tests can be made valuable and practical instruments for use in the schools. It should be remembered, however, that in any type of comparison there is always an opportunity for error unless the norm is clearly defined.

4. Limitations of Norms as a Basis for Comparisons

Standardized tests are distinguished by the fact that they are accompanied by norms; many informal objective tests meet all other requirements of a standardized test except this one. Norms are defined in various ways. Greene and Jorgensen say that "norms represent the actual levels of achievement of typical school children under controlled conditions."[12]

There are various kinds of norms, such as age norms, grade norms, percentile norms, and tentative norms.

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12. Greene, H. A., and Jorgensen, A. N., The Use and Interpretation of Educational Tests, p. 178.

Previously tests have been accompanied by either grade norms or age norms, and in a few instances by both types. The manner of grouping the pupils used in deriving the norms will determine the kind of norm provided. When pupils are grouped by ages, without regard to grades, the resulting norms are age norms. If pupils are grouped by school grades without regard to ages or the length of time they have attended school, the resulting norms are grade norms.

Norms are obtained by giving the tests to a large sample of individuals representing the population for which the norm is intended. If the norms are established by controlling a single factor, such as age or grade, and all other factors are either ignored or considered to be distributed so that their influences are counterbalanced, then any comparison with the norm will be in error if those same factors are not present in the group being compared just as they were in the original group. The realization that such conditions do not operate in exactly the same manner has caused writers in the field of educational measurements to interpret the results of testing very carefully and cautiously.

The fact that test norms should not be used as an absolute basis for classifying pupils has been recognized for many years. As early as 1922, the statement was made that

> The educational tests and mental tests are perhaps the most reliable means of classifying pupils but they should never be considered

> alone. ... The norms or standards used in these tests must be studied very carefully in arriving at results. ... We should also know the amount of retardation in the group from which standards are derived.[13]

Another early writer makes the following statement:

> Tests are valuable, then, in that they help to interpret the pupil's school record. On the other hand, the school record and teachers' judgments are often valuable as means of interpreting the results of tests. The tests do not furnish a complete measure of the capacity which underlies achievement.[14]

Yet many administrators of tests still persist in using the scores made on a standardized test as the sole basis for classifying and promoting students, without seeming to realize the value of many elements not measured by tests or the influence of still other factors not operating in the same manner as they were operating on the original group.

Another important phase of the use of test norms is their use for measuring teaching ability based upon the measurement of pupil achievement.

> The assumption underlying this method of measuring teaching ability is that the pupils of good teachers will, under certain conditions, achieve more as measured by standardized tests of pupil achievement than the pupils taught by poor teachers. According to this method of measuring teaching ability, changes in the educational status of pupils from the beginning of the school year to the end may be used to measure the efficiency of teachers.[15]

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13. Armentrout, W. D., "Classification and Promotion of Pupils," Education, Vol. 42 (April, 1922), p. 509.

14. Freeman, Frank N., "Bases on Which Students Can Be Classified Effectively," School Review, Vol. 29 (December, 1921), p. 744.

15. Walker, Helen M., ed., The Measurement of Teaching Efficiency, p. 74.

Surely if schools are conducted for the sake of the children, then teaching should be judged by its effect on the children. Dr. Walker[16] states though that the use of tests as a sole criterion of pupil change, and therefore of teaching efficiency, is liable to criticism because the result is likely to be the selection of good drill masters with no other desirable qualification. Experiment has shown that a child's achievement score is more closely related to his own ability than to any help a teacher can give him; pupil change on achievement tests usually shows a low correlation with any direct measure of teacher traits.

> Another discouraging aspect of the attempt to find a measure which will show high correlation with pupil change is the apparent tendency of pupil change to be conditioned by a very large number of other variables. These may include such governing factors as intelligence, the pupil's own habits of study, interest, and physical condition. Pupil change may also be affected by factors associated with the teacher, his personality, voice, dress, clarity of thought and expression, sense of humor, and so on. In addition to the foregoing are a large number of factors such as the size of the class, the physical condition of the building, and so on and on. Let us say there are fifty such factors, though of course no one knows how many there are. Unless these fifty are themselves closely related, then pupil change must inevitably show a low relationship to most of them.[17]

Certainly no one has yet found a definite foolproof method for the measurement of teaching efficiency. The

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16. Ibid., p. xi.

17. Ibid., p. xiii.

study of this problem is one of the most challenging in the field of educational research. Once it is possible to measure the success of teachers, a criterion by which to evaluate all phases of the present educational system can be established. When one recognizes the validity of the foregoing statements about the measurement of teaching efficiency, he will not insist on using the scores made by pupils on standardized tests to measure the efficiency of teachers.

J. R. Crawford, in his investigation of the nature and extent to which the three factors, (1) chronological age, (2) mental age, and (3) school progress, operate to influence test norms, found that these factors affected test norms to such a degree that the use of norms based on groups in which these are not controlled are of doubtful value; in other words, individual pupil achievement cannot be evaluated adequately and solely in relation to any single type of test norm. If the norms of tests as they are usually given cannot be used to judge the achievement of individuals, then should these same norms be taken as an absolute criterion for judging the efficiency of a school system, either in comparison of the system with the norms or in comparison of one school system with another? Certain policies of the various school systems may affect the norms. Many schools have a general policy against double promotions and do not hesitate to fail students, while other systems fail few and give extra promotions. Naturally a school with a comparatively high percentage of overageness will score higher on a standardized test than will a school with a low percentage of overageness, simply because its pupils have been in school longer and are older, grade for grade, than a normal situation would permit.[18] Other policies such as the age at which children enter school, the grade in which various subjects are introduced, and the like have their effect on norms. Therefore the age-grade situation of a school system should be investigated before important conclusions regarding the comparative standing of a school system can be definitely and safely stated.

Another factor that must not be overlooked in establishing criteria for judging the efficiency of a school system is that of the percentage of students in average daily attendance. Although Texas has a compulsory attendance law, up to the present time it has not been very effective. This is perhaps due, more than to any other one thing, to the fact that nearly all of the money apportioned by the State to the separate school districts is distributed on a per capita basis--that is, the number of scholastics or names on the census roll--rather than on some basis of attendance. It can easily be understood why some schools

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18. For an elaboration of this point see Pressey, S. L., and Pressey, Luella, op. cit., pp. 65-6.

are not concerned when a large percentage of their scholastics are not attending school. These children are for the most part the "undesirable" element of the community; therefore, some school systems much prefer that they do not attend. On the other hand, a school system that desires to serve its community to the fullest will encourage if not require all children in the district to attend school regularly. This may reduce the school's average test score but should not cause a school system of this type to be judged less efficient.

CHAPTER II

THE METHOD OF THE INVESTIGATION

1. Sources of the Data

In order to study the effects of the survival rate factor on test norms, it was necessary to have access to age-grade distributions, the number of scholastics in average daily attendance, and the mean scores as well as the standard deviations on an achievement test administered to the various schools used in this study. It was essential that these scores be on the same achievement test. Since the New-South Achievement Tests are normed for schools of seven rather than eight elementary grades and in many ways are particularly suitable for use in Texas, they have been used extensively throughout the State. The Texas Commission on Coordination in Education,[19] an organization for the purpose of furthering the development of educational opportunities, recommends as a part of its program the use of the New-South Achievement Tests in the seventh grade. Because of the State-wide testing

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19. For a fuller discussion of the organization and activities of the Texas Commission on Coordination in Education, consult its Research Bulletin, numbers three and four. University Station, Austin, Texas. The commission. 1937.

program and the almost exclusive use of the New-South Tests, it was not a difficult matter to obtain test scores for this study. It was not necessary for the writer to administer the tests; neither was it necessary to obtain the results on the tests from the schools themselves. Many of the data could be obtained from the Commission,[20] since schools coöperating with the Commission submit a copy of the results to the Central Bureau for study. These data are preferable in so far as accuracy and reliability are concerned, but employing them necessitated the use of 1935-36 results, as the 1936-37 material had not yet been compiled. Since schools coöperating with the Commission are likely to be a comparatively homogeneous group, care was used to select for this study only those schools which represented a wide range on the scale, in order that one type would not have too much weight in the results.

A part of the scores was obtained through The E. L. Steck Company, publishers of the New-South Achievement Tests. The results were on the 1936-37 administration of the tests. The difference in the dates of the scores on the tests will be of no consequence provided the other material used in making comparisons corresponds to the dates of the test material.

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20. The Texas Commission on Coordination in Education, as well as The E. L. Steck Company, were glad to coöperate with the writer of this thesis with the definite understanding that no publicity would be given to the standing of the separate schools, either to individuals or in the published results.

The number of scholastics in average daily attendance and the age-grade distributions for the various schools were obtained from the Superintendents' Annual Reports submitted to the State Department of Education. Material on thirty-three small independent school districts scattered throughout the State of Texas was obtained from these sources.

2. Procedure

In submitting the test scores used in this study, each of the schools was provided with a form that called for distributions of the scores made by its students on each of the nine divisions of the New-South Achievement Tests as well as a distribution of the total average scores. The total average score for each child was determined by adding his scores on each of the nine divisions and dividing the sum by nine. The first step in the actual treatment of the data was to determine the mean and standard deviation for each of the thirty-three schools. This involved the use of the frequency distributions based on the total average scores rather than those based on each of the separate divisions. Three schools failed to submit distributions based on the total average scores; therefore, it was necessary to compute their standard deviations by inference. For this purpose a ratio, based on the norms given for the seventh grade on the New-South Achievement Tests, was established between the standard deviations of each of the separate divisions.[21] The standard deviations for these three cases were inferred on the assumption that this same ratio would exist between the average of their standard deviations for the separate nine divisions and the standard deviation for the total average score. The standard deviations for the nine divisions were easily determined from the distributions given. The next step was to divide the sum of these standard deviations by 1.4246 (the ratio found to exist under the norm conditions) to determine what would probably have been the standard deviation for the distribution of total average scores. The test mean for each of these three cases was obtained by computing the means for the separate divisions and dividing their total by nine.

In a study dealing with age-grade data, it is necessary to define the normal age for each grade. Cubberley[22] allows for each grade a normal age zone of eighteen months. This means that on September 1 the normal age for grade 1 would be from five years and nine months to seven years and three months; the normal

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21. The norms are given in the <u>Manual of Directions and Interpretations for Forms A, B, C, and D</u> of the New-South Achievement Tests, p. 11, Table 1.

22. Cubberley, Ellwood P., <u>Public School Administration</u>, p. 439, Figure 37.

age for grade 2 would be from six years and nine months to eight years and three months, and so on. Moehlman[23] uses a two-year span, while other writers have used a one-year span. To the writer the eighteen-months' span would seem preferable in most instances; however, since the age-grade distributions were available only in terms of whole years, the one-year span was used in this study. This means a child is assumed to be at-age for grade 1 if on September 1 of the school year he has reached his sixth year but not seventh. To be at-age for grade 7 a child should be twelve years old but not thirteen. The percentages of overageness, normal ageness, and underageness for each of the seven elementary grades as well as for the total were determined on this basis for each of the thirty-three schools. Because of the use of the narrow normal age span, the percentages of overageness were comparatively high.

It was pertinent to this study to determine for comparative purposes the fractional part of a grade made by the students of each of the schools in one chronological year. In other words, the relationship between chronological age and grade placement was established to show the rate of progress of the students through the grades. This was shown by the computation of the regression coefficients of

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23. Moehlman, Arthur B., Child Accounting, p. 97.

grade on age. The Ayres method[24] for computing the regression coefficients was employed.

An important factor used in this study was found by determining the ratio between the number of children in average daily attendance and the number of scholastics on the census roll. This means that the number of pupils in average daily attendance as shown in the Superintendents' Annual Reports was divided by the number of white scholastics on the census roll. This ratio will be referred to throughout the discussion as the "attendance factor." Certain limitations of this factor must not be overlooked. Since the Annual Reports make no distinction between Anglo-American children and Mexican children, this factor does not take into account the proportion of Mexican children; neither is it affected by the length of the school term.

All these data are compiled in Table A of the Appendix. With these data at hand, the actual study of their relationship to each other was begun. This called for the computation of a series of coefficients of correlation in order to determine whether or not any two of the sets of data under consideration were related, and to what extent the relationship existed. The scattergrams from which the correlations were computed are given in

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24. This method is discussed in Odell, Charles W., Statistical Method in Education, p. 24.

Tables 2-11, and the results are compiled in Table 1, Section 3, of this chapter. The formula used in the computation of all correlations given in this study is as follows:

$$r = \frac{\Sigma f_{xy} d_y d_x - \frac{(\Sigma f_x d_x)(\Sigma f_y d_y)}{N}}{\sqrt{\Sigma f_x d_x^2 - \frac{(\Sigma f_x d_x)^2}{N}} \sqrt{\Sigma f_y d_y^2 - \frac{(\Sigma f_y d_y)^2}{N}}}$$

3. Results and Interpretations

TABLE 1

RESULTS OF THE COMPUTATION OF A SERIES OF COEFFICIENTS OF CORRELATION

	2	3	4	5
1. Test Means	-.3716 ±.0992	-.6964 ±.0581	-.1957 ±.1182	+.1022 ±.1129
2. Attendance Factor		+.6730 ±.0643	+.2185 ±.1085	none
3. Coefficients of Variation			+.1203 ±.1124	-.1406 ±.1118
4. Regression Coefficients				-.6383 ±.0673
5. Overageness				

It will be observed from Table 1 that the correlation between the attendance factor and the test means made on the New-South Tests is not a high correlation. When, however, due consideration is made of the limitations

TABLE 2

CORRELATION BETWEEN THE TEST MEANS AND THE ATTENDANCE FACTOR

	Test Means													
A.F.	48-49.99	50-51.99	52-53.99	54-55.99	56-57.99	58-59.99	60-61.99	62-63.99	64-65.99	65-66.99	f_y	d_y	f_yd_y	$f_yd_y^2$
.75-.799	1					1					2	4	8	32
.70-.749												3		
.65-.699					1	2					3	2	6	12
.60-.649		1	1	3	1	2	1		2		11	1	11	11
.55-.599		1					1	2		1	5	0		
.50-.549		1		1		1	1		1		5	-1	-5	5
.45-.499					1	1			1		3	-2	-6	12
.40-.449							1	1			2	-3	-6	18
.35-.399									1		1	-4	-4	16
.30-.349												-5		
.25-.299							1				1	-6	-6	36
f_x	1	3	1	4	3	7	5	3	5	1	33		-2	142
d_x	-5	-4	-3	-2	-1	0	1	2	3	4				
f_xd_x	-5	-12	-3	-8	-3		5	6	15	4	-1			
$f_xd_x^2$	25	48	9	16	3		5	12	45	16	179			
$f_{xy}d_y$	4	0	1	2	1	7	-9	-3	-5		-2			
$f_{xy}d_xd_y$	-20		-3	-4	-1		-9	-6	-15		-58			

$M_x = 58.94 \quad \sigma_x = 4.64$

$M_y = .572 \quad \sigma_y = .104$

$r = -.3716 \pm .0992$

TABLE 3

CORRELATION BETWEEN THE TEST MEANS AND THE COEFFICIENTS OF VARIATION

C.V.	Test Means 48-49.99	50-51.99	52-53.99	54-55.99	56-57.99	58-59.99	60-61.99	62-63.99	64-65.99	66-67.99	f_z	d_z	$f_z d_z$	$f_z d_z^2$
24-25.99					1						1	4	4	16
22-23.99	1										1	3	3	9
20-21.99		1		1							2	2	4	8
18-19.99		1		1		2					4	1	4	4
16-17.99		1		2	2	4	1	1			11	0		
14-15.99			1			1	3	1	2		8	-1	-8	8
12-13.99							1	1	1		3	-2	-6	12
10-11.99									1		1	-3	-3	9
8- 9.99										1	1	-4	-4	16
6- 7.99									1		1	-5	-5	25
											33			
f_x	1	3	1	4	3	7	5	3	5	1	33		-11	107
d_x	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_x d_x$	-5	-12	-3	-8	-3		5	6	15	4	-1			
$f_x d_x^2$	25	48	9	16	3		5	12	45	16	179			
$f_{xz} d_z$	3	3	-1	3	4	1	-5	-3	-12	-4	-11			
$f_{xz} d_z d_x$	-15	-12	4	-6	-4		-5	-6	-36	-16	-96			

$M_x = 58.94 \quad \sigma_x = 4.64$

$M_z = 16.34 \quad \sigma_z = 3.54$

$r = -.6964 \pm .0581$

TABLE 4

CORRELATION BETWEEN THE TEST MEANS AND THE REGRESSION COEFFICIENTS

R.C.	Test Means 48-49.99	50-51.99	52-53.99	54-55.99	56-57.99	58-59.99	60-61.99	62-63.99	64-65.99	66-67.99	f_w	d_w	$f_w d_w$	$f_w d_w^2$
.80-.849				1			1				2	3	6	18
.75-.799				1	1	1	2	1	1		7	2	14	28
.70-.749		1		1	1	2	1		1		7	1	7	7
.65-.699	1		1			4	1				7	0		
.60-.649		2		1						1	4	-1	-4	4
.55-.599					1			1	2		4	-2	-8	16
.50-.549												-3		
.45-.499								1			1	-4	-4	16
.40-.449									1		1	-5	-5	25
f_x	1	3	1	4	3	7	5	3	5	1	33		6	114
d_x	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_x d_x$	-5	-12	-3	-8	-3		5	6	15	4	-1			
$f_x d_x^2$	25	48	9	16	3		5	12	45	16	179			
$f_{xw} d_w$		-1		5	1	4	8	-4	-6	-1				
$f_{xw} d_x d_w$		4		-10	-1		8	-8	-18	-4	-29			

$M_x = 58.94 \quad \sigma_x = 4.64$

$M_w = .684 \quad \sigma_w = .093$

$r = -.1957 \pm .1182$

TABLE 5

CORRELATION BETWEEN THE TEST MEANS AND THE PERCENTAGES OF OVERAGENESS

O.A.	Test Means 48-49.99	50-51.99	52-53.99	54-55.99	56-57.99	58-59.99	60-61.99	62-63.99	64-65.99	66-67.99	f_m	d_m	$f_m d_m$	$f_m d_m^2$
68-70.99									1		1	7	7	49
65-67.99									2		2	6	12	72
62-64.99		1									1	5	5	25
59-61.99				1				1			2	4	8	32
56-58.99		1						1			2	3	6	18
53-55.99						1	1			1	3	2	6	12
50-52.99			1	1		2			1		5	1	5	5
47-49.99		1		1	2	1	1				6	0		
44-46.99	1			1		1	1				4	-1	-4	-4
41-43.99						1			1		2	-2	-4	8
38-40.99					1	1	1				3	-3	-9	27
35-37.99												-4		
32-34.99								1			1	-5	-5	25
29-31.99							1				1	-6	-6	36
f_x	1	3	1	4	3	7	5	3	5	1	33		21	313
d_x	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_x d_x$	-5	-12	-3	-8	-3		5	6	15	4	-1			
$f_x d_x^2$	25	48	9	16	3		5	12	45	16	179			
$f_{xm} d_m$	-2	5			-6	-9	-13	-1	13	1	-12			
$f_{xm} d_m d_x$	10	-20			6		-13	-2	39	4	24			

$M_x = 58.94 \quad \sigma_x = 4.64$

$M_m = 49.91 \quad \sigma_m = 8.94$

$r = +.1022 \pm .1129$

TABLE 6

CORRELATION BETWEEN THE ATTENDANCE FACTOR AND THE COEFFICIENTS OF VARIATION

	Coefficients of Variation													
A.F.	6-7.99	8-9.99	10-11.99	12-13.99	14-15.99	16-17.99	18-19.99	20-21.99	22-23.99	24-25.99	f_y	d_y	f_yd_y	$f_yd_y^2$
.75-.799						1			1		2	4	8	32
.70-.749												3		
.65-.699					1	1	1				3	2	6	12
.60-.649					4	3	3	1			11	1	11	11
.55-.599		1		1	1	1		1			5	0		
.50-.549	1				1	3					5	-1	-5	5
.45-.499				1		1				1	3	-2	-6	12
.40-.449					1	1					2	-3	-6	18
.35-.399			1								1	-4	-4	16
.30-.349												-5		
.25-.299				1							1	-6	-6	36
f_z	1	1	1	3	8	11	4	2	1	1	33		-2	142
d_z	-5	-4	-3	-2	-1	0	1	2	3	4				
f_zd_z	-5	-4	-3	-6	-8		4	4	3	4	-11			
$f_zd_z^2$	25	16	9	12	8		4	8	9	16	107			
$f_{yz}d_y$	-1		-4	-8	2	1	5	1	4	-2	-2			
$f_{yz}d_yd_z$	5		12	48	-16		20	4	12	-8	80			

$M_y = .572 \quad \sigma y \pm .104$

$M_z = 16.34 \quad \sigma_z \pm 2.54$

$r = +.6730 \pm .0643$

TABLE 7

CORRELATION BETWEEN THE ATTENDANCE FACTOR AND THE REGRESSION COEFFICIENTS

A.F.	Regression Coefficients .40-.449	.45-.499	.50-.549	.55-.599	.60-.649	.65-.699	.70-.749	.75-.709	.80-.849	f_y	d_y	f_yd_y	$f_yd_y^2$
.75-.799						1		1		2	4	8	32
.70-.749											3		
.65-.699						2	1			3	2	6	12
.60-.649					2	3	2	3	1	11	1	11	11
.55-.599		1			1		1	2		5	0		
.50-.549				1	1		3			5	-1	-5	5
.45-.499				2		1				3	-2	-6	12
.40-.449				1				1		2	-3	-6	18
.35-.399	1									1	-4	-4	16
.30-.349											-5		
.25-.299									1	1	-6	-6	36
f_w	1	1		4	4	7	7	7	2	33		-2	142
d_w	-5	-4	-3	-2	-1	0	1	2	3				
f_wd_w	-5	-4		-8	-4		7	14	6	6			
$f_wd_w^2$	25	16		16	4		7	28	18	114			
$f_{wy}d_y$	-4			-8	1	9	1	4	-5	-2			
$f_{wy}d_yd_w$	20			16	-1		1	8	-15	28			

$M_w = .684 \quad \sigma_w = .093$

$M_y = .572 \quad \sigma_y = .104$

$r = +.2185 \pm .1085$

TABLE 8

CORRELATION BETWEEN THE COEFFICIENTS OF VARIATION AND THE PERCENTAGES OF OVERAGENESS

O.A.	Coefficients of Variation 6-7.99	8-9.99	10-11.99	12-13.99	14-15.99	16-17.99	18-19.99	20-21.99	22-23.99	24-25.99	f_m	d_m	$f_m d_m$	$f_m {d_m}^2$
68-70.99	1										1	7	7	49
65-67.99			1	1							2	6	12	72
62-64.99							1				1	5	5	25
59-61.99					1	1					2	4	8	32
56-58.99				1				1			2	3	6	18
53-55.99		1			1		1				3	2	6	12
50-52.99					2	1	1	1			5	1	5	5
47-49.99					1	3	1			1	6	0		
44-46.99					2	1			1		4	-1	-4	4
41-43.99					1	1					2	-2	-4	8
38-40.99				1		2					3	-3	-9	27
35-37.99												-4		
32-34.99						1					1	-5	-5	25
29-31.99						1					1	-6	-6	36
f_z	1	1	1	3	8	11	4	2	1	1	33		21	313
d_z	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_z d_z$	-5	-4	-3	-6	-8		4	4	3	4	-11			
$f_z {d_z}^2$	25	16	9	12	8		4	8	9	16	107			
$f_{zm} d_m$	7	2	6	6	4	-15	8	4	-1		21			
$f_{zm} d_m d_z$	-35	-8	-18	-12	-4		32	16	-3		-32			

$M_m = 49.91 \quad \sigma_m = 8.94$

$M_z = 16.34 \quad \sigma_z = 2.54$

$r = -.1406 \pm .1118$

TABLE 9

CORRELATION BETWEEN THE COEFFICIENTS OF VARIATION AND THE REGRESSION COEFFICIENTS

	Coefficients of Variation													
R.C.	6-7.99	8-9.99	10-11.99	12-13.99	14-15.99	16-17.99	18-19.99	20-21.99	22-23.99	24-25.99	f_w	d_w	$f_w d_w$	$f_w d_w^2$
.80-.849				1			1				2	3	6	18
.75-.799					2	5					7	2	14	28
.70-.749					2	4		1			7	1	7	7
.65-.699					3	1	2		1		7	0	.	
.60-.649		1				1	1	1			4	-1	-4	4
.55-.599	1			1	1					1	4	-2	-8	16
.50-.549												-3		
.45-.499				1							1	-4	-4	16
.40-.449			1								1	-5	-5	25
f_z	1	1	1	3	8	11	4	2	1	1	33		6	114
d_z	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_z d_z$	-5	-4	-3	-6	-8		4	4	3	4	-11			
$f_z d_z^2$	25	16	9	12	8		4	8	9	16	107			
$f_{zw} d_w$	-2	-1	-5	-3	4	13	2	-1		-2	6			
$f_{zw} d_w d_z$	10	4	15	18	-32		8			-8	15			

$M_w = .684 \quad \sigma_w = .093$

$M_z = 16.34 \quad \sigma_z = 2.54$

$r = +.1203 \pm .1124$

TABLE 10

CORRELATION BETWEEN THE REGRESSION COEFFICIENTS AND THE PERCENTAGES OF OVERAGENESS

O.A.	Regression Coefficients .40-.449	.45-.499	.50-.549	.55-.599	.60-.649	.65-.699	.70-.749	.75-.799	.80-.849	f_m	d_m	f_md_m	$f_md_m^2$
68-70.99				1						1	7	7	49
65-67.99	1			1						2	6	12	72
62-64.99					1					1	5	5	25
59-61.99				1			1			2	4	8	32
56-58.99		1					1			2	3	6	18
53-55.99					1	2				3	2	6	12
50-52.99					1	2	1	1		5	1	5	5
47-49.99				1	1		2	1	1	6	0		
44-46.99						2	1	1		4	-1	-4	4
41-43.99						1	1			2	-2	-4	8
38-40.99								2	1	3	-3	-9	27
35-37.99											-4		
32-34.99								1		1	-5	-5	25
29-31.99								1		1	-6	-6	36
f_w	1	1		4	4	7	7	7	2	33		21	313
d_w	-5	-4	-3	-2	-1	0	1	2	3				
f_wd_w	-5	-4		-8	-4		7	14	6	6			
$f_wd_w^2$	25	16		16	4		7	28	18	114			
$f_{wm}d_m$	6	3		17	8	2	5	-17	-3	21			
$f_{wm}d_md_w$	-30	-12		-34	-8		5	-34	-9	-122			

$M_w = .684 \quad \sigma_w = .093$

$M_m = 49.91 \quad \sigma_m = 8.94$

$r = -.6383 \quad \pm .0673$

TABLE 11

CORRELATION BETWEEN THE ATTENDANCE FACTOR AND THE PERCENTAGES OF OVERAGENESS

Attendance Factor

O.A.	.25-.299	.30-.349	.35-.399	.40-.449	.45-.499	.50-.549	.55-.599	.60-.649	.65-.699	.70-.749	.75-.799	f_m	d_m	$f_m d_m$	$f_m d_m^2$
68-70.99						1						1	7	7	49
65-67.99			1		1							2	6	12	72
62-64.99								1				1	5	5	25
59-61.99				1		1						2	4	8	32
56-58.99							2					2	3	6	18
53-55.99							1	1	1			3	2	6	12
50-52.99						1		4				5	1	5	5
47-49.99					1	1	1	2	1			6	0		
44-46.99						1		1	1		1	4	-1	-4	4
41-43.99					1			1				2	-2	-4	8
38-40.99	1							1			1	3	-3	-9	27
35-37.99													-4		
32-34.99							1					1	-5	-5	25
29-31.99				1								1	-6	-6	36
f_y	1		1	2	3	5	5	11	3		2	33		21	313
d_y	-6	-5	-4	-3	-2	-1	0	1	2	3	4				
$f_y d_y$	-6		-4	-6	-6	-5		11	6		8	-2			
$f_y d_y^2$	36		16	18	12	5		11	12		32	142			
$f_{my} d_y$	-3		6	-2	4	11	3	5	1		-4	21			
$f_{my} d_y d_m$	18		-24	6	-8	-11		11	24		-16	0			

$M_y = .572 \quad \sigma_y = .104$

$M_m = 49.91 \quad \sigma_m = 8.94$

$r = 0$

of this investigation and of the many factors which may in some way affect the efficiency of a school system, it seems reasonable to state that this amount of correlation is significant. Rugg regards correlation as being "'markedly present' when *r* ranges from .35 or .40 to .50 or .60."[25] The negative correlation is in itself an indication of the existence of a definite relationship between the attendance factor and the test means. Negative correlation here indicates a tendency for high attendance factors to be associated with low test means and vice versa.

Since nothing has been said in the previous discussion about the coefficient of variation, or coefficient of variability as it is sometimes called, it might be well to recall to the reader's mind the reasons for using the coefficients of variation rather than the standard deviations. The coefficient of variation may be defined as follows:

> ...an absolute number that measures the relative and not the absolute variability of the measures in a distribution. ... It is only by the use of such a measure ... that distributions expressed in different units or having averages that are materially different can be satisfactorily compared with regard to their variability.[26]

The amount of correlation existing between the attendance factor and the coefficients of variation is

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25. Rugg, Harold O., Statistical Method Applied to Education, p. 256.

26. Odell, Charles W., op. cit., p. 140.

marked evidence that schools with a high attendance factor tend to have a high coefficient of variation. This means that schools with a large percentage of scholastics in average daily attendance are likely to have a comparatively high dispersion or scatteration. On the other hand, a correlation of -.6964 between the coefficients of variation and the test means suggests that schools with a large scatteration, or a high coefficient of variation, tend to make comparatively low means on an achievement test. This may be taken, with certain limitations, as a further indication of the existence of negative relationship or correlation between the attendance factor and the test means made on an achievement test.

The tendency for a low attendance factor to be associated with a low coefficient of variation and a high test mean indicates that the children of low abilities are not attending the schools where these conditions exist. It seems evident that the poorer type of student has either been forced out of school by high scholastic pressure or has not been urged to attend. The fact that as the attendance factor becomes higher the coefficient of variation and the test mean become lower shows further that it is the poorer students who tend to remain out of school.

The age-grade status and its influence on test norms should now be considered. When the correlation between the regression coefficients and the percentages of over-ageness was computed, it was found, as would reasonably be expected, that a high regression coefficient is usually accompanied by a low percentage of overageness. This means simply that a small percentage of overageness is usually caused by a low amount of retardation and a general policy favoring double promotions; therefore, under these conditions children progress through the grades at a comparatively rapid rate. When it was found that a correlation of +.2185 existed between the regression coefficients and the attendance factor, the conclusion was that schools with a high attendance factor are the schools in which the general policy is to fail as few children as possible and give extra promotions liberally. The statement has been made in a previous chapter that schools in which there is a general policy favoring retardation and few double promotions will naturally make higher scores on an achievement test than will schools with little retardation, and therefore small percentages of overageness; the children are older, grade for grade, and have attended school for a longer period of time. The results of this study seem to confirm this statement. The schools with the high regression coefficients are the ones which tend to make low scores on the achievement test used in this study.

The data presented thus far demonstrate that the age-grade status of a school is related positively to the attendance factor with regard to the amount of normal ageness, and that the mean test score to be expected of a school is related negatively to both.

CHAPTER III

THE ATTENDANCE FACTOR AND A NEW-TYPE NORM

1. Method Employed in the Construction of a Series of Norms

According to the data presented in the preceding chapter, the survival rate factor does affect test norms and should therefore be taken into consideration in the establishment of norms which will be used as a basis for judging the efficiency of a school system. No single norm will be sufficiently comprehensive to meet the need for a new-type norm in which the survival rate factor is considered; a series of norms should be provided.

In order to estimate the measures in one series when those in another are known, use is made of the regression equations.

> The regression equations are the equations, two in number, that best fit, that is, come nearest to, the means of the columns and of the rows respectively, in a correlation table. The one that comes nearest to the means of the rows is called the regression line of X on Y, or, in other words, the corresponding equation is that by which X values may be found when those of Y are already known. Correspondingly the regression line that best fits the means of the columns is the regression line of Y on X... Unless the coefficients of correlation equal ±1.00, neither regression line nor its corresponding equation yields the exact values of one variable associated with values of the other, but only the most probable values.[27]

27. Odell, Charles W., *op. cit.*, p. 239.

The X factor in this case is the mean scores made on the New-South Achievement Tests and the Y factor is the attendance factor. The information needed to find the equations[28] of the lines of regression of these two series of measures is as follows:

	X	Y
Mean	58.94	.572
Standard Deviation	4.64	.104
r_{xy}	-.3716	

When the proper values were substituted for the M's, σ's, and r in the equations for X and Y, respectively, the following equations resulted:

$$\bar{X} = -.3716\frac{4.64}{.104}X - \left(-.3716\frac{4.64}{.104}\right).572 + 58.94$$

$$\bar{Y} = -.3716\frac{.104}{4.64}Y - \left(-.3716\frac{.104}{4.64}\right)58.94 + .572$$

These reduce to

$$\bar{X} = -16.5791\ Y + 68.4232$$

$$\bar{Y} = -.0083\ X + 1.0612$$

In the equation in which X appears alone on the left, any known value of Y may be substituted in order to estimate the value of X, whereas if one knows the values of the X

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28. The formulae for these two regression equations may be found in Odell, Charles W., <u>op. cit.</u>, p. 241.

measures and wishes to estimate the Y values, the second equation is used. The Y-scores cannot be found from the X equation; neither can the X-scores be obtained by substituting in the Y equation.

Unless the coefficients of correlation are ±1.00, it is not certain that either regression line will yield the actual score, but only the most probable value. The weaker the correlation the greater the chance that the actual score will deviate widely from the estimated score. This means that the probable error of the estimate should be determined. When substitutions were made in the formula,

$$PE_{est} = .6745\sigma\sqrt{1 - r^2}$$

the probable error of the estimate for the X equation given above was found to be 2.8543 and for the Y equation .0651. This means that there is a probability of one-half that an actual measure will be within one probable error of estimate of the predicted score. For example, if a predicted score is found to be .715 from the Y equation, then there is a one-half probability that the actual score would be within .0651 of .715. When these probable errors are interpreted in terms of σ, it is found that the probable error of each equation is .6260 standard deviations. In other words, there is a one-half probability that the actual score would be within .6260 standard deviations of the predicted score.

In estimating the values for the scale constructed in this study, neither of the equations given previously was used. It was desirable to construct a single scale from an equation from which both X and Y values could be determined when either of the series of measures was used as the known values. For this purpose the equation was determined for the line that would bisect the small angle made by the lines of the equations for X and Y. This necessitated the changing of the X equation to the Y form as follows:

$$X = -16.5791\ Y + 62.4232$$

or, dividing through by the coefficient of Y,

$$Y = -.0603\ X + 3.7652$$

In order to determine the new equation, briefly the procedure was as follows:

The size of each of the two angles formed by the X axis and the respective regression lines, one with a tangent of .0083 and the other with a tangent of .0603, was determined and their sum divided by two. From the resulting angle, the new tangent was determined to give the slope of the bisecting line. With the slope of the new line and with one point, which in this case was represented by the test means, the line was determined.

Substitutions were made in the equation,

$$m = \frac{y_1 - y}{x_1 - x}$$

or

$$.0343 = \frac{.572 - y}{58.94 - x}$$

which simplifies to the form

$$Y = -.0343\ X + 2.5936$$

This is the equation for the line that would bisect the angle formed by the two regression lines. In this equation any known value for X may be substituted to find the corresponding value for Y. In the construction of the scale that accompanies this study as Tables 12 and 13, values for Y were determined for X values ranging from 49.0 to 69.0 at intervals of .5, such as 49.0, 49.5, 50.0, and so to 69.0. In order to avoid having convenient scale values on one side of the scale only, it was necessary to determine the values of X when Y values were known. This same equation in terms of Y would read as follows:

$$X = -29.1545\ Y + 75.6152$$

Values for Y ranging from .230 to .920 were substituted at intervals of .010, such as .230, .240, and so on, to determine the corresponding values of X. Since the actual range of the X data, or the test means, of this study was from 48.0 to 68.0 and the Y data was from .250 to .800, some of the values in the scale are extrapolated. The extent to which the scale was projected beyond the actual range of the data of this study was determined by the practicability of its use. No school would very likely have an attendance factor of more than .920 nor less than .227. The scale was extended in both directions an equal distance from the mean of the X data, which was 58.94.

2. Interpretation of the Scale

The question might well be raised as to why the attendance factor was used as the variable with which to associate corresponding test means. According to the results of the study as presented in the preceding chapter, the attendance factor seemed the most important index to the conditions of a school system. The age-grade-progress status of the school system was largely conditioned by its attitude toward the attendance ratio. When, therefore, it was desired to select a measure for the purpose of establishing a series of norms that would be inclusive enough to provide for the basic factors which might affect the efficiency of a school system, the attendance factor seemed the most likely one to meet this requirement as well as other criteria for a useful test norm. Crawford[29] gives the following criteria for a new type of norm:

1. It should be based on a well-defined group.

2. It should be inclusive enough to provide for the basic factors and combinations of factors which may affect achievement.

3. It should be based on measures which are obtainable in any school system.

4. It should be readily interpreted by all test users.

The efficiency of a school system should be judged on the basis of its service to the community and state. In using the attendance factor as the variable with which to associate corresponding test means, the assumption was made that the attendance factor is the best single index to the service rendered by the school. The public school system is maintained for the education of the masses and is supported by the general and direct taxation of all property. Especially in a democracy is it important to maintain a good standard of public education. It is therefore the duty of the school system to see that all its children are educated for citizenship by attending the public schools, either by encouragement or by compulsion, if necessary.

The attendance factor seems to be a good index to the service of a school system not only because it signifies

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29. Crawford, J. R., *op. cit.*, p. 26.

what percentage of its school population is in actual attendance but also because it indicates the nature and character of the school system. A school system that is interested in the entire community will attempt to maintain a varied curriculum that will meet the needs of all groups of students and will not attempt to establish scholastic standards that are too high for the pupils of lower abilities to meet. This will mean less retardation and less stress on the academic side of education.

The scale as given in Tables 12 and 13 is easily used. The Y values (attendance factor) have been placed in the first column, since it seemed reasonable to assume that the attendance factor will be obtainable easily for a school. With the attendance factor of a school known, one needs merely to refer to the comparative scales to find the test mean normally expected for the school. Of course, if the test mean is known, the corresponding attendance factor expected for the school may be found from the comparative scales. One of the measures, either the test mean made by a school or the attendance factor, must be known to find the corresponding value. For example, if a school system is known to have an attendance factor of .820, then it should be expected to make a mean score of only 51.8 for the seventh grade on the New-South Achievement Tests at the end of the school year, notwithstanding the fact that 58.9 is the norm established by the authors of the test. From this expected mean, a school system may be found to be above, below, or at the mean or norm. Educational achievement in a school having an attendance factor of .820 and a mean test score of 51.8 is equivalent to educational achievement in another school having an attendance factor of .343 and a mean test score of 65.5. In both of these cases normal educational achievement has been accomplished for the types of school population being ministered to. A school with an attendance factor of .370 and a test mean of 64.7 would be rated lower than one with an attendance factor of .587 and a test mean of 60.0, while an attendance factor of .518 and a test mean of 60.5 deserves a better rating than an attendance factor of .483 and a test mean of 60.5.

If the mean score for the seventh grade of a school system is known, the corresponding attendance factor may be found on the scale. If a seventh grade has made a mean score of 58.5, then the attendance factor for the school system should be .587. If the actual attendance factor was later found to be lower than .587, the conclusion would be that the school had not made so high a test mean as it should. The test mean normally to be expected could then be located on the comparative scales. The corresponding attendance factor of a school system making a test mean of 61.7 may be found by interpolation from the scale.

The writer has not offered this scale as one that should be used with a high degree of faith in its accuracy. In the first place, it is recognized that the data on which the scale was based were not obtained from a truly representative sample of the school situation. Secondly, there are doubtless many influences that have not been controlled or measured here. It is merely hoped that a suggestion has been given that will lead to the study of the effects of various factors on test norms and to the establishment of reliable norms for achievement tests that will attempt to measure the influence of these factors on achievement test norms. By use of the technique employed here, the writer believes that this study may be greatly extended to produce variable test norms dependent upon the composite influence of several factors. Until such additional investigations are made, however, the scale of test norms given herein to correspond to the attendance factor (the ratio of the number of pupils in average daily attendance to the number of scholastics), is a safer guide to expected achievement on the New-South Achievement Tests for a seventh grade of an independent district of Texas than is any absolute seventh grade norm which disregards the attendance factor.

TABLE 12

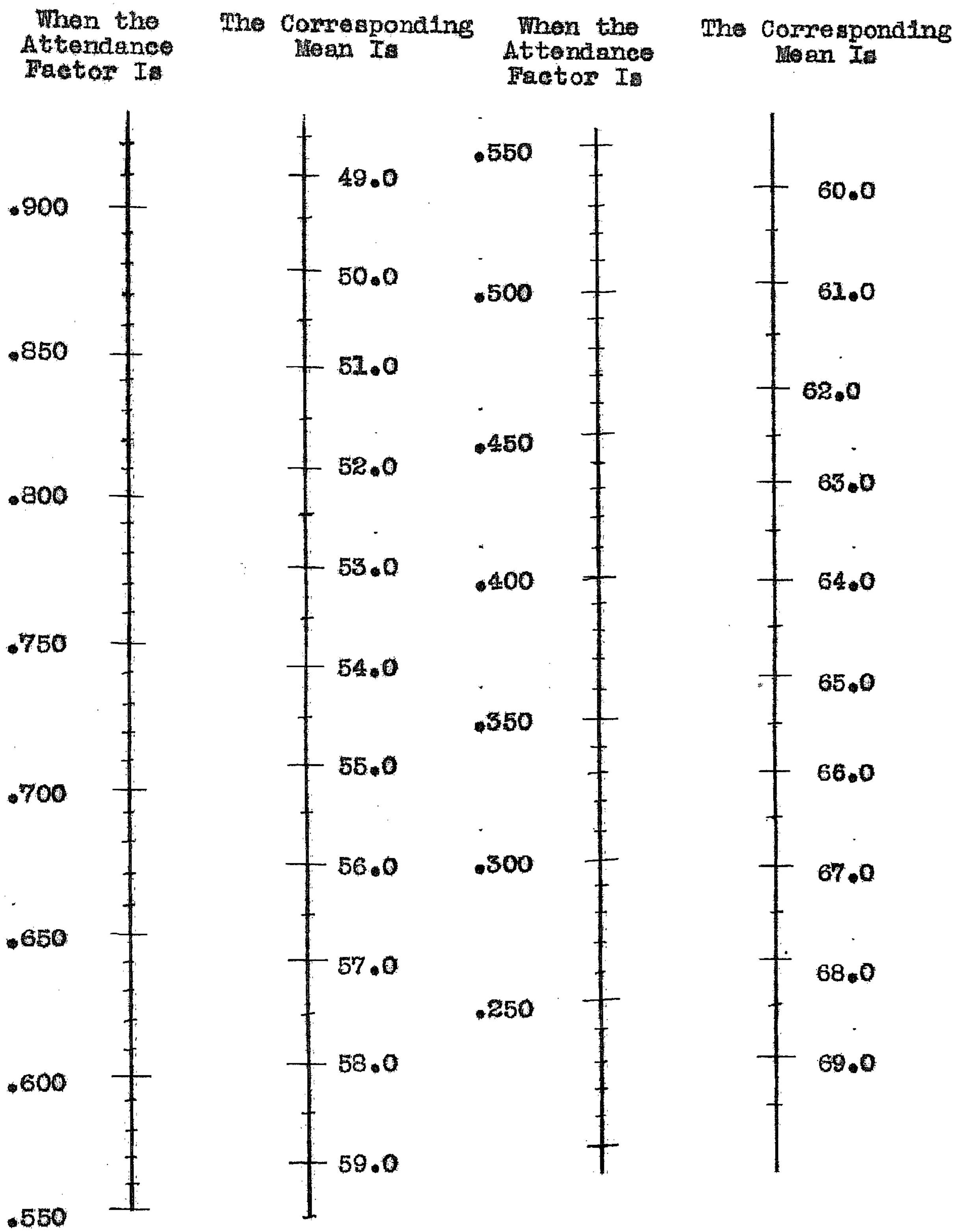
COMPARATIVE SCALES FOR TEST MEANS AND ATTENDANCE FACTORS

When the Attendance Factor Is	The Corresponding Mean Is	When the Attendance Factor Is	The Corresponding Mean Is
.920	48.8	.560	59.3
.913	49.0	.553	59.5
.910	49.1	.550	59.6
.900	49.4	.540	59.9
.896	49.5	.536	60.0
.890	49.7	.530	60.2
.879	50.0	.520	60.4
.870	50.3	.518	60.5
.861	50.5	.510	60.7
.850	50.8	.501	61.0
.844	51.0	.490	61.3
.840	51.1	.484	61.5
.830	51.4	.480	61.6
.827	51.5	.470	61.9
.820	51.7	.467	62.0
.810	52.0	.460	62.2
.800	52.3	.450	62.5
.793	52.5	.440	62.8
.790	52.6	.433	63.0
.780	52.9	.430	63.1
.776	53.0	.420	63.4
.770	53.2	.416	63.5
.759	53.5	.410	63.7
.750	53.8	.398	64.0
.741	54.0	.390	64.2
.730	54.3	.381	64.5
.724	54.5	.370	64.8
.720	54.6	.364	65.0
.710	54.9	.360	65.1
.707	55.0	.350	65.4
.700	55.2	.347	65.5
.690	55.5	.340	65.7
.680	55.8	.330	66.0
.673	56.0	.320	66.3
.670	56.1	.313	66.5
.660	56.4	.310	66.6
.656	56.5	.300	66.9
.650	56.7	.296	67.0
.639	57.0	.290	67.2
.621	57.5	.278	67.5
.610	57.8	.270	67.7
.604	58.0	.261	68.0
.600	58.1	‡.250	68.3
.590	58.4	.244	68.5
.587	58.5	.240	68.6
.580	58.7	.230	68.9
.570	59.0	.227	69.0

†All above are extrapolated. ‡All below are extrapolated.

TABLE 13

GRAPHIC PRESENTATION OF THE COMPARATIVE SCALES



CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

1. Summary

The problem of this study was to determine the nature and extent of the influence of the attendance and progress factors on test norms. If these factors were found to affect norms to the extent that errors in interpretation might result, it was hoped to suggest a method for establishing norms which would at least in part control this effect.

The data used were the test scores made on the New-South Achievement Tests and the age-grade distributions as well as the proportion of scholastics in average daily attendance for thirty-three small independent districts throughout the State of Texas. From these data the following information was obtained for each of the schools: the mean scores, the standard deviations, and the coefficients of variability on the achievement tests; the attendance factor; the percentages of overageness, normal ageness, and underageness; and the regression coefficients for grade on chronological age. The coefficients of correlation for the different combinations of these factors were computed.

The results of this procedure indicated the need for a new type of norm which would make possible more valid comparisons. An attempt to establish such a norm showed that the attendance factor could be used as a basis for determining the test means that should be expected on the New-South Achievement Tests. A scale was constructed by which the corresponding value of either the attendance factor or the test mean could be found when the measure in the other series was known.

2. Conclusions and Recommendations

On the basis of the findings presented in this study, the following conclusions and recommendations appear valid:

1. Attendance and progress factors affect test norms to the extent that they should be considered in norming tests. Norms established on groups in which these factors are not controlled are of doubtful value in judging the efficiency of school systems. Achievement tests should be accompanied by variable test norms that take into consideration the influence of these and other factors on test norms.

2. A high attendance factor tends to be accompanied by a high coefficient of variation and a low mean score on an achievement test. This is an indication that a school system in which the opposite of these conditions exists has only the most capable and most desirable

element of its school population in attendance. These latter conditions should not be encouraged by judging this type of school system more efficient on the basis of its score on an achievement test.

3. The school systems with the low regression coefficients, which are indicative of slow progress through the grades, tend to make higher mean scores on an achievement test than do the schools with low amounts of retardation. It seems evident that the efficiency of these schools should be judged on the basis of variable norms.

4. The school systems with the high attendance factors have comparatively low amounts of retardation. This seems to indicate that these schools are not only interested in having children attend school but are also encouraging them to stay in school for a longer period of time by refusing to discourage them through retardation. Even in these schools, however, the percentages of overageness are much too high. An attempt to reduce the amount of retardation should be made.

5. In so far as the data of the study may be considered typical, most schools have a much lower percentage of scholastics in average daily attendance than a system based on the idea of universal education should allow. A greater effort should be made to strengthen and enforce the compulsory attendance law.

APPENDIX

TABLE A

RAW DATA

Town	Test N	Attendance Factor ADA / Scholastics	Regression Coefficient	Age-Grade Status Percentages: Overageness	Normal Ageness	rageness	Test Mean	Test Standard Deviation	Coefficient of Variation
1	14	.767	.665	44.8	49.5	5.7	49.29	11.06	22.43
2	180	.755	.785	38.8	53.9	7.2	59.72	9.85	16.49
3	29	.671	.661	46.8	51.3	1.9	58.72	8.85	15.07
4	64	.662	.672	54.2	41.4	4.4	59.87	11.66	19.47
5	41	.654	.716	48.7	48.1	3.2	57.61	9.65	16.75
6	62	.644	.773	44.7	42.2	13.1	54.64	9.51	17.41
7	69	.632	.765	38.1	54.6	7.3	56.49	9.05	16.02
8	51	.619	.743	42.8	52.1	5.1	64.94	9.46*	14.57
9	51	.618	.722	49.8	44.9	5.3	58.18	9.70	16.67
10	37	.616	.650	50.0	43.9	6.1	53.08	7.55	14.22
11	29	.615	.766	51.9	45.7	2.4	65.10	9.95	15.28
12	20	.611	.621	63.1	35.6	1.3	51.75	9.40	18.16
13	21	.609	.826	49.7	46.4	3.9	55.91	10.56	18.88
14	13	.608	.626	50.3	36.9	12.9	54.86	11.89	21.67
15	19	.607	.699	55.2	41.7	3.1	60.95	9.25	15.18
16	68	.607	.666	50.7	43.5	5.9	58.60	10.78*	18.39
17	76	.599	.795	34.6	60.7	4.7	62.33	10.75	17.24
18	34	.593	.459	56.1	37.6	6.3	62.64	8.56	13.67
19	40	.579	.706	56.6	39.6	3.8	50.54	10.37	20.51
20	6	.568	.648	55.9	41.4	2.8	67.83	6.70	9.88
21	50	.563	.767	47.0	48.4	4.6	61.72	9.22	14.94
22	103	.543	.702	50.2	42.9	6.9	59.05	9.77	16.55
23	48	.539	.746	45.5	50.4	4.1	60.48	9.33	15.43
24	18	.532	.645	49.7	50.3	0.0	51.44	8.95	17.40
25	17	.525	.707	59.4	33.6	7.0	55.53	9.05	16.30
26	8	.521	.553	70.7	27.1	2.2	65.13	4.95	7.60
27	49	.489	.675	42.5	52.9	4.6	59.35	10.45	17.60
28	37	.469	.561	67.2	30.8	2.0	64.03	8.66	13.53
29	12	.467	.595	48.9	42.1	9.0	57.61	13.95	24.21
30	52	.444	.598	59.8	38.1	2.1	63.38	9.67	15.26
31	35	.435	.798	30.0	65.2	4.8	60.62	10.12*	16.69
32	25	.364	.419	67.5	31.9	0.6	65.60	7.00	10.67
33	19	.277	.809	39.9	49.3	0.9	61.47	7.75	12.61
Mean		.572	.684	49.91			58.94	9.45	16.34
S. D.		.104	.093	8.94			4.64	1.50	2.54

*Computed by inference

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