

ASSOCIATION OF MENTAL TEST SCORES AND SCHOOL MARKS
WITH PARENTAL OCCUPATION OF HIGH SCHOOL STUDENTS,
STILLWATER, OKLAHOMA

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By

RUTH GARWIN

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Chairman, Thesis Committee

Harry K. Brist

Member of the Thesis Committee

O. S. Amman

Head of the Department

James Madsen

Dean of the Graduate School

388065

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CHAPTER I
NATURE AND PURPOSE OF THE STUDY

1. General Nature of this Study: This study correlates parental occupation, mental test scores and school marks of high school students of Stillwater Oklahoma. The interrelationships of these data may reveal one form of social selection whereby mental test scores and school marks tend to be distributed in the high school population somewhat according to the parental occupations of children.

Investigation revealed that while a number of such studies have been made for various regions of the United States, none has been undertaken for the area of the Southwest. The studies in other areas have been defined generally as attempts to discover the relationship between social status of parents and academic or mental test achievement of their children. Systematic correlations have generally been found in both indices of academic achievement and mental test scores when related to parental occupations, and some other indices of family status. The results of these earlier studies formed the basis for the development of this research.

The statistical techniques to be used in this study are devices for measuring the association of grouped scores; they do not necessarily reflect causation. Any existing associations discovered in the series of data studied, assuming that they are not spurious, may suggest mainly that more refined investigation be undertaken through either especially designed experiments or the

of techniques more capable of detecting and measuring perceived relationships which the instruments used in this study cannot identify. The instruments may not even be capable of indicating possible causal factors. At the present stage, this study is one of relationships without reference to social situation.

2.a. The Problem: The problem is to discover the interrelationships of a series of data and formulate statements on them. The basic but explanatory assumption for immediate test is that certain relationships exist between parental occupations and mental test scores and school marks of children, and that they can be found out. Of considerable interest in this assumption is the relative degree of association between parental occupations and school marks, between school marks and mental test scores, and between parental occupations and mental test scores.

b. The Hypothesis: The hypothesis which the study tests is, then, that differences in (1) mental test scores and (2) school marks of high school pupils, as dependent variables, correlate with parental occupational differentiation, as an independent variable, so as to afford statistical evidence of distinct selective patterns.

3. Sources and Nature of Data: The cases used in the study were all the students of the tenth, eleventh, and twelfth school years in attendance during the 1948-49 school year. In all, the study is based on 416 cases, although it was necessary, in some instances, to use fewer cases for some aspects of the study because of omissions of data in the permanent records. Only the first two years of high school class work were used in tabulating

ol marks. This was mandatory to insure approximately uniform school
 sure in the population considered. This provision eliminated freshman
 ents from the study.

a. The occupation categories used in this study were developed in the
 by Alba M. Edwards.¹ His occupational categories of gainful workers
 e United States are based upon collation of income, occupational status,
 type of work data contained in the 1930 census. The principal categories
 e Edwards scale are as follows:

1. Professional persons.
2. Proprietors, managers and officials.
3. Clerks and kindred workers.
4. Skilled workers and foremen.
5. Semiskilled workers.
6. Unskilled workers, laborers and servants.

While Edwards' system provides a general theory for handling occupa-
 al data, it was necessary to modify his scale partially to achieve a basis
 a satisfactory classification of obtainable data on parental occupations
 this investigation. To the six Edwards categories above were added two
 e. A "farmer class" was created to include all agricultural parents,
 e it was impossible to differentiate owner, tenant, or laborer groups on
 basis of the available data. It was necessary also to establish a miscell-
 ous class to include a few indefinite or unclassifiable listings of parental
 apations.

The occupational data were taken from the students' school registration
 is, filled out under teacher supervision at the high school. The entries

¹Alba M. Edwards, "A Socio-Economic Grouping of the Gainful Worker
 he United States," Journal of American Statistical Association, 28
 33), pp. 377-387.

e registration card were checked for inaccuracies wherever possible. This was done by (1) comparing the name, address, and occupation of parent listed by each student with the current city directory which includes occupational data, (2) consulting Oklahoma Agricultural and Mechanical College Bulletin for data on its personnel, (3) interviewing students directly and (4) in some cases by interviewing competent persons acquainted with these families.

The occupation of the male breadwinner was used in every case if listed. If the occupation in which it was estimated that most of his time was spent was not listed, the occupation of the mother was used if it was impossible to determine that the male head of the family, or if it was apparent the head of the family was a male breadwinner. When both parents were listed as employed the father's occupation was used.

The assignment of a listed occupation to one of the above eight classes was made independently by two individuals to establish defensible classification of these data.

b. School marks were obtained from the permanent record books of the Lawton High School. These were in the form of letter ratings. These letter values were converted to numerical grades by assigning points to each letter as follows: A = 4 points, B = 3 points, C = 2 points, D = 1 point, F = 0 point. A grade point index for each student was constructed by dividing the total number of points in "major" courses by the number of these courses completed. Only school marks for English, mathematics, science, history, and languages were used, since comparability could be assured only in these

cts. The grade point index served as the measure of school marks in statistical treatment of data.

c. Mental test scores were obtained from the test score sheets in the school record file. Each student's sheet contained the raw score, stan-score, and percentile rank for the eight Bennett, Seashore, and Wesman mental Aptitude tests, as well as a test profile. Three of the eight tests considered by competent judges to be most indicative of mental ability. These are the verbal reasoning test, measuring ability to understand concepts expressed in words, the numerical ability test, measuring facility in handling numerical relationships, and the abstract reasoning test, measuring non-verbally the ability to reason through perception of operating principles. Percentile ratings on these three tests were averaged to give an over-all score for each student, which score was then used in the statistical treatment of the data.

A master card, 4 inches by 6 inches, was used for recording the data. This card also served as a guide in the use of the data thus transcribed. The card contained the student's name, age, academic year, parental occupation, school marks, and mental test scores.

4. Method and Procedure of Study: The occupational groups were used as the independent variable to find out how the mental test scores and school marks are distributed in patterns. This was done to ascertain whether parental occupation, the independent variable, correlates with mental test scores and school marks, which were employed as dependent variables, so as to determine statistically significant selectivity. The test of significance applied to

ences between means is the standard error of the difference between uncorrelated means. "Critical ratios" of differences of means were computed by dividing the obtained difference in each instance by its standard error as described by Garrett.² It shows whether the observed difference is statistically significant or may be attributable to accidents and errors of sampling to chance, or to a spurious relation between variables. To be statistically significant, the critical ratio of the difference between the two means must be 1.97 or larger; otherwise, the probability is five per cent or greater that the computed relationship may be due to chance alone, which is too high a chance factor to assure predictive value.

Class differences, or similarities, with pupils from each occupation group were classified into five categories of test scores and school marks were tested with Chi-Square. For four degrees of freedom, a value of Chi-Square in excess of 9.49 indicates a significant relationship, with a chance probability less than 5%.³

Similarity, or degree of difference, for all eight occupation groups, was determined also by the analysis of variance. This method allows determination of the degree of variance between occupation classes and within each class. In this way, the relationship of school marks to occupation and to mental

²Henry E. Garrett, Statistics in Psychology and Education, New York: Macmillan, Green and Co., 1947, pp. 197-204. Table A, pp. 190-191.

$$\sigma_D = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2} \quad ; \quad CR = \frac{D}{\sigma_D}$$

³Garrett, op. cit., pp. 242-252. See Table 40 on p. 252 for method

cores was obtainable.⁴

The degree of internal relationship of school marks to mental test scores tested by means of the coefficient of correlation, the Pearsonian r . Thus, relationship of school marks and mental test scores for each class of par-
 occupation was established, using the "gross score" formula described
 Garrett.⁵

Partial correlations were employed to test the relationship between par-
 occupation and mental test scores and school marks.⁶ This was achiev-
 arbitrarily assigning a numerical weight to each occupational class cor-
 responding to its position on the Edwards scale, with a weight of 1 assigned
 to unskilled class through to 8 for the professional class, with the two
 professional classes placed in position according to their mean in test and school
 scores relative to the means of the other groups.⁷ Coefficients of par-
 correlation, holding each one of the three factors constant while relat-
 the other two were computed.

Coefficients of contingency were calculated to obtain a relationship of
 mental occupation and school marks and with mental test scores, as indi-

⁴George W. Snedecor, Statistical Methods, Ames: Iowa State College
 Press, 1946, Chapters 10 and 11, For F table, see pp. 184-187.

⁵Garrett, op. cit., p. 292.
$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

⁶Garrett, op. cit., pp. 404-429. Also, see Table 59, p. 407.

⁷Edwards, op. cit., pp. 377-387.

by Garrett,⁸ without the weighting of occupation classes.

Other factors relating to differences between the occupation classes obtained from the data. The percent of acceleration and retardation in class after allowing for a two-year span for age of entrance, from age to age seven, was calculated according to the age and grade in school. Percentages of "Superior" 90-100, "Good" 70-89, "Average" 30-69, "Low" 10-29, "Low" 0-9 on the test scores achieved by each student for occupation class were obtained.

Similarly, grade point averages, derived from school marks, as explained earlier, were sorted into categories of "Superior" 3.5-4.0, "Good" 3.0-3.49, "Average" 2.0-2.99, "Poor" 1.0-1.99, "Low" 0.0-0.99, indicating proportions of children in each parental occupational group comprising five categories.

A comparison of the proportions of "Superior" through "Low" percentages for each occupation class for mental test scores as compared to the proportion of "Superior" through "Low" averages for the school marks achieved by children in the same occupational class was made. This indicated the degree of spread of school marks for each occupation class.

All statistical tests of significance were performed to determine the degree of similarity and dissimilarity between as well as within the occupation classes. Thus, determination of the relationship of parental occupation school marks and with mental test scores of the children was obtained in

⁸Garrett, op. cit., pp. 359-365.

$$C = \sqrt{\frac{\chi^2}{N + \chi^2}}$$

er to ascertain whether a selective influence was exerted by parental
upation.

CHAPTER II

REVIEW OF LITERATURE

A. Studies Stressing the Positive Relationship. Studies have been made during the last twenty-five years on the effects of certain aspects of the environment on school performance of children. Inasmuch as this study is concerned mainly with parental occupation as the criterion in differentiation of groups, the literature survey concentrates, mostly, on studies of similar nature. Studies relating other factors of environmental nature were also investigated, because it was felt that they related to the distribution of mental test scores and various indices of school progress, and were relevant in understanding of certain aspects of the problem at hand.

The majority of the studies stress the positive relationship between type of occupation of parents and school marks received by the children. A number of these, however, include and emphasize the exceptions or variations found, indicating a low correlation between socio-economic status of parents and school progress of the children.

Broom and De Silva pointed out in their study that the testing of mental ability, or innate intelligence, is based on acquired intelligence.¹ The assumption rests on the premise of common experience and similar opportunity

¹M. E. Broom and F. W. De Silva, "Achievement Test Scores as Measures of the Mental Ability of Junior High School Pupils," School and Society (1933), pp. 715-716.

study is interested mainly in emphasizing the dangers of accepting scores as measures of innate ability without taking into account other factors as well as group common experiences.

Haggerty and Nash found a positive correlation between parental occupation and mental ability of children.² Chauncey has similarly found a positive relationship between the ability of children and socio-economic factors.³ He studied children having similar school background through similarity of school training up to the time of his study.⁴ He found a coefficient of positive correlation of 0.4 between social status and I. Q. of pupils belonging to the same school grade and with the same formal training. He found that as status approached greater homogeneity the correlation increased somewhat. Thus, social status is an important factor in the values and distribution of test scores of pupils when school background is held constant.

Jester states that home influences follow the children into school and are an important factor in the education of children.⁵ Those children coming from homes of low economic and social status make low marks at school.

Janke and Havighurst studied ability as related to social status by dividing their group into five social status categories and by comparing test ability

²Melvin E. Haggerty and Harry B. Nash, "Mental Capacity of Children and Paternal Occupation," Journal of Educational Psychology 15, (1924), pp. 567-572.

³Marlin R. Chauncey, "Relation of the Home Factor to Achievement and Intelligence Test Scores," Journal of Educational Research 20, (1929) pp. 88-94.

⁴M. Sirkin, "Relation Between Intelligence, Age and Home Environment of Elementary School Pupils," School and Society 30, (1929) pp. 304-308.

⁵Clarence L. Jester, A Comparative Study of the Relation of Socio-Economic Status to Achievement in the Sixth Grade, Unpublished Master's Thesis, Oklahoma Agricultural and Mechanical College, 1940.

the different groups.⁶ Their findings were that mental test scores are closely and positively correlated with social status in that differences in scores between high and low status groups are large and consistent. Also, the parental environment as measured by status selects out and favors certain abilities. For example, high status groups do better on all tests except those measuring mechanical ability. Havighurst and Breese found that children of higher social status tended to excel those of lower social status in all tests.⁷

Robinson and Meenes studied two groups of Negro children in the third grade in 1938 and again in 1945.⁸ In the latter year more parents were listed in the higher occupational categories due to a greater demand for labor in virtually all occupational classes in 1945 than in 1938. They found that the relatively greater numbers of parents listed in the higher occupational categories corresponded with an increase in I. Q. points among the children of the 1945 group. Thus, more occupational opportunities and higher planes of living show up in an increase in the intelligence test scores of school children.

B. Studies Emphasizing the Exceptions Found. The following studies show a positive relationship between home factors and mental ability of chil-

⁶Leota Long Janke and Robert J. Havighurst, "Relationship Between Ability and Social Status in a Midwestern Community," Journal of Educational Psychology 36, (1945) pp. 499-509.

⁷Robert J. Havighurst and Fay H. Breese, "Relationship Between Ability and Social Status in a Midwest Community," Journal of Educational Psychology 38, (1947) pp. 241-247.

⁸Mary Louise Robinson and Max Meenes, "Relation Between Test Intelligence of Third Grade Negro Children and the Occupation of Their Parents," Journal of Negro Education 16, (1947) pp. 136-141.

but emphasize the variations found.

Stokes and Lehman found that the higher social levels are inferior to the lower in respect to the number of superior children included in their ranks and that the non-professional groups furnish the great majority of gifted children (I. Q. 140 and over) and superior children (I. Q. 120-140).⁹

McGehee and Lewis state that investigators have been preoccupied with positive relationships and that they have not emphasized the many exceptions in their data, thereby giving the impression of perfect correlation between socio-economic status and intelligence.¹⁰ The criticism ranges from the technique of the Terman study¹¹ to the limited number used in the Haggerty-Nash study.¹² While there is a positive correlation between parental occupation and test scores of the child, there are retarded and accelerated children in families of all occupations and in all types of homes. The positive relation between parental occupation and test scores of children holds primarily for group averages, and environmental factors are not the only ones which determine mental test scores.

Livesay found an overlapping of occupational groups in relation to mental

⁹Stewart M. Stokes and Harvey C. Lehman, "Intelligence Test Scores of Social and Occupational Groups," School and Society 31, (1930) pp. 372-377.

¹⁰William McGehee and W. D. Lewis, "The Socio-Economic Status of Homes of Mentally Superior and Retarded Children and the Occupational Rank of Their Parents," Pedagogical Seminary and Journal of Genetic Psychology (1942), pp. 375-380.

¹¹Lewis M. Terman, The Intelligence of School Children, New York: Houghton, Mifflin Co., 1919, p. 367.

¹²Haggerty and Nash, loc. cit.

scores achieved, and a greater span within groups than between groups.¹³ However, a large number of cases in lower occupations scored well up in higher ranges, and a considerable amount of talent exists at all levels.

R. C. Osborn found home background to be a factor in influencing the achievement and intelligence of school children, although not a major one.¹⁴

McMillan's study shows that family background factors such as tenure, duration and parental education are related positively to acceleration and retardation of children in school.¹⁵ He found that in areas of great mobility and low levels of living the children were on the average more retarded and less accelerated than in areas of less mobility and longer tenure. Thus, social and economic opportunities are factors in school progress in children.

Studies somewhat related to this problem have been reviewed by Sorokin and others.¹⁶ These have dealt mainly with eminent men and their family backgrounds. It was found that, on the whole, the most prominent families tended to produce by far the greatest proportion of outstanding world figures, while

¹³Thayne M. Livesay, "Relationship of Test Intelligence of High School Graduates in Hawaii to the Occupation of Their Fathers," Journal of Applied Psychology, 25, (1941), pp. 369-377.

¹⁴Richards C. Osborn, "How is Intellectual Performance Related to Social and Economic Background?" Journal of Educational Psychology 34, (1943) 215-228.

¹⁵Robert T. McMillan, "School Acceleration and Retardation among Open Country Children in Southern Oklahoma," Rural Sociology 13 (1946), pp. 339-

¹⁶Pitirim Sorokin, Carle C. Zimmerman and Charles J. Galpin, Systematic Source Book in Rural Sociology, Vol. III, Minneapolis: University of Minnesota Press, 1930, pp. 227-351.

lower classes produced only negligible proportions.

C. Pertinent Conclusions From These Studies. That home background, social status of family, and economic position influence significantly the concentration of mental test scores and school marks of children grouped statistically has been confirmed by a number of studies. This is particularly true with respect to parental occupations, which is the only index of home background employed in this study.

Usually, the higher the socio-economic status of the family, the greater are the opportunities and the more powerful are the incentives for achieving high school marks. Likewise the greater is the likelihood of an upward selection in mental test scores. The differences in cultural and economic background are revealed in differences in mental test scores and in school marks between the various groups. However, other selective factors are also at play; these are indicated by considerable variation of mental test scores and school marks within groups. Often intra-group variations are greater than inter-group differentials.

Eells¹⁷ explored the general problem of children's performance on intelligence tests and their cultural or social-status background. He noted that previous investigators of the problem had found clear-cut differences in the intelligence test performance of different social status groups. His own correlations between I. Q. and status ranking were moderate in size - his simple coefficients or correlation ranged from 0.20 to 0.43 - but were significant in

¹⁷Eells, Kenneth W., et al., Intelligence and Cultural Differences. Chicago: University of Chicago Press (1951), pp. 10-161.

statistical sense. He found, also, that there was a large amount of over-
 lying at all social-status levels, with many high-status pupils receiving low
 es and many low-status pupils receiving high scores.

This study, therefore, through its design and orientation, is intended
 neck a mass of previously tested hypotheses and often verified theories
 ting to a selective relationship between parental occupations and both
 tal test scores and school marks of children. In the main, the earlier
 stigations, which have used mass data, have confirmed the presence of
 tive, although variable, selectivity in the association of these factors.

In spite of high coefficients of positive correlation, critical ratios of less
 . five percent of chance, and other indications of statistically significant
 tionships, individual exceptions will occur in any chosen category. The
 ury is not meant to find absolute relationships but relatively predominant
lencies which have been tested extensively by numerous investigators at
 ely different times and places producing substantially similar results.
 e of the studies examined considers minor divergencies among the findings
 ifferent investigators as signs of a lack of either validity or reliability
 ither the measures used or in the results achieved.

The accumulated literature, then, offers a fertile medium in which to
 ceptualize, formulate, and pursue a study of the interrelationships opera-
 in a given human population in respect to evidences that parental occupa-
 is associated with mental test scores and school marks of children in
 s suggestive of selection. In other words, this literature delves far enou
 the problem of group selection to enable a student to observe the emerge

certain forms of social stratification, recognizing them at face value as they appear, and on the basis of measurable objective proofs.

CHAPTER III

RELATIONSHIP OF OCCUPATIONS TO SCHOOL MARKS AND TEST SCORES

1. Statistical Comparison of the Occupational Classes. This study proceeds to establish measures of the relationships of parental occupation to school marks and (2) mental test scores of pupils in Stillwater High School (3) the relationship between school marks and mental test scores. The first of these operations is intended to serve as a check against the first two of any possible spuriousness.

In addition to showing what relationships exist and the degree of relation among these three factors, the study also is to determine the degree of inter-occupational selection of mental test scores and school marks.

TABLE 1

DISTRIBUTION OF STILLWATER HIGH SCHOOL PUPILS
ACCORDING TO PARENTAL OCCUPATION

Parental Occupation	High School Students	
	Number	Per Cent
Professional	85	20
Business	77	19
Technical	58	14
Unskilled	68	16
Semi-skilled	44	11
Unskilled	48	12
Unskilled	15	4
Miscellaneous	21	5
Total	416	100

A simple description of the aggregate population is shown in Table 1. This table indicates the numbers and percentages of all children of each occupational class enrolled in the high school at the time of this study. The large percentage of children from the professional and business classes found in the high school may be attributed to many factors. Still, being mainly a college town, would be expected to have relatively large numbers of professional people in the population (counting college and high school teachers as professionals), as well as proprietors. These classes tend to emphasize the value of higher education for their children.

For comparing the eight occupational classes, the arithmetic means for test scores and for the grade point averages (M's), their respective standard deviations (σ 's), the coefficient of correlation, and its standard error were calculated for each class. Similar calculations were made for the entire group. The results are shown in Table 2. The inter-occupational comparisons may be observed by reading the vertical columns of computed means and the intra-occupational findings by the horizontal rows.

The means of both the mental test scores and school marks decline, in general, when passing from the professional to the unskilled occupations. The departure from this tendency occurs with the clerical group, which shows an average mental test score as high as that of the professional class. The findings of Anderson and Davidson in a study of occupations lend support to this observation.¹ They have found that clerical groups emphasize education.

¹H. Dewey Anderson and Percy E. Davidson, Occupational Mobility in a Modern American Community, Stanford: Stanford University Press, 1937.

TABLE 2

RELATIONSHIP OF PARENTAL OCCUPATION TO MENTAL TEST SCORES AND SCHOOL MARKS OF HIGH SCHOOL PUPILS EXPRESSED IN TERMS OF MEANS AND COEFFICIENTS OF CORRELATION

Parental Occupation	Mental Test Scores		School Marks		Coefficient of Correlation ² r	
	Mean (M)	σ	Mean (M)	σ		r
Professional	62.58	22.48	2.88	0.701	0.624	0.071
Business	53.38	23.70	2.46	0.833	0.657	0.067
Academic	62.08	23.20	2.50	0.735	0.611	0.089
Unskilled	47.48	25.15	2.23	0.842	0.613	0.082
Semi-skilled	42.23	23.35	2.24	0.766	0.709	0.087
Unskilled	41.81	20.61	2.03	0.791	0.570	0.105
Unskilled*	27.43	10.04	2.10	0.632	0.126	0.023
Miscellaneous*	43.53	23.94	2.27	0.751	0.452	0.198
Classes	51.57	24.74	2.31	0.808	0.601	0.032

*The numbers in these classes are too small to be regarded as yielding significant results.

The analysis of the data produces reasonably high coefficients of correlation between mental test scores and school marks for all classes, except the unskilled and miscellaneous classes which are too small numerically to yield significant results of any kind. The lower Pearsonian r for the miscellaneous group is probably consistent with the heterogeneity of the group. The coefficient of correlation between mental test scores and school marks is disproportionately low, though positive, for the unskilled group. This is probably due, (1) to a rapid drop in the means of the mental test scores without a corresponding change in the means of the school marks, and (2) to a small number of cases (only 14) within this group, which tends to nullify any potential significance of the results obtained.

As a check to determine the probability that any observed interrelation-

²Garrett, *op. cit.*, pp. 291-293. The gross-score formula was used in calculating the coefficient of correlation (Pearsonian r).

might have arisen from chance alone, or from factors other than chance. The critical ratios of differences between means of school marks and of test scores were computed in the manner described by Garrett for each of the eight occupational classes.³ For four hundred degrees of freedom, a critical ratio of 1.96 is considered significant as shown by Garrett, which means that the probability of the computed relationship being due to chance is five per cent.⁴ The critical ratios calculated for the various classes in this study are presented as part of Table 3.

Further, the Chi-Square method was also applied to determine whether observed differences among the group means were attributable to chance or other factors entirely. In this technique each occupation class was subdivided into five categories of mental test scores and school marks with intervals as follows:

<u>Categories</u>	<u>Mental Test Scores</u>	<u>School Marks</u>
Superior	90-100	3.5-4.0
High	70- 89	3.0-3.49
Average	30- 69	2.0-2.99
Low	10- 29	1.0-1.99
Very Low	0- 9	0.0-0.99

The Chi-Square results are also presented in Table 3. The criterion of significant dissimilarity for four degrees of freedom is a Chi-Square result greater than 9.49 as shown in Garrett.⁵ At this value of Chi-Square, the probability

³Garrett, op. cit., pp. 197-205. $CR = \frac{D}{\sigma_D}$, where $\sigma_D = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$

⁴Garrett, op. cit., Table 29, pp. 190-191.

⁵Garrett, op. cit., pp. 251-253. Table 40, p. 252 was used as a guide for the calculations of χ^2 . The table of Chi-Square appears on p. 242.

ty of a chance relationship is 5%.

TABLE 3

CRITICAL RATIOS AND CHI-SQUARE RESULTS FOR SCHOOL MARKS
AND MENTAL TEST SCORES FOR EACH OCCUPATION
CLASS COMPARED WITH EVERY OTHER CLASS

Occupation Classes	Critical Ratios		Chi-Square Results	
	Mental Test Scores	School Marks	Mental Test Scores	School Marks
Professional & Business	2.42	3.50	6.49	10.63
Professional & Clerical	0.12	3.18	2.67	7.94
Professional & Skilled	4.00	4.23	9.15	19.51
Professional & Farmer	5.65	4.57	14.10	15.43
Professional & Semiskilled	5.04	6.07	20.65	29.11
Professional & Unskilled	9.45	4.33	23.34	12.18
Professional & Miscellaneous	2.98	3.38	9.79	14.90
Business & Clerical	2.56	0.38	8.09	4.13
Business & Skilled	1.37	2.09	2.82	2.48
Business & Farmer	2.29	1.68	8.40	3.61
Business & Semiskilled	2.74	1.86	8.40	6.78
Business & Unskilled	6.70	1.97	15.58	3.28
Business & Miscellaneous	1.53	1.00	2.38	2.92
Technical & Skilled	3.15	1.98	10.95	6.45
Technical & Farmer	3.84	1.73	16.78	3.15
Technical & Semiskilled	4.43	2.62	21.71	10.83
Technical & Unskilled	8.17	2.11	25.04	3.42
Technical & Miscellaneous	2.78	1.21	9.47	6.04
Unskilled & Farmer	1.02	0.10	3.08	2.38
Unskilled & Semiskilled	1.24	0.12	6.09	1.92
Unskilled & Unskilled	4.74	0.10	11.92	2.70
Unskilled & Miscellaneous	0.59	0.21	0.81	2.04
Semiskilled & Semiskilled	0.92	0.13	1.91	3.50
Semiskilled & Unskilled	3.49	0.14	5.87	2.49
Semiskilled & Miscellaneous	0.19	0.15	1.61	1.96
Unskilled & Unskilled	3.46	0.33	7.92	2.17
Unskilled & Miscellaneous	0.26	1.11	3.14	1.50
Unskilled & Miscellaneous	2.51	0.79	5.09	1.72

In the interpretations of Table 3 to follow, conclusions regarding differences are accepted as significant only if both critical ratios and Chi-Square results are large enough to meet the previously adopted criteria of signifi-

and are, therefore, too large to be attributable to chance. Further, each occupational class is successively compared with all classes following it. As shown in Table 3, both the Chi-Squares and the critical ratios indicate a significant difference in favor of children of the professional over those of all classes except the business, clerical and skilled classes, in respect to mental test scores, and over all classes except the clerical class in regard to school marks.

According to the accepted criteria, both measures indicate that children of the business class have average mental test scores significantly higher than those of the unskilled classes. Children from the clerical class have significantly higher average mental test scores than those of all classes following it and excel only those of the semiskilled class in school marks with differences great enough to be attributable to other factors than chance. Children from the skilled class have significantly higher mean mental test scores than those from the unskilled class. No other significant differences in either mental test scores or school marks were observed.

To ascertain the relative closeness of correlation of pairs of variables in the study of occupation, mental test scores and school marks, partial coefficients of correlation were calculated.⁶ A weight of 8 was arbitrarily assigned to Professional, 7 to Business, 6 to Clerical, 5 to Skilled, 4 to Miscellaneous, 3 to Farmer, 2 to Semiskilled and 1 to Unskilled. The Miscellaneous class was placed according to its sequence in the distribution of the

⁶Garett, *op. cit.*, pp. 404-11.

s between the Skilled and Farmer classes. The results are given in : 4.

The coefficient of partial correlation between school marks and occupation holding mental test scores constant, was found to be 0.100. The results a somewhat closer relationship between mental test scores and occupation than between school marks and occupation. That both show a relatively degree of relationship with occupation status indicates that other factors far not considered are of importance. Imperfect patterns of occupation-lection may be one such factor; another possibility is that the more generalized occupational classifications may not be sufficiently clear-cut to be y selective.

TABLE 4

EMPLE AND PARTIAL CORRELATIONS OF OCCUPATIONAL CLASSES WITH MENTAL TEST SCORES AND WITH SCHOOL MARKS OF 366 HIGH SCHOOL CHILDREN⁷

School Marks ₍₁₎	Mental Test Scores ₍₂₎	Occupation Class
2.31	M_2 51.57	M_3 5.44
0.808	σ_2 24.74	σ_3 2.17
0.601	r_{23} 0.389	r_{13} 0.319
0.032	σ_r 0.044	σ_r 0.047
	$r_{12.3} = 0.648$	
	$r_{13.2} = 0.100$	
	$r_{23.1} = 0.253$	

⁷Mental test scores were available in only 366 cases; in this calculation those cases were used for which both mental test scores and school marks were available.

as a further check on the relationship between occupation and mental test and occupation with school marks, the coefficients of contingency were calculated. This was done in order to eliminate any subjectiveness inadvertently involved in the numerical weighting of the classes necessary for the calculation of the coefficients of partial correlation. Eells uses the same procedure for the same purpose.⁸ The coefficient of contingency, as described by Garrett, provides a measure of correlation when it is possible to express one of the variables tested only by categories.⁹ The coefficient of contingency results are 0.38 for mental test scores and occupation, as against a simple coefficient of correlation of 0.389 for the same, and 0.33 for school marks and occupation against a Pearsonian r of 0.319 for the same. These coefficients of contingency are not very much different from those of simple correlation. This indicates that the weighting of occupations as was done for the calculation of the coefficient of simple correlation was valid, since the values of C and r are substantially equivalent. The final statistical test employed for the detection of significant differences among the variables was the technique of variance. This reveals variance between all the 8 classes on an over-all whole, as compared with variance within each class. The method used was that for the testing of unequal variances as described by Snedecor.¹⁰ School marks were subdivided into

⁸Eells et al., op. cit., pp. 92-94.

⁹Garrett, op. cit., pp. 363-365.

¹⁰Snedecor, loc. cit.

ories of quality according to like quality mental test scores. The findings are given in Table 5.

TABLE 5

TEST OF VARIANCE BETWEEN AND WITHIN OCCUPATION CLASSES

Type of Variation	Degrees of Freedom	Sum of the Squares	Mean Square
Dependence	22	0.93	0.0423
In Class	4	15.29	3.82
Between Class	7	1.23	0.176
	33	17.45	
In Class Variance Ratio	$3.82/0.0423 = 90.2$		
Between Class Variance Ratio	$0.176/0.0423 = 4.17$		
	Ratio for Significance		
	<u>95% Certainty</u>		<u>99% Certainty</u>
In Class	2.82		4.31
Between Class	2.47		3.59

Thus, the technique of variance reveals, on an over-all basis, that significant differences do exist between the classes, even though the spread within classes is quite large.

2. Additional Class Comparisons. Comparisons were made using several different factors to explain further the differences found and the specific types of differences revealed. First, an age-grade distribution table was made to determine the per cent "accelerated" and per cent "retarded" for each of the occupation classes. Allowances were made for children entering school one year early and for those entering up to the age of seven years by permitting a year span on either side of the six year-age of entrance to be counted as normal. Any child in advance of his class by more than one year was re-

d as accelerated and any child more than one year older than the age for school year was recorded as retarded. These percentages were calculated on the total number in each class. The data are summarized in Table 6.

TABLE 6

NUMBER AND PER CENT OF CHILDREN IN EACH OCCUPATION CLASS EITHER ACCELERATED OR RETARDED

Occupation Class	Total Number	Accelerated		Retarded	
		Number	Per Cent	Number	Per Cent
Professional	85	7	8	3	4
Business	77	3	4	2	3
Technical	58	6	10	6	10
Unskilled	68	2	3	14	22
Semi-skilled	44	3	7	5	11
Skilled	48	5	10	4	8
Unskilled	15	0	0	3	20
Miscellaneous	21	0	0	2	10
Total Classes	416	26	6.2	39	9.4

From Table 6 it can be seen that accelerated and retarded children appear in all occupation classes, except that there are no accelerated children in unskilled and miscellaneous categories. It is possible that the brighter children of these classes may have (1) dropped out of school, either temporarily or permanently, (2) gravitated into other socio-economic levels before finishing the last two years of high school or (3) been eliminated from school by selective factors not shown by the study, so that those remaining in school are not completely representative of their class. It should be stressed that the small numbers of pupils involved in the unskilled and miscellaneous groups are small to give more than somewhat speculative results in regard to either

eration or retardation.

The percentages of high school students from the professional, clerical and unskilled classes who are accelerated are somewhat higher than the average. High personal motivation or family emphasis on formal training as well as social selection in various forms may account for this showing. It may be also that many individuals included in occupations listed low on the prestige scale have a high degree of education. Often, people who live in the urban community and who work either temporarily or permanently for the day in various manual labor fields as well as in numerous skilled and unskilled trades have had more formal schooling than the general population in other localities.

The skilled as well as the unskilled class shows a high percentage of read students, 22 and 20 per cent, respectively. This is about twice as high a proportion as in any other occupation group. One of the reasons may be that the skilled and unskilled migrate frequently in pursuit of employment opportunities. In many studies, migration has been shown to be a factor in the type of school marks achieved.¹¹ Frequent moving occasions loss of time and interest in school. Also, in these classes, as is shown in numerous studies, the levels of living, efforts to satisfy physiological wants consume relatively more energy than formal education. Hence, parents in these occupations tend to keep their children out of school more frequently than those of other occupations, which discourages study. It is also possible that the value systems of the unskilled classes do not emphasize formal training as an end in itself as

¹¹McMillan, loc. cit.

gly as those of other occupational groups.

Health is another factor that must be considered in relation to various of performance of children in school, although it is not an identified variable in this investigation. Studies have shown that the lower the occupation the higher the incidence of ill-health. Home adjustment of the child is only a factor in mental attitude to all sorts of personal relationships in school and out as well. However, it is necessary to leave the significance of these influences to imputation for immediate purposes. That all of the above serve to affect social as well as educational advancement has been borne out by numerous investigators.^{12, 13, 14}

The numbers and proportions of children within each class at each mental test score level as well as those having specified school marks are of primary interest to this study, for the means indicate only the average or general tendencies of each occupation class. The data for the mental tests are given in Table 7; those for the school marks are presented in Table 8.

¹²Pitirim Sorokin, Social Mobility, New York: Harper's, 1927, pp. 258-

¹³Dorothy F. Holland, "Health of the Negro," Milbank Memorial Fund Quarterly 16 (1938), pp. 5-38.

¹⁴Ralph E. Wheeler, "A Canadian Study of Health and Unemployment," Milbank Memorial Fund Quarterly 17, (1939), pp. 106-107.

TABLE 7

RELATION OF PARENTAL OCCUPATION TO THE DISTRIBUTION OF HIGH SCHOOL STUDENTS IN MENTAL TEST SCORE RANKINGS

Parental Occupation	Total	Per Cent of High School Students with Average Test Scores of				
		Superior 90-100	Good 70-89	Average 30-69	Poor 10-29	Low 0-9
Professional	20	10	34	44	9	3
Clerical	19	7	18	59	14	3
Semiskilled	14	6	38	50	6	0
Unskilled	16	4	19	53	19	7
Miscellaneous	10	0	12	56	24	9
Professional	11	0	5	69	19	5
Unskilled	4	0	0	36	57	7
Miscellaneous	5	0	18	53	24	6
Total	100	5.1	21.3	53.4	16.0	4.2

In Table 7 the distributions of high school pupils of the professional classes are skewed above the average category, proportionally more "Good" and "Superior" scores being found here than "Poor" and "Low" scores. In contrast, semiskilled, unskilled and miscellaneous classes, relatively more "Poor" and "Low" scores are found here than "Good" and "Superior." Factors to be considered for this may be the greater ease and familiarity and dexterity of the children of professional and clerical classes in handling paper and pencil techniques due to family training and stress placed on these rather than manual techniques. The cultural equipment of the children from these classes may have been an aid in handling the test materials.¹⁵ Occupational selectivity due to differences in degrees and kinds of mental ability may be

¹⁵Sorokin, Zimmerman and Galpin, *op. cit.*, pp. 293-299.

consideration. There is an overlapping of high scores to be found here and superior scores in almost every occupation group except the unskilled.

A comparison of Tables 7 and 8 shows a fairly wide variation existing between the percentages in the sub-categories for school marks and mental test scores. The professional as well as the business class has more than the percentage of superior grades than was found for mental test scores. The professional class shows no low school marks, even though low mental test scores do appear for this class in this category. Further, the unskilled class shows some school marks which are high but none that are low. Owing to a small number of cases in this group, chance alone may account for this. However, the literature points to factors other than mental test scores as influencing the school marks received by students. Among these are personal characteristics, type of incentives, and seriousness of application to formal study. Professional, business and clerical classes show larger proportions of marks above than average school marks than do the other classes.

TABLE 8

RELATION OF PARENTAL OCCUPATION TO DISTRIBUTION OF
HIGH SCHOOL STUDENTS IN SCHOOL MARK RANKINGS

Parental Occupation	Total	Per Cent of High School Students with Average School Marks of				
		Superior 3.5-4.0	Good 3.0-3.49	Average 2.0-2.99	Poor 1.0-1.99	Low 0.0-0
Professional	20	25	25	36	14	0
Business	19	14	16	39	27	4
Technical	14	9	22	43	26	0
Unskilled	16	9	12	43	29	7
Farmer	10	5	14	50	30	3
Unskilled	11	4	8	42	35	10
Unskilled	4	7	7	40	47	0
Miscellaneous	5	5	14	33	43	5
Classes	100	11.8	16.4	40.9	27.4	3.6

The relationships found in this study tend to demonstrate that some positive and significant differences do exist between occupational classes for mental test scores and school marks. Mental test scores bear a slighter association than school marks with parental occupation. Apparently parental occupation is more selective in regard to mental test scores in respect to intellectual equipment as measured by school marks.

CHAPTER IV

SUMMARY AND CONCLUSIONS

.. Summary. a. This study analyzes 416 records of white students in Stillwater High School, and it correlates parental occupation, mental test scores, and school marks. These relationships were tested to ascertain whether a form of social selection occurred whereby mental test scores and school marks tended to be distributed according to parental occupation, especially to determine if higher or lower average school marks and mental test scores tended to be concentrated disproportionately in certain occupational classes.

The student population used in this study was drawn from the enrollments in the sophomore, junior, and senior grades in the high school during the 1948-49 school year. The parental occupation categories used were developed in a major part by Alba M. Edwards. Each high school student listed the occupation of his parents and these listings, in turn, were sorted according to the modified Edwards occupational scale. Mental test scores were taken from the original test sheets in the high school record file, and school marks were obtained from the permanent student record books of the Stillwater High School.

The purpose of the study, using occupational groups as the independent variable, was to show how the means of mental test scores and school marks were distributed. The techniques used were devices for measuring association between group scores. The means and coefficients of simple correlation were calculated.

and, after which critical ratios of differences of mean, Chi-Squares, coefficients of contingency, coefficients of partial correlation, and analysis of variance were computed to find whether differences of means and other measures among the occupation groups were statistically significant or were so close as to be attributable to chance alone.

Other factors relating to differences among the occupation groups were percent of acceleration and retardation, and per cent of children distributed on a five point scale ranging from "Superior" to "Low." This scale was applied to both mental test scores and school marks achieved by each student in each parental occupation class.

All statistical tests were performed to show degrees of similarity and dissimilarity characterizing different parental occupational groups as well as occurring within each separate occupational class.

The study has tested the hypothesis that variations in parental occupation are correlated with both mental test scores and school marks of high schools according to fairly definite and discernable statistical patterns. This hypothesis is borne out in greater part. Parental occupational differences correlate positively with mental test scores and school grades so as to form recognizable patterns.

b. Previous studies have shown that parental occupation and school marks and mental test scores of children are correlated significantly, although the coefficients of correlation usually are not very high. There is a considerable spread within each group and the differences between groups are small.

differences in home background, represented in this study by parental education, are reflected tangibly in mental test scores and school marks of men is confirmed within certain limits by this study. Thus, the results of the present study are in substantial agreement with those preceding it.

Several tendencies were noted in the study of the interrelationships between occupational status of school marks and mental test scores.

A fairly high positive correlation was found between grades and test scores in each occupational class, except for the unskilled. Since no correlation coefficient higher than 0.7 was found for any occupational level, there is a rather strong indication that factors other than test ability alone are involved in achieving a school grade. In some occupational groups, and especially the unskilled labor class, school marks were quite high while mental test scores were quite low. Numerous earlier studies and, implicitly, internal inspection of the data used in this study suggest that such factors as family incentive value systems, personal motivation, association with other students, home adjustment, and various other influences tend to condition test performances and school marks. Low test scores, as well as school marks, may be associated with a lack of verbal and writing facility as well as with a heavy emphasis on training in strictly mental or predominantly manual dexterity. Mental test scores showed a slightly higher correlation with occupation than did school marks. The lower coefficient of correlation between school marks and occupational levels may be due to several factors. There was a wide spread within any particular class, and personality factors may possibly enter more largely into this relationship than they do into test score achieve-

Coefficients of partial correlation for the three factors indicated that mental test scores and grades correlate more highly than does occupational class with either mental test scores or school grades. Mental test scores correlate more highly with parental occupation than do school marks.

Significant differences were found to exist in the means of mental test scores and school marks for various occupation classes. The professional class showed school marks significantly higher than those of any other group. This may be due to emphasis placed by this class on mental development and education. Family background as measured by occupation would be a major factor here since mental test scores did not differentiate so definitely between the professional class and all the others.

There were no failures in the school marks of children of the professional class, even though some of their mental scores were in the "Low" category. In this class, the spread in school marks was not as great for this class as for the other classes. In such a case, family incentives, occupational selectivity, and access to education may be said to be important considerations.

When the mental test scores in each class were subdivided into score levels, a much more normal distribution curve was obtained than when school marks were similarly analyzed. The latter curve was skewed toward "Superior" and "Good" for the professional, business and clerical classes. This is an indication of factors other than mental ability as being responsible for the school marks received.

Greater proportions of the children of skilled, farmer, semiskilled and

lled classes than of those of the business, clerical and professional es were retarded in high school; a greater proportion of children accel- d in high school were found in the professional than in other groups.

reasons may be given to explain this occurrence, such as more inten- schooling of children of parents whose occupations emphasize a high ed- onal attainment. There is a greater tendency of these parents to enter children in school as early as possible, to put stress on study at home, o make available additional facilities for the acceleration of mental dev- ent. There are other factors which characterize the professional es, such as health, economic and social adjustment, which may assist nieving an unimpeded school program.

1. Conclusions. a. The statistical methods used were sufficiently sen- : to demonstrate that the observed differences are large enough to be outed to factors other than chance only. The techniques employed clearly out the degree of similarity or dissimilarity, as to distributions of al test scores and school marks, among the occupational groups. The available for the study were suitable within certain limitations. The ma- . obtained from the school records was quite accurate. The mental test s were administered under competent supervision. The limitations red mainly in the listing of occupations of parents by children. This is tially not a weakness of the method itself but of record keeping. The ng of occupations into categories presented somewhat of a problem, part- cause of these above possible inaccuracies and also because of the neces- broadness of the occupational categories used. This was solved in part

gh sorting more than once and by more than one person.

. The study shows that variations in parental occupation correlate positively with mental test scores and school marks so as to form recognizable statistical patterns. The coefficients of correlation are, however, not very high, only 0.389 for mental test scores and 0.319 for school marks, with parental occupation. Generally, the means of the mental test scores and school marks follow the level of parental occupation as set up in the Edwards classification. The professional and clerical classes gave significantly higher mental test score means than any others, except the business class, and children of the professional class had measurably higher school mark means than children of other classes.

. While this study indicates general selective patterns in respect to school marks and test scores, a more refined statistical methodology, and especially a more detailed personal and family data appropriate to the problem might justify more concrete and definitive predictions. More sensitive and more searching analysis and inquiry into family characteristics possibly could reveal more specific factors correlating highly with "school progress" and group selection. The study might even produce a defensible basis of mental test score differentiation, which would be one of the causes of the observed differences among children of the various parental occupational groups.

The results of this study have predictive value, but limited, of course. The broad interrelationships shown point up a form of general expectancy for various occupational groupings. These hold for the means only, much more so for particular individuals within a group, or in different groups.

. For future work, related factors associated with school marks may be studied in greater detail. It is recommended that health of the child and his immediate family be considered, as well as home adjustment and type of personal motivation. To the extent that these are ascertainable they would strengthen the predictive value of the present finding. Motivation within the school system itself may be a worthwhile consideration. Whether or not the school curriculum utilizes to the fullest the capacities and capabilities of the student, and whether or not mental tests and school marks measure these capacities and capabilities, are important to an understanding of school problems.

A further inference of the study which invites fuller investigation is that the school system is a selective device which operates functionally in social differentiation. Numerous data are available which show that from the first grades of primary school through college, classes diminish in size as they become more advanced. Investigation designed to determine the why of this "dropping out" process, what socio-economic groups absorb most of it, what factors or obstacles interfere with extended education, and similar questions, promise of fruitful results. Negative, as well as the positive, socialization processes need to be looked into from the standpoint of academic as well as of applied and functional values, especially since the school has been entrusted under its care more hours per day than any other agency except the child himself.

BIBLIOGRAPHY

- tasi, Anna. Differential Psychology. New York: The Macmillan Company, 1937.
- rson, H. Dewey and Davidson, Percy E. Occupational Mobility in an American Community. Stanford: Stanford University Press, 1937.
- ., Morris M. Elementary Statistics with General Applications. New York: Henry Holt, 1944.
- m, M. E. and De Silva, F. W. "Achievement Test Scores as Measures of the Mental Ability of Junior High School Pupils." School and Society, 38 (1933), pp. 715-716.
- is, Ruth and Henmon, V. A. C. "Parental Occupation and Mental Ability." Journal of Educational Psychology, 27 (1936), pp. 284-291.
- ncey, Marlin R. "Relation of the Home Factor to Achievement and Intelligence Test Scores." Journal of Educational Research, 20 (1929), pp. 88-90.
- s, Allison and Havighurst, Robert J. Father of Man. Chicago: The University of Chicago Press, 1947.
- ards, Alba M. "A Socio-Economic Grouping of the Gainful Worker in The United States." Journal of American Statistical Association, 28 (1933), pp. 377-387.
- s, Kenneth W. et al. Intelligence and Cultural Differences. Chicago: University of Chicago Press, 1951.
- er, Ronald A. Statistical Methods for Research Workers. London: Harper's, 1934.
- rett, Henry E. Statistics in Psychology and Education. New York: Longmans, Green and Co., 1947.
- gerty, Melvin E. and Nash, Harry B. "Mental Capacity of Children and Paternal Occupation." Journal of Educational Psychology, 15 (1924), pp. 559-572.
- od, Margaret Jarman. Statistics for Sociologists. New York: Reynal and Hitchcock, Inc., 1941.

- ghurst, Robert J. and Breese, Fay H. "Relationship Between Ability and Social Status in a Midwest Community." Journal of Educational Psychology, 38 (1947), pp. 241-247.
- and, Dorothy. "Health of the Negro." Milbank Memorial Fund Quarterly 16 (1938), pp. 5-38.
- e, Leota Long and Havighurst, Robert J. "Relationship Between Ability and Social Status in a Midwestern Community." Journal of Educational Psychology, 36 (1945), pp. 499-509.
- er, Clarence L. "A Comparative Study of the Relationship of Socio-Economic Status to Achievement in the Sixth Grade" (Unpublished Master's Thesis, Oklahoma Agricultural and Mechanical College, 1940)
- quist, Everet F. Statistical Analysis in Educational Research. New York: Houghton, Mifflin Co., 1940.
- say, Thayne M. "Relationship of Test Intelligence of High School Seniors in Hawaii to the Occupation of Their Fathers." Journal of Applied Psychology, 25 (1941), pp. 369-377.
- eehe, William and Lewis, W. D. "The Socio-Economic Status of Homes of Mentally Superior and Retarded Children and the Occupational Rank of Their Parents." Pedagogical Seminary and Journal of Genetic Psychology, 60 (1942), pp. 375-380.
- illan, Robert T. "School Acceleration and Retardation Among Open Country Children in Southern Oklahoma." Rural Sociology, 13 (1946), pp. 33-40.
- orn, Richards C. "How is Intellectual Performance Related to Social and Economic Background?" Journal of Educational Psychology, 34 (1943), pp. 215-228.
- inson, Mary Louise and Meenes, Max. "Relationship Between Test Intelligence of Third Grade Negro Children and the Occupation of Their Parents." Journal of Negro Education, 16 (1947), pp. 136-141.
- in, M. "Relation Between Intelligence, Age and Home Environment of Elementary School Pupils." School and Society, 30 (1929), pp. 304-308
- decor, George W. Statistical Methods. Ames: Iowa State College Press 1946.
- skin, Pitirim. Social Mobility. New York: Harper's, 1927.

kin, Pitirim and Zimmerman, Carle C. Principles of Rural-Urban Sociology. New York: Henry Holt, 1929.

kin, Pitirim, Zimmerman, Carle C. and Galpin, Charles J. Systematic Source Book in Rural Sociology, Vol. III, pp. 227-351. Minneapolis: University of Minnesota Press, 1930.

es, Stewart M. and Lehman, Harvey C. "Intelligence Test Scores of Social and Occupational Groups." School and Society, 31 (1930), pp. 372-377.

nan, Lewis M. The Intelligence of School Children. New York: Houghton Mifflin Company, 1919.

om, John, Tangent, Pierre and Useem, Ruth. "Stratification in a Prairie Town." American Sociological Review, 7 (1942), pp. 331-342.

eler, Ralph E. "A Canadian Study of Health and Unemployment." Milbank Memorial Fund Quarterly, 17 (1939), pp. 106-107.