

A STUDY OF THE VALUE OF THE COUNTY DIPLOMA EXAMINATION FOR PREDICT-
ING SUCCESS IN THREE SMALLER HIGH SCHOOLS OF KANSAS

by

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H.A.L.

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INTRODUCTION

Can a 'third-grader' do high school work? A ridiculous question! But the writer found a person with third-grade educational status in his high school freshman class in the fall of 1929. With him in a class of sixteen were two persons who had attained the twelfth grade level. How were these pupils to be adequately cared for in the same courses and in the same classes as is made necessary by the limited facilities of the average small high school?

That situation presents one of the larger problems of administration in the small high schools of Kansas, that problem occasioned by the wide range of educational status and mental ability of approximately twenty-eight thousand persons who present themselves each fall as legally entitled to entrance to the high schools of the state.

The regulations for high school entrance are contained in the following paragraphs quoted from the Revised School Laws of Kansas:

325. Common-School Diplomas. (72-5101)

"Any person who shall complete the course of study prescribed by the State Board of Education, for rural schools and grades in schools having two or more teachers, in a satisfactory manner; who shall give evidence of good moral character; who shall pass the examination provided for in this act, shall be granted a common school diploma which shall admit such a person to entrance in any high school in the state."

326. Average Grade and Subjects Required. (72-5102)

"An average of 80 percent who no grade below 60 percent shall be required for graduation, in the following subjects: Reading, writing, grammar, spelling, arithmetic, U.S. history, Kansas history, geography, civil government, agriculture, physiology, and classics; Provided, That grades of 80 percent or more may be carried as credits and applied as grades for graduation for a period of two years; Provided further, That at the option of the county superintendent, credit may be given on school work, which shall not exceed 50 percent in any one subject; and provided further that pupils who have satisfactorily completed the 7th grade in the graded school, and the 7th and 8th grades in the rural schools, may take the examination in subjects that are completed in their respective grades."

Comment is unnecessary to give the reader full appreciation of the problem. To the many school men acquainted with recent progress in testing and with the refinement of tools for determining educational placement, this system has seemed inadequate and unnecessary. The examination system has been severely criticized, particularly by those whose duty is its administration. According to the statement of an official of the State Department of Public Instruction the new type objective tests have not been used on account of the lack of funds for printing copies of the examinations to be placed in the hands of each child. Would more objective tests or standardized tests of known reliability select more efficiently persons who will succeed in high school?

CHAPTER I

THE GENERAL PROBLEM, RELATED LITERATURE

No part of the small amount of study of the county diploma examinations has been concerned with their predictive value. However, many studies have been made of prognosis in high school.

A.H. Turney⁶ in his recent study of Other Factors than Intelligence that Affect Success in High School, points out that correlation between teachers' marks and mental tests are usually between plus .40 and plus .60 with plus .50 generally accepted as average. Turney presents the most complete and recent summary available of correlations between mental tests and school marks. The writer takes the liberty to quote from that summary sample findings which are related to his problem.

Gates found a correlation of .47 between group intelligence tests and composite achievement scores on objective tests in the eighth grade.

S.S. Colvin reported a correlation of .55 between the Otis Group Test scores and average junior high school marks, and .34 between those scores and average academic marks in high school.

A.M. Jordan found the following correlations between marks for the first year of high school and four group mental tests:

| | | | |
|------------|-----|-----------------------|-----|
| Otis | .45 | Miller Mental Ability | .48 |
| Army Alpha | .48 | Terman Group Test | .49 |

W.S. Miller found in University High School of Minneapolis a correlation of .60 and average high school marks for twelve weeks.



Note: Numbers following names refer to detailed references in the Bibliography, Page 51.

Odell found a correlation of .43 between the Otis Higher examination and average high school marks for 1892 cases. For the same group the correlation between Stanford-Binet I.Q. and high school average marks was .54.

W.M. Proctor reported a correlation of .52 between high school marks and Stanford-Binet I.Q.

In Needham, Massachusetts, R.L. West found a correlation of .58 between average high school marks in the ninth grade and the Otis Intelligence Scale.

In his study quoted above Turney found a correlation of .649 between freshman high school marks and intelligence quotient, and .614 between average freshman marks and mental age.

Proctor⁴ reported a correlation of .45 between Stanford-Binet I.Q. and marks in freshman algebra.

W.R. Niles² published in 1911 a most complete comparison of elementary school marks and high school marks. He found the correlation between the average elementary school marks and average high school marks to be .711. He states in his conclusion that average marks correlate more closely than do marks in special subjects.

Kelly¹ in 1914, reported a correlation of .789 between elementary school marks and high school marks.

Ross⁵ in 1925, found the correlation between elementary and high school marks to be .60. Other correlations reported by Ross between average high school marks and elementary school subjects are:

| | |
|--------------------------------|-----|
| High school marks - reading | .35 |
| High school marks - spelling | .36 |
| High school marks - arithmetic | .52 |
| High school marks - geography | .50 |
| High school marks - English | .59 |
| High school marks - history | .40 |

These studies may be summarized as follows:

1. Mental tests show a correlation with achievement averaging slightly more than .50.
2. Tests in elementary school subjects correlate less with high school marks than do elementary school marks.
3. For prediction mental tests are superior to tests over elementary school subjects but are not as valuable as school marks.
4. Any one measure correlates less with special subjects than does the general average.

CHAPTER II

THE SPECIFIC PROBLEM

The aim of this study is to determine, to a degree, the value of the county diploma examinations for predicting the success of eighty-six freshmen in four high schools of Doniphan County, Kansas. The following questions will be answered: Do the county diploma examinations select persons who will be able to succeed in these high schools? Do achievement tests and mental tests offer a better basis for predicting success in high school than do the grades made on the county diploma examinations?

Other studies indicate that elementary school marks are the best basis for prediction now known. In Kansas villages and rural schools diploma examination marks are substituted for grades made during the elementary school period. Are these diploma examinations valid?

This study can be no more than suggestive. Only with great difficulty could those persons be reached who have failed to pass the examinations. We are necessarily limited to a consideration of those persons who have entered high school, most of them with a common school diploma, and a few who have reached the age of sixteen at which age they may be admitted by the boards of education without other credentials.

Specifically this study aims to:

1. Determine the validity of the county diploma examinations as measured by mental age and intelligence quotient.
2. Determine the validity of the county examination as measured by the Stanford Achievement Test.

3. Compare the results of the Stanford Achievement Test with mental age and intelligence quotient.
4. Determine the value of the county diploma examination, the Stanford Achievement Test, mental age, and intelligence quotient for predicting success in high school.

CHAPTER III

THE METHOD OF PROCEDURE

The subjects of this study were all of the members of the freshman classes of the rural high schools at Troy, Wathena, Sparks, and Highland, in Doniphan County, Kansas, in the fall of 1929. They totaled one hundred at the beginning: forty-four in Troy; thirty-three in Wathena; seven in Sparks; and sixteen in Highland. None of the subjects had previously been in high school.

The Stanford Achievement Test was administered under standard conditions by the high school principals during the second week of September. The principals were carefully instructed by the writer in the correct method of administering the test. All tests were scored and checked by the writer and rechecked by a group of capable high school seniors under his direction.

The county diploma examination grades were copied by the writer from the permanent record in the office of the county superintendent.

The Otis Higher Examination; Form B was administered to these groups by the writer and were scored by him. Mental age and intelligence quotient were derived from the scores according to the norms which accompany the tests.

At the close of the school year the grades of the subjects were obtained from the principals of the schools. Due to a difference in grading systems and standards for grading in the schools and a wide range of marks for similar classes in the schools, the grades for each class in

each school were transmuted into standard deviation units. The standard deviation unit is one-tenth of the standard deviation of the distribution. The zero point is placed at five standard deviations below the mean of the distribution. Thus the average mark in each class would be expressed as 50 in terms of standard scores. In the presentation of data which follows grades will be stated in terms of standard scores. Some objection may be raised as to the validity of this method, but it seemed to be the only way of comparing the marks. For Example: In one school Latin marks ranged from thirteen to ninety eight percent, in another from D to A. The mean mental ages for these classes were approximately the same as were the standard deviations for the distributions of mental age. Tables I and II and Figures I and II show the distribution of mental ages for the entire group and for the three high school considered in comparison of grades.

The class in the Sparks High School was so small as to make transmuting grades into standard scores quite meaningless. The mental ages of that group varied much more from the mean of the entire group than did their average marks. Hence the class of the Sparks High School was eliminated from this part of the study. The close correspondence of the means and standard deviations of the mental ages in the classes of the other schools justified the use of the standard deviation technique.

All of these data for each student were assembled on a form sheet to make them accessible for correlation.

The correlations were worked out by the writer on the Otis Correlation Chart, and the calculations checked for accuracy.

One of the imperfections of this study is that all of the data are complete for only eighty of the one hundred cases. Some were in high school without examination records on account of transfer from other states. A few persons were absent at the time of the administration of various parts of the Stanford Achievement Test. Others did not take the Otis test. Several did not finish the school year.

TABLE I

Mental Ages of 87 Persons Included in This Study

| <u>Mental Age in Months</u> | <u>F</u> |
|---------------------------------|----------|
| 212-220 | 3 |
| 204-212 | 1 |
| 196-204 | 0 |
| 188-196 | 5 |
| 180-188 | 17 |
| 172-180 | 12 |
| 164-172 | 20 |
| 156-164 | 21 |
| 148-156 | 5 |
| 140-148 | 5 |

N 87

Mean 171.9

Sigma 15.4

FIGURE I

DISTRIBUTION OF MENTAL AGE

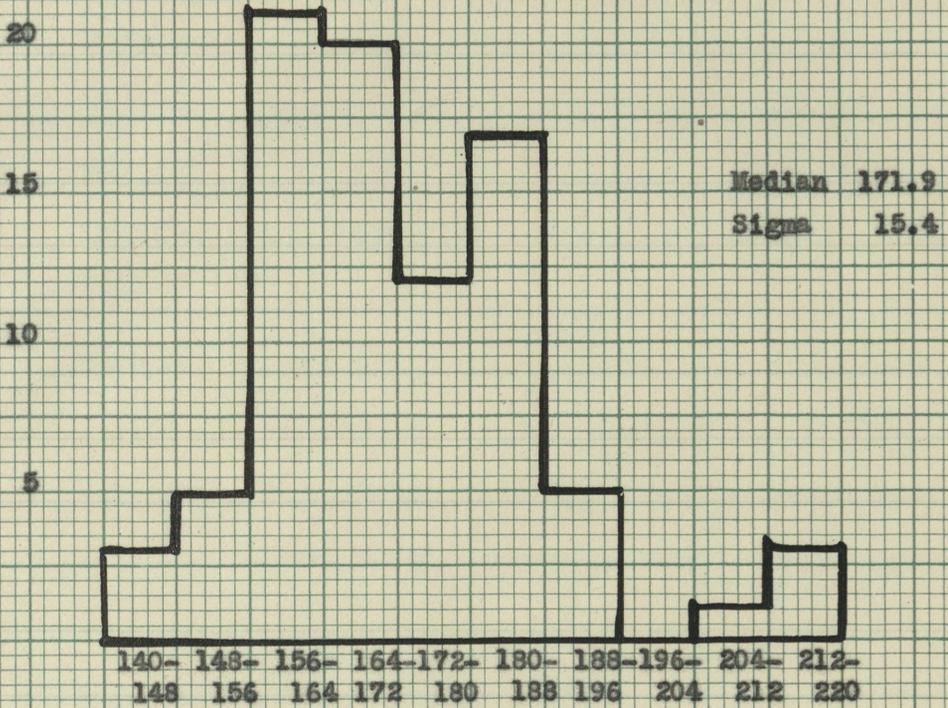


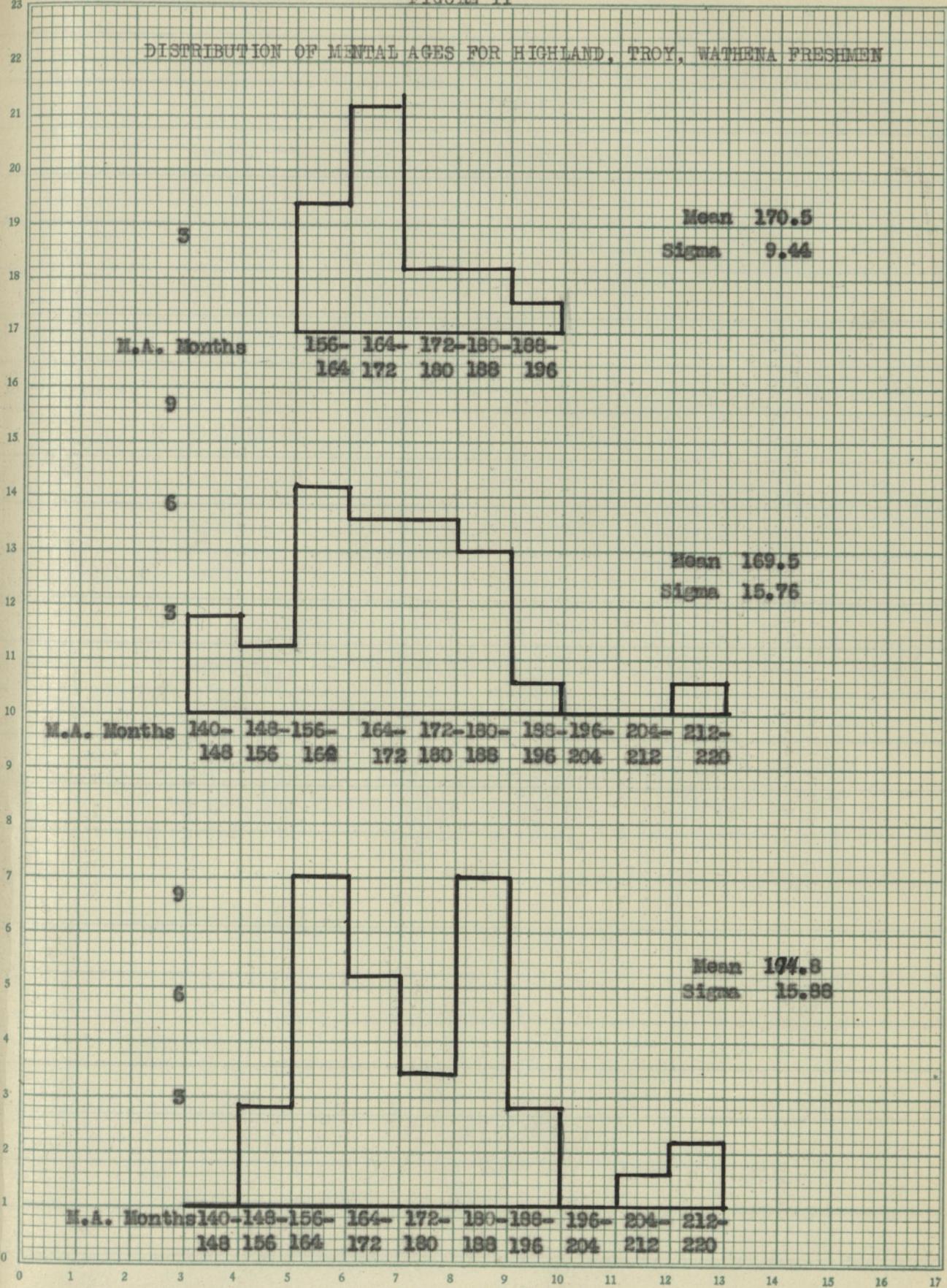
TABLE II

Mental Ages of Subjects from the Three Schools

| Mental age | F Troy | F Wathena | F Highland |
|------------|-------------|-------------|------------|
| 212-220 | 2 | 1 | 0 |
| 204-212 | 1 | 0 | 0 |
| 196-204 | 0 | 0 | 0 |
| 188-196 | 5 | 1 | 1 |
| 180-188 | 10 | 5 | 2 |
| 172-180 | 4 | 6 | 2 |
| 164-172 | 7 | 6 | 7 |
| 156-164 | 10 | 7 | 4 |
| 148-156 | 5 | 2 | 0 |
| 140-148 | 0 | 3 | 0 |
| | N 40 | N 51 | N 16 |
| | Mean 174.8 | Mean 169.5 | Mean 170.5 |
| | Sigma 15.88 | Sigma 15.76 | Sigma 9.44 |

FIGURE II

DISTRIBUTION OF MENTAL AGES FOR HIGHLAND, TROY, WATHENA FRESHMEN



Possibly another objectionable feature is the varied number of cases for the correlations. It would have been better to have considered the same cases in each element of the study. The writer felt it necessary to compute all possible correlations during his spare time before it could be known who would drop out of school. The number of cases for most of the details of the study is sufficiently large that a few individual cases would not significantly alter the results. With the exceptions of algebra and English there could be no correspondence in the numbers of persons taking the various school subjects. On account of an unusually varied course of study for these schools it seemed useless to employ correlation for studying the prediction for any subjects other than algebra, English, Latin, general science, manual arts, and domestic arts. There is no evidence that the variation in the number of cases does invalidate the conclusions based upon the results of this study.

CHAPTER IV

THE PRESENTATION OF DATA

Problem 1. To determine the validity of the county diploma examination as measured by mental age and intelligence quotient.

The average of the grades in the county diploma examinations* was 88 with a standard deviation of 5.32 as shown in Table III and Figure III.

The mean mental age of the group was 171.9 months with a standard deviation of 15.4 months.

The mean intelligence quotient was 97.07 with a standard deviation of 10.15. (Refer to Table IV and Figure IV).

The correlation between the average of the county examinations and mental age was $.522 \pm .052$.

The correlation between the average grade on the county examinations and intelligence quotient was $.622 \pm .045$.

The correlation between intelligence quotient and the examination grades is significantly higher than that between mental age and examination grades.

By the coefficient of alienation the relative value of correlations is determined. Explanation of that coefficient may be appropriate at this point. Quoting in part from Otis³, "We represent

*Throughout the remainder of the discussion the county diploma examinations will be referred to by the abbreviation CE.

An original set of examination questions for the year 1929 is contained in the appendix.

TABLE III

Average Grades on County Diploma Examinations of 80 Persons
Who Completed School Year

| <u>Grade</u> | <u>F</u> |
|--------------|----------|
| 96-100 | 2 |
| 92-96 | 19 |
| 88-92 | 20 |
| 84-88 | 17 |
| 80-84 | 20 |
| 76-80 | 2 |

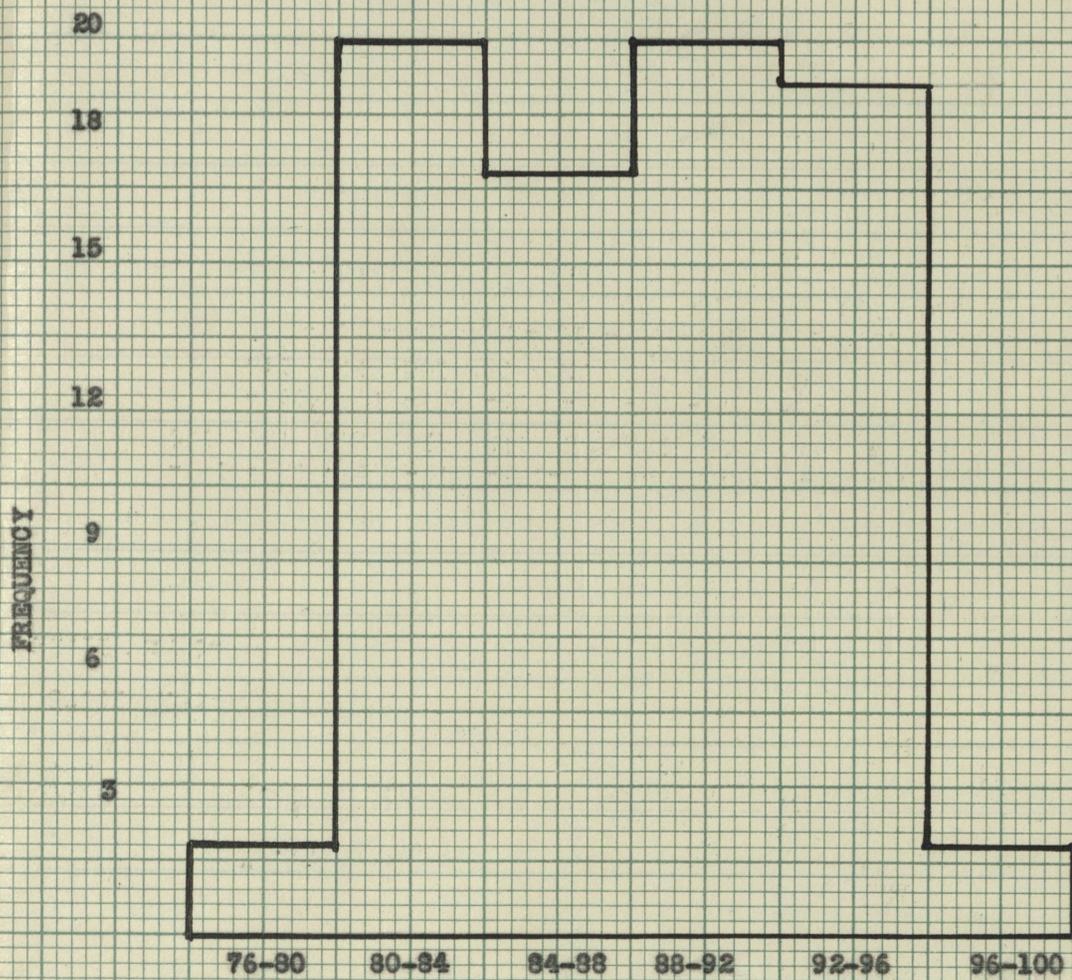
N 80

Mean 88

Sigma 5.32

FIGURE III

DISTRIBUTION OF COUNTY EXAMINATION AVERAGE GRADES



Mean 88

Sigma 5.32

the coefficient of alienation by the letter k . The value of k is calculated from the coefficient of correlation by the formula: $K = \sqrt{1 - r^2}$. If $k = 1.00$ there is no predictive value at all. If $k = 0$ there is perfect prediction. The predictive value, then, of a correlation is $1 - k$.

The coefficient of alienation for .622, the correlation between intelligence quotient and the average examination grades, is .78. This would mean that in predicting the average grade on county examinations we would be right in 100 - 78 or 22 cases. Since the coefficient of alienation for .522 is .85 we would be correct in only fifteen of one hundred cases in predicting examination averages from mental age. It appears, then, that intelligence quotient is more valuable in the ratio 22:15 in predicting scores on county examinations than is mental age.

This rather wide difference in correlation may be explained by the presence in the group of a number of over-age persons of low I.Q. who were unable to pass the examinations and were admitted upon reaching the legal age for high school entrance without a diploma. There is evidence that persons of high I.Q. are superior to persons of like mental age, but with low I.Q., in high school. It appears that the mental age attained by the average of our group is sufficient to write a satisfactory examination, and that the greater mental alertness and facility of expression which usually accompanies high intelligence quotient produces higher quality of examination performance.

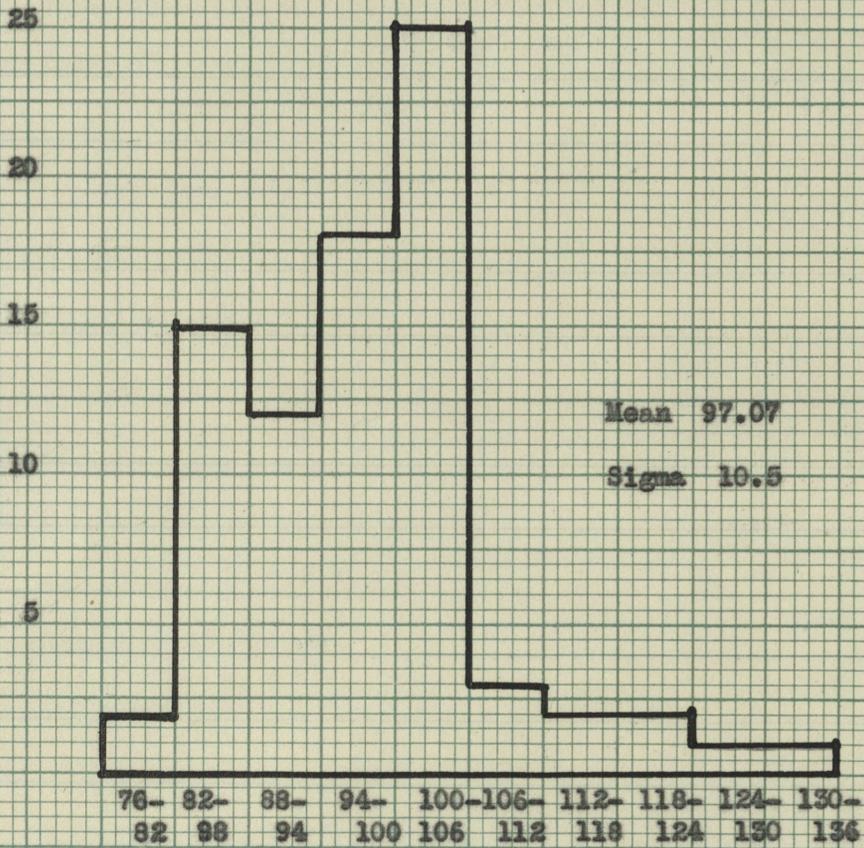
TABLE IV

Distribution of Intelligence Quotient of 81 Persons who Completed

Year of High School

| <u>I.Q.</u> | <u>F</u> |
|-------------|----------|
| 130-136 | 1 |
| 124-130 | 1 |
| 118-124 | 2 |
| 112-118 | 2 |
| 106-112 | 3 |
| 100-106 | 25 |
| 94-100 | 18 |
| 88-94 | 12 |
| 82-88 | 15 |
| 76-82 | 2 |
| N 81 | |
| Mean 97.07 | |
| Sigma 10.15 | |

FIGURE IV
DISTRIBUTION OF INTELLIGENCE QUOTIENT



Problem 2: To determine the validity of the Stanford Achievement Test as measured by mental age and intelligence quotient.*

For the ninety-four cases with complete examination records the mean total score on the Stanford Achievement Test was 93.7 with a standard deviation of 11.52. According to norms accompanying the test the normal total for the first month of the ninth grade is 96, 2.3 points above the score of our group.

The mean mental age of our group was 14 years 3.9 months. The normal total score on the achievement test for that age is 92, or 1.7 points below the mean of the group.

The mean chronological age of the subjects was 15 years .48 months. The normal total score for that age is 94.5, only .8 points above the total score for the group.

The validity of the Stanford Achievement Test for determining the educational status of these subjects is demonstrated by the close correspondence of their score to the norms, if we accept its reliability and validity.

These data are shown in Tables V and VI and Figures V and VI.

The correlation between the Stanford Achievement Test scores and mental age is $.702 \pm .036$. The correlation between the Stanford Achievement Test and intelligence quotient is $.719 \pm .036$. Perhaps these rather high correlations support the common criticism that the Stanford Achievement Test is in truth a mental test.

- - - - -

*Throughout the remainder of the discussion the Stanford Achievement Test and its sub-tests will be designated by the abbreviation SA.

TABLE V

Total Scores on Stanford Achievement Test of 94 Persons Included
in This Study

| <u>Score</u> | <u>F</u> |
|--------------|----------|
| 110-116 | 2 |
| 104-110 | 13 |
| 98-104 | 20 |
| 92-98 | 16 |
| 86-92 | 20 |
| 80-86 | 16 |
| 74-80 | 5 |
| 68-74 | 2 |

N 94

Mean 93.7

Sigma 11.52

TABLE VI

Distribution of Chronological Age of 86 Persons who Completed School

Year

| <u>Age in Months</u> | <u>F</u> |
|----------------------|----------|
| 216-224 | 1 |
| 208-216 | 0 |
| 200-208 | 4 |
| 192-200 | 7 |
| 184-192 | 19 |
| 176-184 | 20 |
| 168-176 | 26 |
| 160-168 | 8 |
| 152-160 | 1 |

N 86

Mean 180.48 months

Sigma 11.36 months

FIGURE V
DISTRIBUTION OF TOTAL SCORES ON STANFORD ACHIEVEMENT
TEST

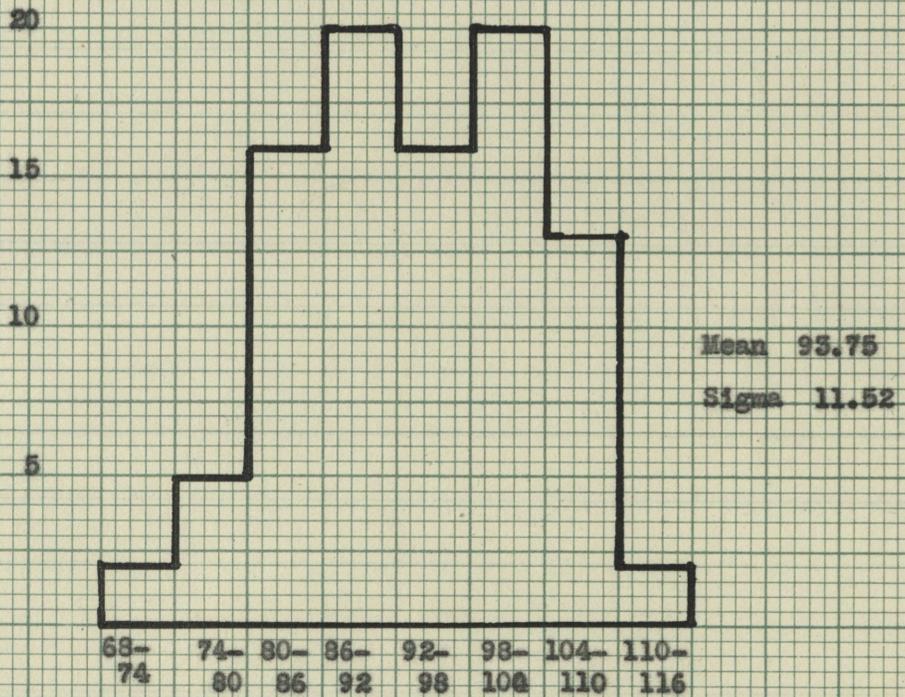
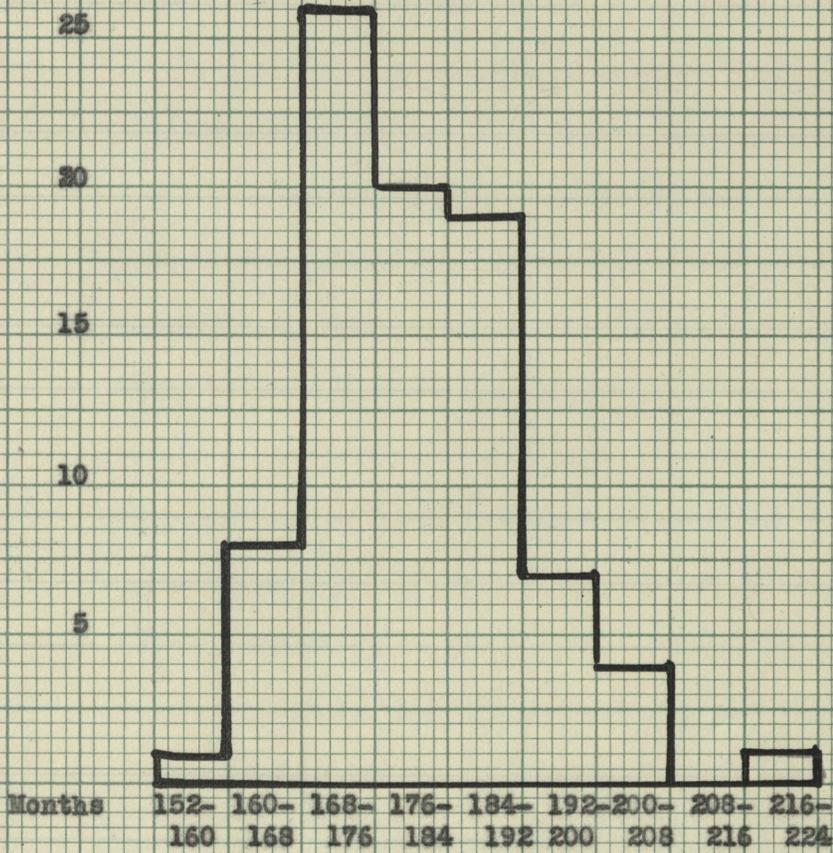


FIGURE VI

DISTRIBUTION OF CHRONOLOGICAL AGE



Problem 3: To determine the validity of the county diploma examinations as measured by the Stanford Achievement Test.

A correlation of $.711 \pm .038$ resulted from a comparison of the average county examination grades and the total scores on the Stanford Achievement Test. This is quite significant when compared with the correlation of $.522$ between the examination average and mental age, and $.622$ between the examinations and intelligence quotient. These comparisons would be that the county diploma examinations and the Stanford Achievement Test have measured the same thing rather well.

With mental age held constant the correlation between the examination grades and the Stanford Achievement Test was $.566$. With intelligence quotient held constant the correlation between the examinations and the achievement test was $.441$.

A comparison of single scores on the Stanford Achievement Test with single examination scores is interesting and somewhat meaningful. The following correlations resulted from this comparison:

| | |
|-----------------------------------|-----------------|
| Reading CE - paragraph meaning SA | $.491 \pm .052$ |
| Reading CE - word meaning SA | $.494 \pm .052$ |
| Reading CE - literature SA | $.319 \pm .062$ |

These low correlations indicate that the reading examination is not good if by it the ability to read is to be determined. Aside from measuring reading ability that examination could have no purpose than measuring the pupils familiarity with good literature which it does not do as evidenced by a correlation of $.319$ between the reading examination and the achievement test in literature.

A correlation of $.597 \pm .047$ was found between the county examination on grammar and the achievement test in language usage. This is not a high correlation between measures for the same ability, but it is surprisingly high to one who notes that the examination questions are concerned entirely with the content and rules of formal grammar.

The arithmetic examination, CE, shows a correlation with arithmetic reasoning, SA, of $.678 \pm .037$ as compared with a correlation of $.541 \pm .049$ with arithmetic computation, SA. The arithmetic examination does not select persons with skills in the fundamental processes as well as those who can apply their knowledge to problems.

The county examination in classics yielded a correlation of $.149 \pm .069$ with the literature test, SA. That correlation is so low as to indicate no relationship at all between scores on tests which presume to measure the same thing, an acquaintance with literature. It is worthy of note that the mean literature score, SA, was 85.2, or 8.5 points below the mean total score on the Stanford Achievement Test, while the average grade on the classics examination was 91.6, or 3.6 percent higher than the average grade on the county examinations. It is clearly seen that this county examination in classics was too easy, and that the elementary schools in Doniphan County are not functioning well in the teaching of literature.

A comparison of the county spelling examination with the dictation, or spelling, exercise on the achievement test gave the

correlation $.541 \pm .051$. That correlation is sufficiently high to indicate some relationship, but not high enough to show that the spelling examinations and the achievement test in spelling are measuring the same thing adequately. Since our standard measures for spelling are more nearly perfect than measures for any other school subject the low correlation must be attributed to the inefficiency of the spelling examination. Reference to the spelling examination in the appendix will support this statement.

The county examination in geography and the achievement test in geography yielded a correlation of $.329 \pm .063$ which is so low as to be insignificant if mental age were held constant. This low correlation would support no adverse criticism of the county examination in geography, but would call our attention to the wide diversity of aims and materials in the teaching of that subject. The question might be raised as to the adequacy of any standardized test for measuring geography which is commonly taught with emphasis on the more immediate vicinity of the school.

A correlation of $.497 \pm .051$ resulted from a comparison of the grades in the county examination in physiology with the achievement test, physiology-hygiene.

A comparison of the civics examination grades with the achievement test, history-civics resulted in a correlation of $.507 \pm .051$. The correlation between the examination in United States history and history-civics, SA, was $.546 \pm .048$. When consideration is given the

fact that the achievement test, history-civics, covers a wide range of materials these correlations are high. The slightly smaller correlation of .486 was found between Kansas History and history-civics, SA. Since the Stanford Achievement Test pertains in no particular to Kansas History, it may be deduced that these tests measure not so much the result of schooling as a combination of factors which lead to success and information in these related subjects.

Problem 4: To determine the value of the county examination, the Stanford Achievement Test, mental age, and intelligence quotient for predicting success in high school.

As was stated, and partly justified, in a former section of this study the high school grades were transmuted into standard deviation units to make correlation possible. Since errors in measurement and transposition tend to lower correlation the writer feels justified in interpreting the correlations rather liberally.

A. The prediction of average high school grade for freshmen.

The average grades were taken to be the average of the standard scores of a pupil in his classes. Comparison of the average high school marks, or standard scores, with the various factors yielded the following correlations:

| | |
|--|---------------|
| Average marks p average county examination grades | -- .726 ±.035 |
| Average marks - average county examination grades with mental age held constant | -- .525 ±.052 |
| Average marks - total score, SA, | -- .661 ±.041 |
| Average marks - total score, SA, with mental age held constant | -- .482 ±.053 |
| Average marks - mental age | -- .525 ±.052 |
| Average marks - intelligence quotient | -- .69 ±.037 |
| Average marks - chronological age | -- .624 ±.044 |

The relative predictive values of these factors derived from the coefficient of alienation as explained on Page 15 are shown in Figure 7. It may be seen that the average grade on the county examination is somewhat better than the total score on the Stanford Achievement Test and the intelligence quotient for predicting the average grade in the high schools with which this study is concerned. Many writers insist, with the support of evidence, that teacher's marks are not accurate measures of achievement, yet the popular conception of school success is the attainment of good school marks. It is surely true that the abilities and qualities which enable one to write a good examination are pleasing to the average teacher and thus attain better marks. The Stanford Achievement Test yielded a slightly less correlation with average high school grades than do the average examination grades and intelligence quotient, but by the coefficient of alienation the achievement test is found to be seventy-eight percent as valuable for prediction as the county examination and eighty-nine percent as valuable as in-

100

FIGURE VII

THE RELATIVE VALUES OF SEVERAL FACTORS FOR
PREDICTING AVERAGE HIGH SCHOOL MARKS

When $r = 1$, $K = 0$ which value is
perfect prediction as represented by
the line of perfect prediction.

Line of Perfect Prediction

County Examination Average

Intelligence Quotient

Stanford Achievement Test

Chronological Age

Mental Age

100
90
80
70
60
50
40
30
20
10

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

telligence quotient. The comparatively low predictive value of mental age is shown in all of our comparisons with high school marks. A comparison of chronological age with high school marks shows a correlation of minus .624 which is much higher than reported in other similar studies. This factor will not be considered further for it is nonsense to say that the older the person the less likely is his success in high school without the consideration of other factors. Intelligence quotient cares for the factor of chronological age.

B. The prediction of success in Algebra.

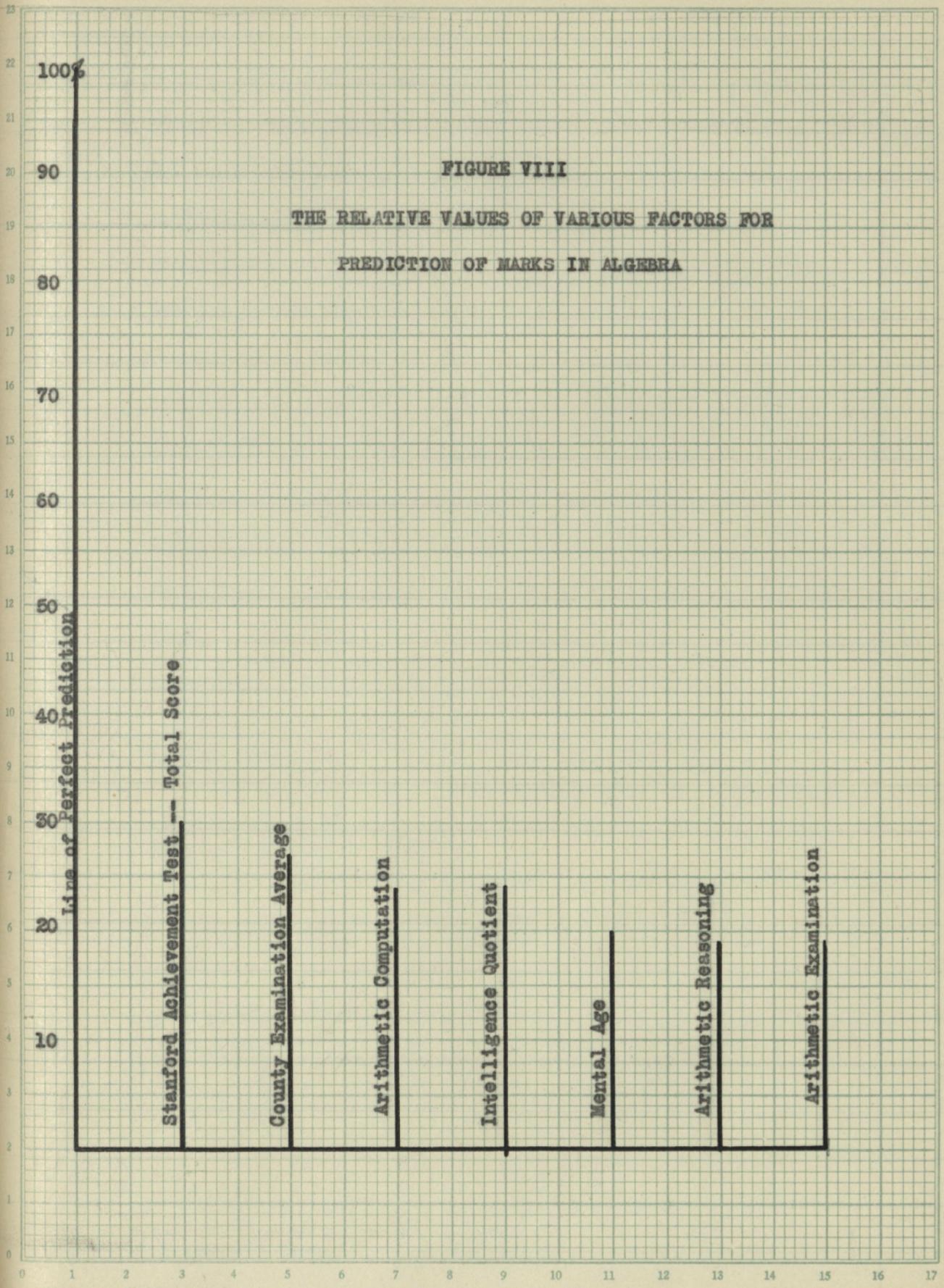
Comparison of marks in high school freshman algebra with the various factors:

| | |
|--|-------------|
| Algebra mark - county examination average | .684 ± .039 |
| Algebra mark - county examination average with mental age held constant | .544 ± .048 |
| Algebra mark - Stanford Achievement Test | .71 ± .037 |
| Algebra mark - Stanford Achievement Test with age held constant | .51 ± .052 |
| Algebra mark - mental age | .597 ± .047 |
| Algebra mark - intelligence quotient | .649 ± .04 |
| Algebra mark - arithmetic, CE | .578 ± .049 |
| Algebra mark - arithmetic computation, SA | .652 ± .043 |
| Algebra mark - arithmetic reasoning, SA | .586 ± .048 |

The relative predictive value is shown in Figure VIII.

FIGURE VIII

THE RELATIVE VALUES OF VARIOUS FACTORS FOR
PREDICTION OF MARKS IN ALGEBRA



For predicting success in freshman algebra we find the total score on the Stanford Achievement Test to be most valuable when considering merely the coefficient of correlation. However, with mental age held constant the correlation between algebra and the achievement test drops a trifle below the correlation between algebra and the county examination. We find both of the achievement tests in arithmetic to be superior to the county examination in arithmetic for the prediction of algebra marks. It is particularly notable that arithmetic computation, which is an achievement test in skills, yields a much higher correlation with algebra marks than does the achievement test arithmetic reasoning. The reverse was true when comparing the achievement tests in arithmetic with the county examination in arithmetic. Evidently our algebra teachers mark more on the acquiring of skills than on the ability to reason.

C. The prediction of success in freshman English.

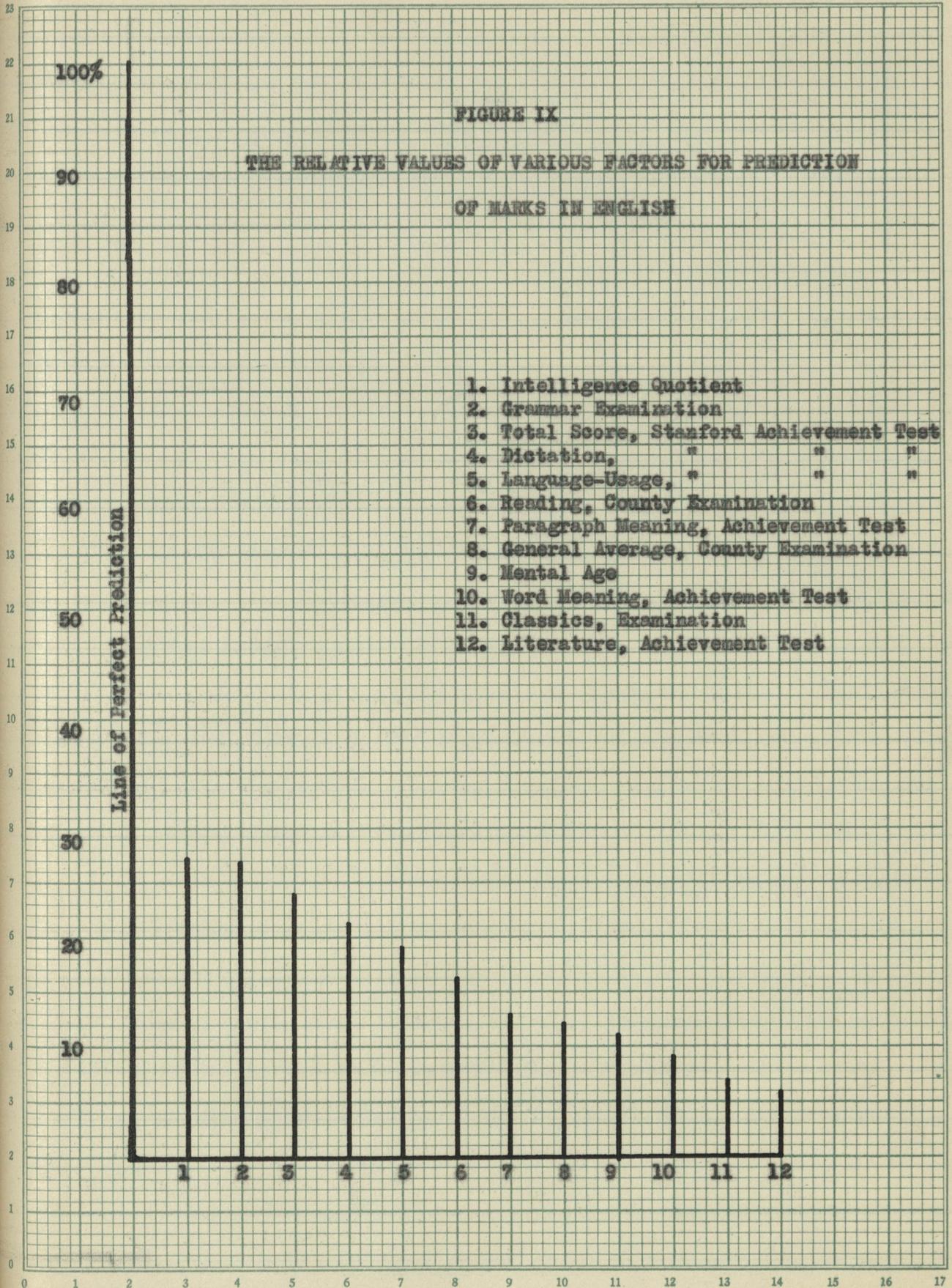
A comparison of English marks with the various factors yielded the following correlations:

| | |
|--|-------------|
| English mark - average county examination grade | .465 ± .059 |
| English mark - average county examination grade with mental age held constant | .288 ± .065 |
| English mark - Total score, SA | .648 ± .044 |
| English mark - Total score, SA, with mental age held constant | .535 ± .051 |

| | |
|--|-------------|
| English mark - mental age | .443 ± .059 |
| English mark - intelligence quotient | .683 ± .039 |
| English mark - grammar, CE | .683 ± .039 |
| English mark - Reading, CE | .536 ± .054 |
| English mark - Classics CE | .362 ± .065 |
| English mark - Language usage, SA | .578 ± .049 |
| English mark - literature SA | .33 ± .066 |
| English - paragraph meaning, SA | .486 ± .056 |
| English - word meaning, SA | .41 ± .062 |
| English mark - dictation (spelling) SA | .61 ± .047 |

The relative predictive value of these factors is shown in Figure IX.

Interpretation of these correlations is not clear. Correlations of the average of the marks in English with grades in related county examinations are low. The correlation of .465 between English marks and the average county examination grades dwindles to .238 when mental age is held constant. Intelligence quotient and the county examination in grammar show the highest correlation with English marks. That would indicate that the English teachers of these students mark on a knowledge of formal grammar and the mental alertness accompanying a high I.Q. and pay little attention to individual differences in mental ability. The next highest correlation with English marks is shown by the achievement test in spelling. This may be due to the fact that the course of study for freshman English includes quite an amount of



spelling which lends itself to objective scoring. It is the writer's observation that a few such elements of a subject which may be objectively scored influence teacher's marks to a large degree. Low correlation is found to exist between English marks and the reading examination and tests. Previous familiarity with literature seems to bear little relationship to English marks as evidenced by the quite insignificant correlations with the classics examination and achievement test in literature. Evidently intelligence quotient and a knowledge of grammar are most valuable to the attainment of good English marks in the schools studied. Tests of literature have no value for prediction.

D. The prediction of success in Latin.

A comparison of Latin marks with the various factors yielded the following correlations:

| | |
|---|-------------|
| Latin mark - average grade, county examinations | .566 ± .074 |
| Latin mark - total score, Stanford Achievement Test | .415 ± .088 |
| Latin mark - mental age | .467 ± .082 |
| Latin mark - intelligence quotient | .627 ± .06 |

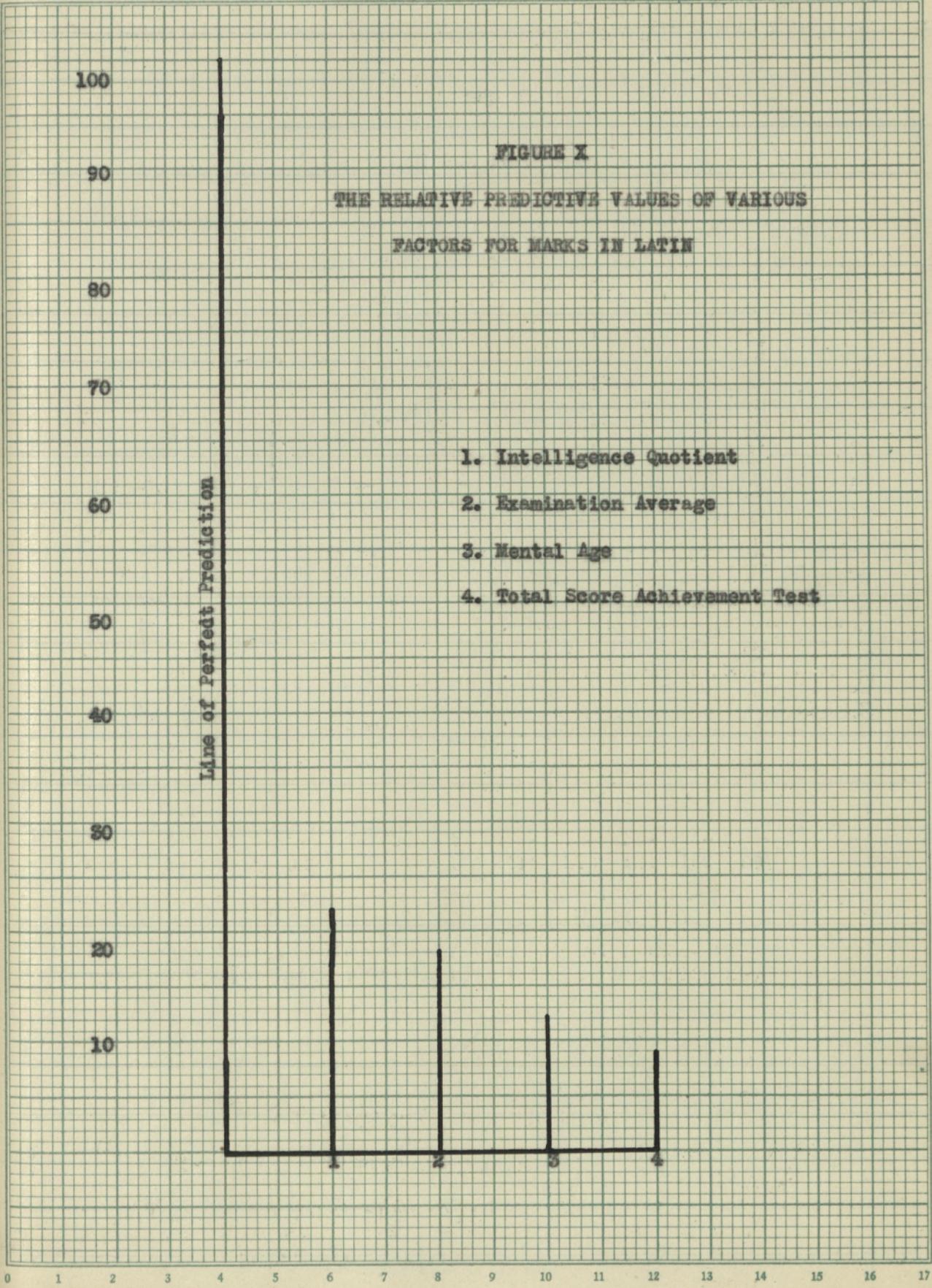
The relative predictive values of these factors is shown in Figure X.

The small number of cases for Latin rendered the correlations quite unreliable. However, the intelligence quotient seems to be quite superior in value for prediction. A high level of mental ability is not regarded to be as essential to success in Latin as

FIGURE X
THE RELATIVE PREDICTIVE VALUES OF VARIOUS
FACTORS FOR MARKS IN LATIN

Line of Perfect Prediction

1. Intelligence Quotient
2. Examination Average
3. Mental Age
4. Total Score Achievement Test



industry and application which are more apt to be found among the young persons with high I.Q. This brightness and industry are necessary to good examination performance which explains the relatively high correlation of Latin marks with the county examination average as compared with the correlation of Latin marks with the Stanford Achievement Test and mental age.

E. The prediction of success in general science.

A comparison of general science marks with the various related factors yielded the following correlations:

| | |
|---|-------------|
| General science marks - average grade CE | .599 ± .089 |
| General science marks - total score SA | .682 ± .066 |
| General science marks - mental age | .309 ± .105 |
| General science marks - intelligence quotient | .598 ± .089 |

The relative predictive values of these factors is shown in Figure XI.

Since only twenty-seven of our group were enrolled in general science correlations concerning them can be only indicative. For this subject the total score on the Stanford Achievement test is outstanding in predictive value when compared to the other factors. Marks in general science are quite likely to be determined by the individual's store of general information in the related field. This quality would be measured to a degree by the achievement test. The correlations of general science marks with intelligence quotient and the examination average are approximately the same and rather high. Mental age and

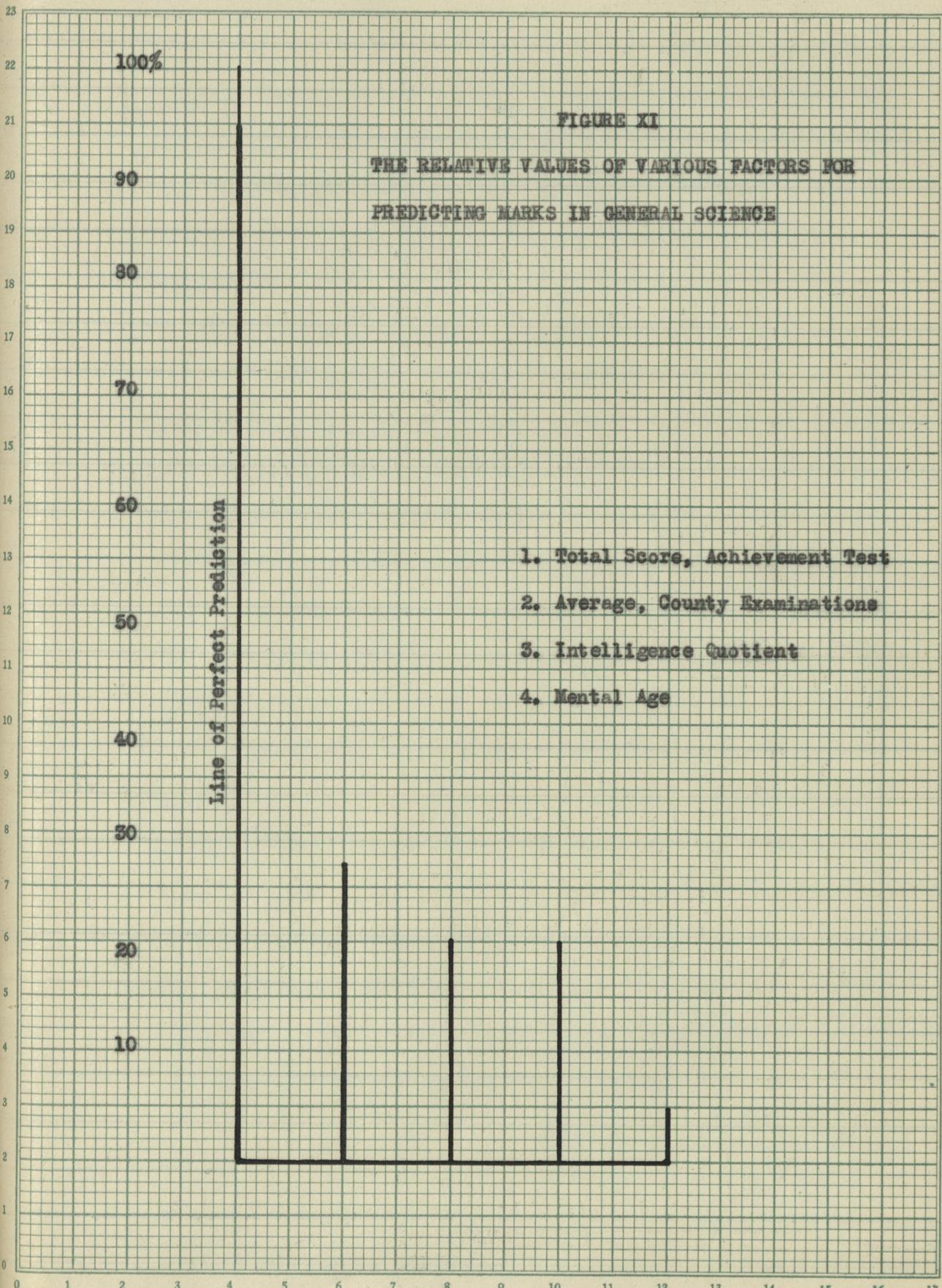


FIGURE XI

THE RELATIVE VALUES OF VARIOUS FACTORS FOR
PREDICTING MARKS IN GENERAL SCIENCE

- 1. Total Score, Achievement Test
- 2. Average, County Examinations
- 3. Intelligence Quotient
- 4. Mental Age

general science marks show a correlation of .309 less than three times its probable error which indicates complete unreliability. The materials of general science as taught in these schools are within the reach of the lower mental levels of the classes, and marks in that subject would be largely determined by the mental alertness and fund of general information.

F. The prediction of success in domestic arts.

A comparison of marks in domestic arts with the various factors yielded the following correlations:

| | |
|---|-------------|
| Domestic arts marks - average grade CE | .503 ± .09 |
| Domestic arts marks - total score SA | .397 ± .104 |
| Domestic arts marks - intelligence quotient | .36 ± .105 |
| Domestic arts marks - mental age | .40 ± .10 |

The relative predictive values of these factors are shown in Figure XII.

Thirty-one persons were enrolled in Domestic Arts. The correlations are of little value. The county examination grades are of superior predictive value if the correlations carry any meaning. Mental age is slightly superior to the achievement test and intelligence quotient. As we might suspect in a course of this nature intelligence quotient seems to have little bearing. Domestic arts marks are largely determined by the product of the student the quality of which is more apt to be dependent upon maturity and experience.

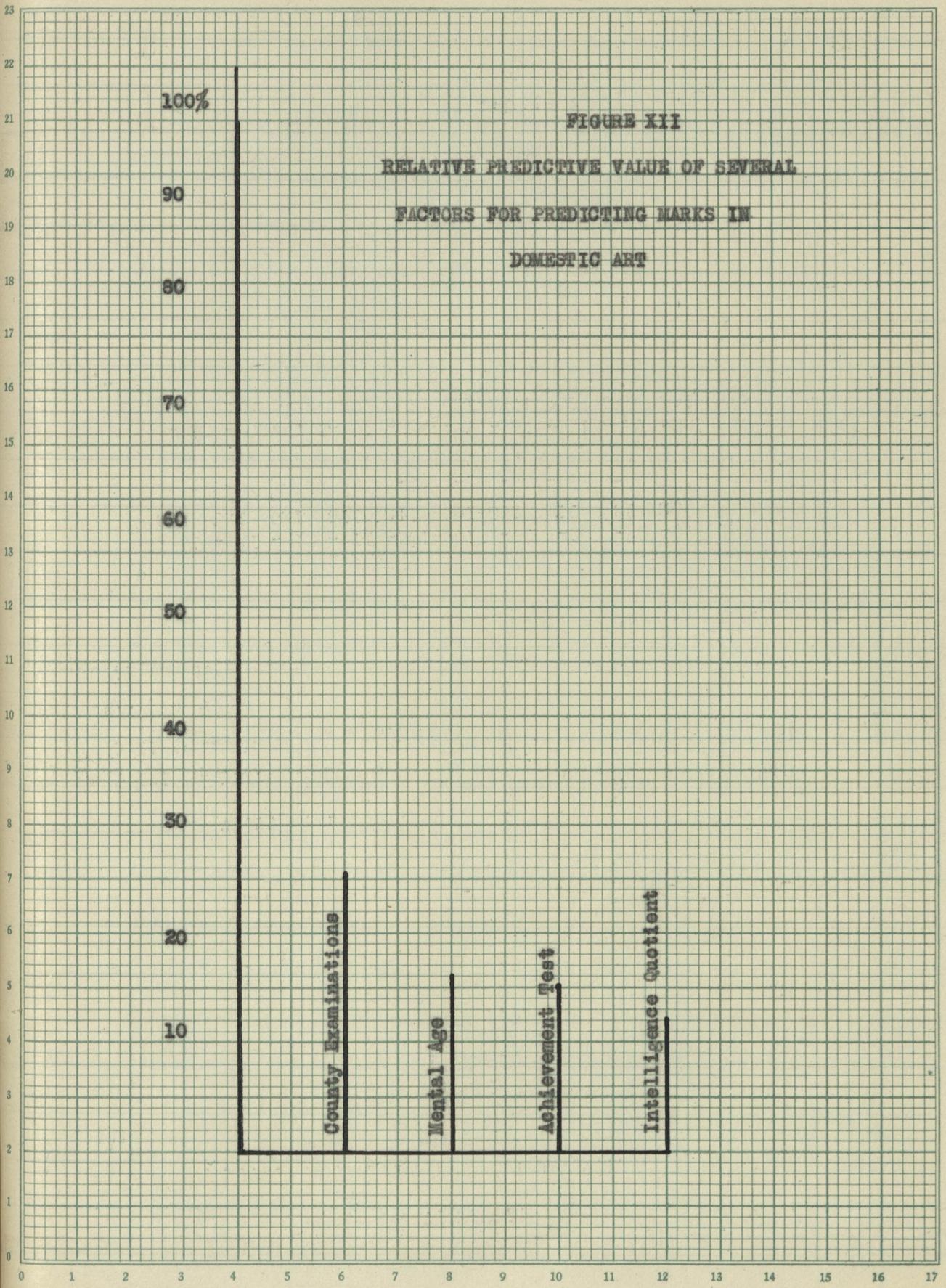


FIGURE XII

RELATIVE PREDICTIVE VALUE OF SEVERAL
FACTORS FOR PREDICTING MARKS IN
DOMESTIC ART

G. The prediction of success in manual arts.

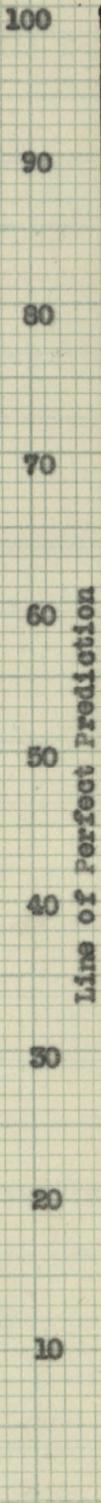
Comparison of marks in manual arts with the various factors yielded the following correlations:

| | | |
|---|------|------|
| Manual arts marks - average grade, CE | .487 | .09 |
| Manual arts marks - total score, SA | .471 | .091 |
| Manual arts marks - mental age | .218 | .107 |
| Manual arts marks - intelligence quotient | .22 | .106 |

The relative predictive values of these factors is shown in Figure XIII.

Again the county examination average shows a superior value, compared to other factors, for predicting success in a manual subject. It is little superior to the Stanford Achievement Test. Mental age and intelligence quotient show no relationship to marks in manual arts.

FIGURE XIII
THE RELATIVE VALUES OF SEVERAL FACTORS FOR
PREDICTING MARKS IN MANUAL ARTS



CHAPTER V

SUMMARY AND CONCLUSIONS

Summary:

The average grades of the county examinations show comparatively low relationship to mental age, and a marked relationship to intelligence quotient.

The Stanford Achievement Test seems to have functioned more as a mental test than as an achievement test for the freshmen studied. A comparison of the scores made by the subjects with the norms indicate that the Stanford Achievement Test measured something rather well.

A comparison of the total scores on the Stanford Achievement Test with the average county examination grade resulted in a significantly high correlation. This would show that the county examination tends to select pupils on the basis of mental age as does the achievement test.

Few high correlation resulted from comparisons of county examination grades in special subjects with scores in similar achievement tests. The highest of these correlations were found between the arithmetic county examination and the achievement tests in arithmetic. The county examinations in classics and geography showed almost complete lack of relationship with similar tests of the Stanford Achievement Test.

The average grade on the county diploma examination appears to be the best criterion for the prediction of average high school marks. It is not outstandingly superior to the intelligence quotient and the

total score on the Stanford Achievement Test. Mental age, of all the criteria considered, shows the least relationship with average high school marks.

Little difference appears between the values of the county examination average and the total score on the Stanford Achievement test for the prediction of algebra marks. With mental age held constant the examination average is slightly superior. Of the examinations and tests in single subjects the achievement test shows the highest relationship to algebra marks.

For the prediction of English marks the average of the county examination grades falls to one-half the value of the intelligence quotient and the county examination in grammar. In predictive value it exceeds only the factors of mental age and grades on the classics examination and the achievement test in literature. A high I.Q. and a knowledge of formal grammar seem most closely related to good marks in English.

The intelligence quotient is superior to the average county examination grade for predicting marks in Latin. Mental age has little relationship to success in Latin.

In only one subject, general science, does the total score on the Stanford Achievement Test lead the other criteria in predictive value. The average examination grade and intelligence quotient show equal relationship to this subject. Mental age has little, if any value, for the prediction of marks in general science.

For both manual arts and domestic arts the county examination is superior to the other criteria for prediction. Intelligence quotient and mental age show little relationship to either.

Conclusion:

The general purpose of this study was to answer two questions: the first, "Do the county diploma examinations select persons^{who} will be able to succeed in these high schools?"

The data show that the average of the county examination grades is more valuable than the other factors studied for predicting average high school marks.

The county examination is very slightly superior to the total score on the Stanford Achievement Test for the prediction of algebra marks.

The average county examination grade falls below several other criteria in value for predicting marks in English. However, the county examination in grammar stands with the intelligence quotient as most valuable for prediction in English. However, the county examination in grammar stands with the intelligence quotient as most valuable for prediction in English.

The county examination average is excelled only by the intelligence quotient in the prediction of Latin marks.

The value of the Stanford Achievement Test stands above that of the county examination for the prediction of marks in general science.

The county examination is distinctly superior to the other criteria of the study for the prediction of success in manual and domestic arts.

The answer to the first question appears to be, "Yes". The county examination, in comparison with other measures, has selected successful high school pupils rather well."

The second question to be answered in this study was: "Do achievement and mental tests offer a better basis for predicting success in high school than do the grades made in the county diploma examinations?"

For the prediction of average high school marks the total score on the Stanford Achievement Test ranks below the intelligence quotient and the county examination.

The Stanford Achievement Test is practically equal to the county examination in value for the prediction of algebra marks.

In the prediction of English marks the Stanford Achievement test ranks above the county examination, but neither the total score on the achievement test nor any of its related tests is as valuable as the county examination in grammar.

For the prediction of marks in Latin the Stanford Achievement Test is least valuable of all the factors considered.

In the prediction of marks in general science the total score on the achievement test is outstandingly more valuable than the other criteria.

For the prediction of marks in manual and industrial arts the Stanford achievement test is inferior in value to the average grade on the county examinations.

The intelligence quotient stands practically equal to the county examination average for predicting marks in all high school subjects excepting manual and domestic arts in which subjects it has little value.

Mental age shows the least predictive value of all the criteria for prediction of high school marks.

The general conclusion:

The common criticism of the county diploma examinations as being quite inefficient is not justified by this study. That system may as well continue until methods and measures can be devised which will demonstrate their superiority over the examinations.

The writer does not mean to suggest that the county diploma examination is superior to the Stanford Achievement Test for determining educational placement, nor that it is superior to mental tests for determining mental ability. The examination does, however, appear to be more efficient than achievement or mental tests for the selection of persons who will succeed in the struggle for credits in three high schools of Doniphan County, Kansas.

Since the three high schools included in this study of prediction are average small high schools, two of them are rated as Class A, and the other as class B by the State Department of Education--

the conclusions of this study may be generalized as being characteristic of the situation throughout the smaller schools of Kansas.

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A P P E N D I X

Coefficients of correlation derived from this study with probable error and coefficient of alienation.

CE refers to grades on county examination.

SA refers to scores on Stanford Achievement Test.

HS refers to high school grades.

| | r | PE | k |
|---|------|------|-----|
| 1. Total score SA - general average CE | .711 | .037 | .69 |
| 2. Total Score SA - mental age | .702 | .036 | .70 |
| 3. Total Score SA - intelligence quotient | .719 | .035 | .68 |
| 4. Average grade CE - mental age | .522 | .052 | .85 |
| 5. Average grade CE - intelligence quotient | .622 | .044 | .78 |
| 6. Average grade HS - mental age | .525 | .052 | .85 |
| 7. Average grade HS - intelligence quotient | .69 | .037 | .72 |
| 8. Average grade HS - total score SA | .661 | .041 | .75 |
| 9. Average grade HS - average grade CE | .728 | .035 | .68 |
| 10. Average grade HS - Chronological age | .624 | .044 | .78 |
| 11. Algebra HS - mental age | .597 | .047 | .80 |
| 12. Algebra HS - intelligence quotient | .649 | .04 | .76 |
| 13. Algebra HS - total score SA | .71 | .037 | .70 |
| 14. Algebra HS - average grade CE | .684 | .039 | .73 |
| 15. Algebra HS - arithmetic CE | .578 | .049 | .81 |
| 16. Algebra HS - arithmetic computation SA | .652 | .043 | .76 |
| 17. Algebra HS - arithmetic reasoning SA | .586 | .048 | .81 |
| 18. English HS - mental age | .443 | .059 | .89 |
| 19. English HS - intelligence quotient | .683 | .039 | .73 |
| 20. English HS - total score SA | .648 | .044 | .76 |
| 21. English HS - average grade CE | .465 | .059 | .88 |
| 22. English grade - grammar CE | .683 | .039 | .73 |
| 23. English grade - reading CE | .536 | .054 | .84 |
| 24. English HS - classics CE | .362 | .062 | .93 |
| 25. English HS - language usage SA | .578 | .049 | .81 |
| 26. English HS - literature SA | .33 | .066 | .94 |
| 27. English HS - paragraph meaning SA | .486 | .056 | .87 |
| 28. English HS - word meaning SA | .41 | .062 | .91 |
| 29. English HS - dictation (spelling) SA | .61 | .047 | .79 |
| 30. Latin HS - mental age | .467 | .082 | .88 |
| 31. Latin HS - intelligence quotient | .627 | .044 | .78 |
| 32. Latin HS - total score SA | .415 | .088 | .91 |
| 33. Latin HS - average grade CE | .566 | .074 | .82 |
| 34. General Science HS - mental age | .309 | .105 | .95 |
| 35. General Science - intelligence quotient | .598 | .082 | .80 |
| 36. General Science - total score SA | .682 | .066 | .73 |
| 37. General Science - average grade CE | .599 | .089 | .80 |
| 38. Domestic art - mental age | .40 | .11 | .91 |
| 39. Domestic art - intelligence quotient | .35 | .105 | .93 |
| 40. Domestic art - total score SA | .397 | .104 | .91 |