6/25 1931

To the Committee on Graduate Study:

I submit herewith a thesis by Mr. O. D. Teague, "The predictive significance of pre-college data with reference to college success." I recommend that this thesis be accepted for 18 quarter hours credit in fulfillment of the requirements for the degree of Master of Science in Education.

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J O Stuart
Major Professor

At the request of the Committee on Graduate Study, I have read this thesis and recommend its acceptance.

Robert P. Carroll

Accepted by the Committee

P M Horton
Chairman

THE PREDICTIVE SIGNIFICANCE OF PRE-COLLEGE DATA WITH REFERENCE TO COLLEGE SUCCESS

A THESIS

Submitted to the Graduate Committee
of the
University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science in Education

O. D. TEAGUE

August 1931

PREFACE

Intelligence tests have been used extensively by colleges and universities as a basis for predicting success or failure in college since the world war. Due to this fact it was decided to make a survey of what is being done in this country with reference to admission to colleges and to determine the predictive value of intelligence tests, high school marks, and college marks of students who enter the University of Tennessee.

In consideration of what has been done, and because of the indefiniteness of the work done along this line in the past it was decided to make a further study of the specific situation in the University of Tennessee. The pre-college data used in this study consists of intelligence quotients, high school marks, and English placement grades.

THE PREDICTIVE SIGNIFICANCE OF PRE-COLLEGE DATA
WITH REFERENCE TO COLLEGE SUCCESS

CHAPTER I

e. Intelligence versus examination as a means of predicting success in college.

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THE PREDICTIVE SIGNIFICANCE OF PRE-COLLEGE DATA WITH REFERENCE TO COLLEGE SUCCESS

CHAPTER I

SURVEY OF LITERATURE BEARING ON THIS SUBJECT

1. College entrance.

a. Problems of college entrance. During the later teens prediction of scholastic success in the first two years of college is an important problem. A large number of American institutions are overcrowded and enroll many students who cannot or do not use profitably the educational facilities provided. Many colleges find restricting registration a complex matter; it is now being regarded largely as one of selecting for admission those students who give promise of profiting most by the training which the college offers. There are being used and proposed various bases of admission. The three following methods, singly or in combination, have wide use: (1) certificate of graduation from high school, with fifteen acceptable units; (2) passing marks on entrance examinations, such as those given by the College Entrance Board; and (3) satisfactory scores on psychological examinations.[1]

1. Brooks, Fowler D., Psychology of Adolescence. p. 574.

b. The Thorndike college entrance tests.

The most significant application of intelligence tests to university students at present is the use of the Thorndike tests by the department of admissions of Columbia College. Students who make application for admission to Columbia and whose school and character records are satisfactory may substitute the psychological tests for the usual entrance examinations. Thorndike reports a correlation of .65 between the work of the entire freshman year and the scores on the mental test. The test seems to detect the poorer students; for "of eleven boys at Columbia, reported to the dean's office for inability to do college work in the early weeks of the year, all had notably low scores in the intelligence examination. Of a score or more so reported as a result of the mid-term records, all but two had low scores. The defective college work of these two was by common consent not due to intellectual defect."[1]

Thorndike quotes the Dean of the College as follows:

> "In addition to the use of the results of the mental tests in admission to college, they have

1. Pintner, Rudolf, Intelligence Testing, pp. 275-276.

been most helpful in my office as an aid in arriving at a diagnosis of academic maladies. A boy who has a poor academic record and a low mental test grade generally needs very different treatment from the student whose record is poor but whose mental test mark is high. And in several cases the mental test mark is high. And in several cases the mental test has afforded the clue which has enabled my office in cooperation with the university physician so to advise the boy that he has not only escaped being dropped but has become an excellent academic citizen."[1]

Wood, in describing the work at Columbia, says,

"In 1919 the office of Admissions of Columbia University inaugurated an experiment for the purpose of discovering the value of the Thorndike College Entrance Intelligence Examination for High School Graduates as a criterion for admission to Columbia College. From an attitude of healthy, if not severe skepticism toward the use of intelligence tests for this purpose, the whole college administration came, within the space of two years, to consider the intelligence tests as an indispensable part, not only of the admission machinery, but also of the administration of the college in the Dean's Office."[2]

"Wood also gives the correlations between the intelligence scores and scholarship records of 111 students who remained in college during two years."[3]

Freshman Year	r	.63
Sophmore Year	r	.62
Freshman & Sophmore Years	r	.67

"That the intelligence test has higher predictive value of a man's work in college is shown by the following correlations with the scholarship record for two years:"[4]

	r	n
Thorndike Intelligence Test	.67	111
Regents Examinations	.64	144
Secondary School Marks	.26	103

1. Ibid., pp. 275-276.
2. Ibid., p. 276.
3. Ibid., p. 276.
4. Ibid., p. 276.

c. Intelligence test as one basis of admission to college. No one would think of using the psychological examination as the only criterion for admission to college. The school record, content examinations, and every available means should be used to test the qualities that the psychological fails to touch. The correlation between the psychological tests and college accomplishment may not be so very high, unless the results of the psychological examination are used scientifically.[1]

d. A composite basis of admission desirable. A combination of two or more bases of admission is likely to be more effective than any single basis. The total evidence is indicative of the fact that high-school marks and intelligence examinations combined give more accurate predictions than either one alone. This is what has been found in predicting high-school success. The basis is always better, the more comprehensive it is. Proctor has suggested a threefold basis of admission to college which consists of: (1) a scholarship-rating based on all high school marks; (2) the intelligence test score on the Thorndike test; and (3) character ratings by high school teachers. Such

1. Hawks, Hubert E., Dean of Columbia College, "Intelligence Tests as one Basis of Admission to College", in National Education Association, p. 439, (1926).

a comprehensive basis would naturally be expected to produce better results; but improved techniques in the character ratings are essential before they will contribute much to the other two, because McPhail[1] has shown that the character rating given by high-school principals correlated but .17 with freshman-year marks. More striking still is the correlation of .14 between these ratings and high school marks, fully justifying McPhail's comment that "either that the estimates are extremely inaccurate measures of the qualities which it is desired to measure or that these qualities have very little to do with success in high school classes". Probably both factors help to lower the correlations. Certainly some of the traits, such as popularity, cheerfulness, and citizenship, would not be expected to be very significant in predicting scholastic attainments in either high school or college. Other means may be used whereby the prediction of college success may be improved combining two or more bases of admission. It seems desirable that a composite basis, rather than a single, should be used. The correlations are higher, as shown in Table I.

1. Brooks, Fowler D., Op. Cit., p. 582.

TABLE I

Simple and Multiple Correlations Showing the Relative Values of a Composite versus a Single Basis of Admission to College.[1]

Reported by	Correlation of College marks with	Multiple Correlation of College Marks with
Dempster at Johns Hopkins University	H. S. Average.. .53 Intelligence... .47	H. S. Average and Intelligence.. .61
Johnston at University of Minnesota	H. S. ranks.... .50 Intelligence... .60	H. S. ranks and Intelligence... .67
May at Syracuse University	Intelligence... .60 H. S. Average.. .40 Units of entrance.22	Intelligence, H. S. average and units of entrance.... .64
McCrory at St. Cloud, Minn., Teacher's College	H. S. Average.. .66 Intelligence... .46	H. S. average and Intelligence... .68
Symonds at University of Hawaii	H. S. average.. .52 Intelligence... .41	H. S. average and Intelligence..... .59

1. Ibid., 582.

2. The value of intelligence tests. The greatest value of the intelligence test lies in the fact that it furnishes data not duplicated from any other source. The intelligence test gives a new line on the student. Better than any other source of information, it tells us what quality of work we have a right to expect. It gives a very favorable starting point for the investigation of the cause of failures.

It enables us to discriminate between the intelligent student whose failure is avoidable and the student whose inferior native ability renders him comparatively incapable of obtaining an education.[1]

The purpose of intelligence tests is not to deprive any person of any educational opportunity from which he is fitted by ability to derive normal profit, but rather to enable us to select the type of curriculum from which a given individual can profit most, whether he be dull or bright.[2]

The relative dull student may, and perhaps usually does, obtain some benefit from a college education. But a college may "educate" a number of such students without making any appreciable contribution toward the

1. Wood, Ben D., Higher Measurement in Education, p. 5.
2. Ibid., p. 6.

advancement of higher learning.

The college, certainly, is justified in permitting the exceptionally able student who is lacking in some of the academic requirements to enter by the test route.

The plan, properly safeguarded, involves no risk whatever of lowering academic standards. It puts the emphasis on ability where it belongs. The best possible bet, as regards scholastic promise, is the candidate who can earn an exceptionally high test score in spite of inadequate training. The plan of conceding to intellect has the additional advantage that it tends to attract the best and discourages the weakest from entering college.[1]

It might be interesting to note that, after only one year of actual experience with the intelligence test, the Director of Admissions at Columbia felt justified in defending it against the hasty inferences which might be drawn against it on the assumption of its failure to correlate higher than r 0.65 with success in college.

Every indication leads us to think that the mental test is a most useful addition to our machinery of admission.

1. Ibid., p. 8.

Professor Jones says:

"It should be remembered that there are many factors other than intelligence which determine a student's standing, and that the psychological examination (or mental test) is not supposed to measure them.... There is no thought of using the intelligence test without the student's complete previous record... Occasionally a student of especial promise with a record which is doubtful in certain particulars may be allowed to take the intelligence examination with the requirement that he pass with a very high mark."[1]

Records for thirty-four men tested at Columbia have been followed for three years. Five of the seven who had the highest grades in the test have received general honors, while four of the seven lowest in the test failed in more than half of the work and left school. The seven at the top made more than 125 credits in three years, the middle seven averaged 92 credits each in three years, and of the lowest seven the two who remained in school averaged 56 credits in three years.[2]

We find fairly uniform increments in both quantity and quality of academic work done as we go up the scale of intelligence scores. In terms of C grade work, the men above 105 in intelligence score are within twenty hours of graduation at the end of the second year, while the men below sixty-eight have eighty-three hours of the same grade of work to do before graduation. As we ascend the intelligence scale we find a progressive decrease in the percentage of men who get F and D grades.

1. Ibid., p. 19
2. Ibid., p.23

It may be interesting to examine three tables drawn up by Mr. Harold K. Chadwick, Assistant Director of Admissions of Columbia University, on the basis of Freshman records at the end of the first semester in the session of 1919-1920.[1]

TABLE II

Intelligence Scores	N	F	D	C	B	A	S	Total points attempted	Points passed (C,B,A)	Average Scholarship Score
70-72	10	33	15	46	31			125	77	61.7
86-88	10	9	21	53	51	6		140	110	88.5
104-106	10		9	49	89	19		166	157	125.0

TABLE III

Intelligence Scores	Lower Quartile	Median	Upper Quartile
70-75	F	C-	C-
85-90	C-	C	B-
105-	C-	B	B-

1. Ibid., p. 70.

TABLE IV

Intelligence Scores	N	Number averaging B or better	Per cent averaging B or better
60-70	50	2	4
70-80	50	4	8
80-90	50	7	14
90-100	50	15	30
100-117	50	25	50

To quote from Wood:

"Ten men selected at random from among those Freshmen who made intelligence scores between seventy and seventy-two attempted a total of 125 hours, or an average of 12.5 hours each. In spite of this very light academic load, these men failed in nearly forty per cent of the work attempted, and made no grade above B. Ten similarly selected men scoring between eighty-six and eighty-eight attempted 140 hours of college work in the same time; they failed in twenty-two per cent of their work, passed 110 hours, of which six were of A grade. On the average these ten men passed eleven hours as compared with 7.7 hours passed by the men scoring between seventy and seventy-two, and they did this work at a higher grade of quality. Ten men with scores between 104 and 106 attempted in the same time 166 points; they received no F grades, only five per cent D grades, and passed 157 hours of work, of which 108 were of B or A quality."[1]

1. Ibid., p. 70 f.

The intelligence test has been found to be not only as good a criterion for admission to college as any other single criterion thus far used, but it is more valuable and less expensive. The nearest rival to the intelligence test is the leaving examination of the State High Schools of New York. The strength of this leaving examination lies in the fact that it approximates an intelligence test, in addition to measuring actual achievement and industry.[1]

a. Miscellaneous group and individual tests. It might be truly said that there is practically no mental test which has not been tried out on college students, and very few upon which we do not have some kind of a report. These reports range from a few tests tried out on a few students to many tests tried out on a large number of students; from studies of an incidental nature to studies in which a group of students has been intensively tested. All of the studies more or less deal with the reliability of the tests, but particularly with the problem of the significance of psychological tests for predicting success in college work. We find, therefore, a great many correlations between test results and academic marks.[2]

1. Ibid., p. 91.
2. Pintner, R., op. cit., p. 266.

b. The army tests in college. Up to the present time the most popular group test for college students has been the army test. During and immediately after the war it was given in many of our colleges. This work with the army tests in colleges and universities has been more or less experimental in nature. Unpublished accounts of the work in a large number of the universities show that practical use is being made of the results to some extent. Students with high intelligence ratings and low college grades are said to improve frequently when confronted with the facts. Deans and other administrative officers take the intelligence rating into consideration when handling academic delinquents and cases of probation, dismissal, reinstatement, petitions to carry extra work and the like. "The extent to which students of low intelligence are consuming administrative time and energy is shown by the report from Ohio State, in which 81 per cent of the delinquents in a certain college were found to be students with intelligence scores equal to those received by the lowest 5 per cent of the whole student body."[1]

1. Ibid., p. 269.

3. The predictive value of classification tests.

a. The predictive value of the Yale classification tests. The use of intelligence tests and similar methods of personnel classification in colleges dates from shortly after the close of the war, and has become so extensive that the majority of the colleges and universities are using a freshman classification test of some form. Classification tests have been given to the freshmen at Yale each year since the fall of 1918.

There are available records covering four years or more of academic work for three classes, viz., 1923, 1924, and 1925. The class of 1923 was given the Army Alpha test in the fall of 1919. An additional test consisting of eight parts, and of greater difficulty, was given to the 1924 class. A further revision resulted in the test given to the class of 1925. The existing relationship between entrance examinations, grades and academic grades is of much interest when compared to the relationship exhibited by the test scores and the same criterion. Two forms of entrance admissions exist at Yale. Under the old plan students are admitted upon passing a number of examinations totaling fifteen entrance credits, and usually involving twelve to fifteen separate papers.

These examinations may be taken a few at a time and thus spread over several years preceding the year of entrance. Under the new plan students of high preparatory standing may take four examinations in subjects which they studied during their last preparatory year, and be admitted on the basis of these grades alone, if their preparatory standing has been high in other subjects. The new plan entrants are probably a higher selection of students, at least as measured by preparatory school grades.

By studying Table VII we see that a greater proportion of the students who entered under the new plan graduated than those who entered under the old plan. The figures of Tables V and VI show significant variation at the lower and of distribution. At Yale a grade of 75 gives a student quality credit. It is very evident that students whose freshman work averages at quality credit level are almost certain to graduate, if they do not resign, or are not expelled. After considering the various citeria freshman grades are therefore the best single index of a student's future success in college both as to his numerical grades and as to his ultimate chances of graduating from college.[1]

1. Anderson & Spencer, "Predictive Value of the Yale Classification Test", in School and Society, Vol. XXIV, pp. 305-312, (Sept. 4, 1926).

TABLE V

Percentage of Individuals Gaining The Degree at Each Range of Old Plan Entrance.[1]

	1923	1924	1925
No. of Cases.....	211	443	518
Grades			
90-94	100		
85-89	100	100	91
80-84	100	97	97
75-79	93	95	89
70-74	92	86	87
65-69	87	76	69
60-64	43	57	66
55-59	87	25	50
45-49		100	
Percentage after elimination gaining degree			
Total	90	82	81

TABLE VI

Percentage of Individuals Gaining the Degree at Each Range of New Plan Entrance.[2]

	1923	1924	1925
No. of Cases.....	51	67	128
Grades			
90-94			100
85-89	100	1000	100
80-84	100	100	100
75-79	100	100	96
70-74	83	88	87
65-69	89	100	90
55-59	90	67	100
50-54	50	100	100
45-49			100
Percentage after eliminations gaining degree			
Total	92	93	95

1. Ibid., p. 310.
2. Ibid., p. 312.

TABLE VII

Percentage of Cases Gaining the Degree at Each Range of Average Freshman Grade.[1]

	1923	1924	1925
No. of Cases	328	527	667
Grades			
93-97	100	100	100
88-92	100	100	100
83-87	100	100	100
78-82	100	100	100
73-77	96	97	99
68-72	89	97	98
63-67	70	91	78
58-62	40	78	46
53-57		44	38
48-52		38	31

These tests, modeled upon the Army Alpha test, but revised to fit the requirements of the college group show correlations with academic work of .30 to .40. Entrance grades are not shown to be any higher with the same criterion. Entrance grades and test scores give an intercorrelation of .40. Academic grades in the form of yearly averages show correlations from year to year between .60 and .85.

Comparison of the chances of graduating with classification test percentile scores shows a definite relationship of a more reliable nature than that between entrance grades and graduation. The average grade at the end of the freshman year was the best

1. Ibid., p. 312.

single measure found of the probability of graduation.

b. Classification of Freshmen at Brown University. In September, 1924, 313 freshmen entering Brown University Psychological Examination, Moore (Dartmouth) Completion Test, and the Classification Test in English. This investigation showed that in general total scores on the English test and scores on the Brown Psychological test predict grades in English I with practically the same accuracy. (See Table VIII)

For both the English test and the Brown test prognosis is considerably greater in the low ranges than in the high. Those who score low on either test seldom do well in English, but those who score high very often do a grade of work which is apparently below their ability.

TABLE VIII

Correlation of the Scores Made on Various Preliminary Tests and the Marks Received in English I.[1]

		Correlation with English I
1		2
1.	Composition Brown University and English Test--- Total.....	.419
2.	Brown University and English Test Total	.416
3.	English Test Part II.....	.416
4.	Brown Psychological Test.....	.371
5.	English Test. Part I.....	.371
6.	English Test. Total.....	.368
7.	Moore Completion Test.....	.327

1. McPhail, A. M., "Classification of Freshmen at Brown University", in Journal of Educational Research, Vol. XIV, (1926).

4. Predicting success in college.

a. The Thorndike intelligence tests and academic grades. Dr. David Grauer and Dr. W. T. Root, University of Pittsburg, made a study[1] to discover: first, the relation between the performance on the Thorndike intelligence examination and the academic grades over an entire college course of four years; and, secondly, to attempt, by means of analyses and case studies, to find the condition of correlation and non-correlation, and to relate the scholarship and test record of these students to their intelligence from other points of view.

The group chosen for this purpose was the class of 1925. One of the reasons for this choice was that in 1922 Dr. Root in a study of 569 freshmen who took the Thorndike examination in 1921, correlated their Thorndike ranking with their academic standing for the first semester. Dr. Root obtained for the first semester a correlation of .51. This study was made in order to follow up Dr. Root's investigation.

Only 153 of the 569 students who took the Thorndike examination were graduated from the University of Pittsburg in June, 1925. The work of the last two years was scattered over such a wide range of subjects that in

1. Grauer and Root, "Thorndike Intelligence Tests and Academic Grades", in Journal of Applied Psychology, Vol. XI, pp. 298-310, (1927).

over half of the courses the tabulation revealed not more than three or four students to a subject. On account of such difficulties, it was determined to take the grades of the first two years as a sufficient index of a student's academic standing and, where any appreciable change in the grade of academic work during the last two years was noted, to make an analysis of actual letter grades given. His report is given below:

The Correlation Between the Thorndike Examination Score and the Academic Grades for Two Years.

Coefficient of correlation.....	0.39
Probable error.....	0.046
Median of Thorndike scores.....	73
Range of Thorndike scores.....	21-98

Tabulation 8 groups the students according to Thorndike's classification, of which Thorndike makes the following statements:

> "A boy scoring over 95 is worth admitting in almost entire disregard of technical deficiencies.
> A boy scoring 85 to 95 has intellect enough to do collegiate and professional work with distinction.
> A boy scoring 70 to 85 has intellect enough to do the work to obtain a college degree.
> A boy scoring 60 to 70 may be admitted, if he is sufficiently in earnest and otherwise desirable.
> A boy scoring 50 to 60 should be admitted only if he is of extraordinary zeal or has suffered very great educational handicaps.
> A boy scoring under 50 should not be admitted."[1]

1. Ibid., p. 298.

In the words of Grauer and Root,

"The academic grade rank-orders are grouped so as to agree with the Thorndike classification. Groups A, B, C, D, E, and F compose the Thorndike classifications; groups A', B', C', D', E', and F' are the academic grade classes. Thus in the A or A' group there are 2.6 per cent of all students. In the B or B' group there are 17 per cent of the students. In the C or C' group there are 41 per cent of all the students. In the D or D' group there are 28 per cent of the students. In the E or E' group are 7 per cent of the students. In the F or F' group are 3 per cent of the students. The resemblance of this distribution to the normal distribution of grades (A-3.5 per cent, B-24 per cent, C-45 per cent, D-24 per cent, F-3.5 per cent) is noticeable.

TABLE IX

Thorndike scores	Grade ranks						Total
	A'	B'	C'	D'	E'	F'	
A (over 95).....	0	0	3	1	0	0	4
B (85-95).....	2	11	9	4	0	0	26
C (70-85).....	2	9	34	14	2	2	63
D (60-70).....	0	4	14	19	5	2	44
E (50-60).....	0	2	2	4	3	0	11
F (below 50)....	0	0	1	2	1	1	5
Total number of cases.....							153

"Regarding the students as atypical with respect to the correlation who are more than one step (above or below) removed from the precise class in which they would have been placed had there been perfect correlation, we have:

"In group A (students scoring over 95 in the Thorndike tests) 100 per cent are atypical, three being the C' group and one in the D'group.

"In group B (students scoring between 85 and 95) 15 per cent are atypical.

"In group C (students scoring between 70 and 85) a chance distribution is approximated.

"In group D (students scoring between 60 and 70) 13 per cent are atypical.

"In group E (students scoring between 50 and 60) 36 per cent are atypical.

"In group F (students scoring below 50) 60 per cent are atypical.

"We must remember, however, that differences in the

the character of scholastic work between students separated only by one step are sufficiently high for purposes of classification into Superior, Very Superior, Average, Inferior, and Very Inferior.

"From the above data the following observations are suggested:

I. As a basis for predicting scholarship, groups C, D, and B, respectively, are most likely to agree with actual grades given.
II. Groups E, F, and A are the least valid for the prognosis of scholarship if the Thorndike classification is to be followed.
III. From the data obtained here, it would seem safe to predict that a student scoring over 95 in the Thorndike tests is unlikely to attain more than average academic standing."[1]

The following is the analysis by Grauer and Root of Thorndike Scores of fifty failing students:

"An analysis was made of fifty students who failed in their studies the first two years. Of these, twelve, or 24 per cent, scored below 50 in the Thorndike test. Eleven, or 22 per cent, made between 50 and 60. Six, or 12 per cent, made 60 or 70. Eighteen, or 36 per cent, made between 70 and 85. Three, or 6 per cent, made between 85 and 95. None made over 95.

"Regarding the distribution of Thorndike grades over the 569 freshmen as the normal one, we have the following:

11.0 per cent score under 50
17.0 per cent score between 50 and 60
25.0 per cent score between 60 and 70
35.0 per cent score between 70 and 85
9.5 per cent score between 85 and 95
1.5 per cent score over 95

"Subtracting to find how much better than chance the Thorndike tests are when applied to a special group, we have:

"In group F (below 50) there are 13 per cent more than chance would have picked (a correlation of approximately 0.50).

"In group E there are 5 per cent more than chance.

"In group B chance would have picked 3.6 per cent more than the Thorndike test.

"In group C the test gives just about the same result that chance would have given.

"From this study the only conclusion that can be

1. Ibid., pp. 299-300.

drawn is the tendency for students scoring below 50 to drop out, although there are too many exceptions to warrant excluding all students on this basis. If, however, a student with a score of below 50 has failed to make passing grades the first semester, the probability is very great that he is incapable of doing college work."[1]

According to Grauer and Root, lack of interest in studies is the most popular explanation for the low scholarship of the superior intelligence group. And the lack of interest is incapable of being measured objectively, and is often given for feeble-minded children as the reason for their backwardness in school.[2]

Their conclusions are:

"1. There is a very moderate degree of correlation (0.39) between the Thorndike Examination score and the average academic grade for the first two years.

"2. The indications are that the above situation holds true for the average academic grade of the entire four years of the university course.

"3. The correlation between the Thorndike score and the average academic grade is too low to justify the exclusion of students from college on the basis of the Thorndike rating alone.

"4. A high Thorndike score does not necessarily, nor even usually, imply high scholarship, great social intelligence, or pronounced intellectual interests; nor does an average or low Thorndike score imply average or low scholarship, intellect, or social intelligence.

"5. Other intellectual elements, exclusive of those measured by the Thorndike tests, are operating in at least many instances of superior scholarship. The number of individuals studied intensively is too small to justify generalizations as to the nature of the factors involved, or as to whether they apply in all cases. Extended powers of analysis, classification, and interpretation, are probably among the mental processes included in these intellectual elements.

"6. The Thorndike tests, although they do not have high predictive value, are very useful in the study of individual cases since they isolate and measure an as-

1. Ibid., pp. 301-302.
2. Ibid., p. 310.

pect of intelligence of considerable importance for scholarship.

"7. In order to obtain an adequate intellectual estimate of a student, it is necessary to supplement the Thorndike score with individual tests, questionnaires, and follow-up studies."[1]

b. Intelligence test results and college success. In a great many colleges intelligence tests have been given to the students upon entering and the results have been compared with students' academic records. On the whole, they rank third among the three bases of admission, the average correlation being .44 (range .10 to .67). All tests are not of equal value. Some of them, like the Thorndike Test for High-School Graduates, have greater predictive value than others. This is really to be expected. Other things being equal, a three-hour test is more reliable than a thirty-minute one, and, in addition to statistical considerations of reliability, there is reason to believe that a two- or three-hour test is better for college students than a half-hour test. The ability to work at high pressure for three hours should be more symptomatic of college success than the ability to work intensively for thirty minutes. Accordingly, the first should be a more valid test of the abilities that make for academic success in college.[2]

1. Ibid., p. 317.
2. Brooks, Fowler D., Psychology of Adolescence, p. 578.

The following table shows contrast in college performance between students in the lowest and highest one-fourth of the high school class and of the psychological test respectively.

College standing.....	F	D	C	B	A
High School Record					
Lowest fourth.....	92	83	4		
Highest fourth.....	7	88	190	89	1
Psychological Test					
Lowest fourth.....	79	141	34	..	..
Highest fourth.....	17	90	140	68	1

Of the lowest fourth in high school, 2.23 per cent secured the C average; of the highest fourth almost 75 per cent did so."

The relative rank of a student in his class in high school is a highly significant indication of his aptitude for college work. Using the combination of high school standing and score made of the psychological test in predicting that 208 students out of 1088 at the University of Minnesota would fall below the average of C. Of these 208 there were three who secured C standing. The prediction was made before any class work had been done.

A study of the 1921 class at the University of Minnesota shows that not one whose rating was below the "threshold" either graduated or made four years progress in four years.

c. Predicting success or failure in college for the high-school senior. The seniors who go to college are only to a slight degree selected from the higher levels of scholarship. Sometimes, more from the lower levels than from the higher levels go.

Fewer than one-half of those who enter ever graduate from any college of the university. Possibly thirty or forty percent of the students who enter college are lacking in the ability to do the kind of thing they try to do. A large number of students in the upper levels of high school scholarship who probably would make good scores in college are staying away, and a large number of students who have already shown a lack of aptitude for a career of study are coming to college and failing.

"Many elements may enter into the basis of prediction," such as: (1) the record of high school scholarship, (2) the results of psychological tests, (3) the interests of students, (4) their activities and experience during the high school period, (5) the advanced studies taken in high school, and (6) estimates by principal and teachers.

By this method more than one-half of those who are unable to do college work are identified in ad-

vance. Predicting distinguished scholarship is much more difficult than predicting poor scholarship.

What could be accomplished? Through the cooperation of the high schools and colleges a plan for the selection of college students could be worked out that would be to the advantage of students and society. Several hundred students each year in the colleges could be relieved of the disappointment, the waste of time and money, and the discouragement that they now suffer through no fault of their own. The students could be helped to find and prepare for an occupation that would bring them happiness.

Students of greater capacity would fill the places of those who are lower in mentality and the universities and colleges would operate on a higher plane. We could get a better product from the university and thereby make the world a better place in which to live.

Those who would be advised to stay away from college would derive the greatest benefit by a true and just method of selection. Those who are less apt are now suffering shipwreck, while the more capable ones are fairly able to take care of themselves.[1]

1. Johnston, J. B., "Predicting Success or Failure for the High School Senior", in The Educational Record, Vol. IX, pp. 17-25, (Jan. 1928).

d. Predicting success or failure in college at the time of entrance. An investigation was made in the University of Minnesota to determine whether the combinations of several kinds of information would make it possible to predict what individuals would fail to carry college work successfully, and what students would carry their work with distinction. The measures used in the study were high school scholarship, psychological tests, the proportion of advanced studies taken in high school, and the marks made on the first three themes written in freshman English in college. The fact that a student selects advanced or elementary subjects during his high school course has a certain predictive value, but this has not proved as important in later studies as in the first. In using the high school standing the only dependable guide is the relative standing of the student in his class.

The correlation of high school record with freshman scholarship was .63. It has been seen that high school marks furnish a fairly good, but by no means absolutely satisfactory, basis for predicting college success. The correlation of intelligence tests with freshman marks was .50. For this group the intelligence tests proved less reliable for prediction than

the high school scores. The correlation obtained by combining the high school scores and intelligence tests is obviously higher than either of the preceeding correlations and therefore is superior in predicting success. Scholarship prediction is much less accurate for students above the ability threshold than for those below it. This may be due to the lack of interest and effort in class work on the part of some intellectually capable student. High school ratings and intelligence rating supplement each other so that an error in prediction based upon one is corrected by the other.[1]

e. Intelligence versus examination as a means of predicting success in college. This investigation undertaken by Arlitt and Hall was begun in 1919 and lasted until June, 1923. The purpose of the study was, (1) to determine the relative value of the record in intelligence tests and the record in entrance examinations as a means of predicting success in college which admits only through the regular channels of entrance examinations; (2) the extent to which the record in intelligence tests could be used to exclude students who passed the entrance examinations, but

1. Johnston, J. B., "Predicting Success or Failure in College at the Time of Entrance", in School and Society, Vol. XIX, pp. 772-776, (1924).

were not able to do adequate work in college; and (3) the relative merit of two intelligence tests and entrance examination grades as a means of selecting the students who will do the least adequate work in college.

The 305 subjects, were students who entered Bryn Mawr in 1919, 1920, and 1921. The test results for each class were treated separately by Arlitt and Hall. As a matter of convenience the classes were called Group I, Group II, and Group III in the order of the date of entrance into Bryn Mawr. Results of the tests of Group I in terms of intelligence quotient were correlated with the grades received in entrance examinations and with scores at the end of the first year, second year, and third years in college and at the middle of the senior year. Scores at the end of the freshman and sophomore years are in terms of the average of all percentage grades received by the student during the year. Marks during the second and third years in college are in terms of honor points. Marks received in entrance examinations were also correlated with marks at the end of the first, second, and third years and at the middle of the senior year.

The results of Arlitt and Hall's investigation are presented in Table X below.[1]

Table X

No. of students	r.	P.E.
98 Entrance Grades and Marks end of Freshman year.	.539	.048
83 Entrance Grades and Marks end of Sophomore year.	.548	.052
74 Entrance Grades and Marks end of Junior year.	.541	.055
74 Entrance Grades and Marks middle of Senior year.	.542	.056
98 IQ's and Entrance Grades	.245	.064
98 IQ's and marks end of freshman year	.298	.062
83 IQ's and marks end of sophomore year	.097	.073
74 IQ's and marks end of Junior year	.102	.078
73 IQ's and marks middle of Senior year	.100	.078

The results obtained from correlating the two intelligence tests used with Group II with scores received in academic work, and entrance examination grades with college scores are represented in Table XI below.[2]

Table XI

No. of students	r.	P.E.
103 Entrance grades and marks end of 1st. year	.520	.048
88 Entrance grades and marks end of 2nd. year	.486	.055
103 Entrance grades and IQ	.190	.064
103 IQ and freshman marks	.197	.064
88 IQ and sophomore marks	.166	.070
103 IQ and Thurstone scores	.223	.063
103 Thurstone scores and freshman marks	.274	.061
88 Thurstone scores and sophomore marks	.293	.066

1. Arlitt and Hall, "Intelligence Tests Versus Entrance Examinations as a Means of Predicting Success in College", in Journal of Applied Psychology, Vol. VII, p. 331, (1923).
2. Ibid., p. 332.

The results from Group III are presented in Table XII.[1]

Table XII

No. of students		r.	P.E.
104	Entrance grades and marks end of first year	.638	.039
104	Thurstone scores and marks end of first year	.347	.058
104	Thurstone scores and entrance grades	.298	.060

The above tables indicate that success in the freshman year in college can be predicted with greater accuracy from the entrance examination than from the intelligence tests.

Arlitt and Hall also undertook to determine whether the records in intelligence tests might have been used to exclude students who, although able to pass the entrance examination, made unusually poor records in college. Groups I and II show that a low grade of entrance examinations is more indicative that the student will do less than average work in college than is a low score in intelligence tests as is shown by the fact that a larger per cent of the students ranking below the 25th. percentile in entrance grade rank below the 25th percentile and median in college. According to group III the intelligence tests and entrance grade select the poor students almost equally well. The Thurstone test shows itself to be slightly superior to the entrance grade.

1. Ibid., p. 333.

Eighty per cent of the students ranking below the 25th percentile in Thurstone score rank below median in college marks as against 76 percent in the case of those ranking below the 25th percentile in entrance grades.

Even though the Thurstone test is a better measure on which to base prediction of success in college than is the I Q , and although entrance grades are a better measure on which to base prediction of success in college than is the score in either of the intelligence tests, the I Q selects the students who will do the poorest work in college better than does either the Thurstone test or the entrance examinations.

These tests show (1) that neither the Thurstone test score nor the I Q correlated as highly with marks received in college as did the grades received in entrance examination; (2) that the intelligence tests could not with fairness be used to exclude students who had passed the entrance examinations; (3) that the students whose work was the poorest were selected better by the I Q's than by either the entrance examination grades or by the scores of the Thurstone test.

The fact that the scores in intelligence tests and college marks do not show closer agreement may

be explained by the fact, that the students dealt with are a highly selective group from which the less able ones have been for the most part eliminated by failure to pass the entrance examination. Also all but seven of the 201 students given the Stanford Binet have I Q's above 100. Again, very intelligent students have often not been trained to work to the limit of their capacity in the lower schools. These students enter college with inadequate preparation as shown by low grades in entrance examination and such students have the habit of working only enough to "get through". If this habit continues throughout the four years in college it may cause a very intelligent student to receive poor marks. Some of the most intelligent students, moreover, are not interested primarily in college work, and, unless pride in academic success is sufficient to make these students put forth a great effort to obtain excellent grades, most of their energy may find its outlet in extra-curricular activities.

f. High-school marks and college success. The number of credits offered for college entrance does not seem to have much value for forecasting academic success in college. A minimum of fifteen units usually is required for admission anyway, and the few excess credits offered are not at all symptomatic of honor points in college, the correlation being but .22, according to one investigation. High-school marks have greater value. While their predictive value varies very much from one college to another (the correlations ranging from .26 to .77), and from one year to another in the same institution, yet they are at present the best single basis of admission to colleges of arts and sciences which has thus far been extensively investigated. It is expected that high-school scholarship is symptomatic of scholarship in college. Indeed one would naturally expect the two to bear a reasonably close relationship.[1]

g. Predicting academic success. "That general intelligence is the most important single factor there is no doubt." The brighter the student the less he

1. Brooks, Fowler D., Psychology of Adolescence. p. 575.

studies. Thus some bright student will make low grades and some dull ones will make high grades by sheer application. If application to work were proportional to ability then all correlations between college grades and intelligence scores would be much higher.

The most reliable means of predicting academic success is a combination of intelligence and degree of application. We do not know the application in advance to the student's admission to college, therefore, it can only be used to a limited extent for the purpose of prediction.[1]

h. Prediction of scholastic success in college. We have quite a few students who make high intelligence scores, but low scholarship scores. The "reasons" for such behavior are to be looked for in terms of such things as poor application, inefficient study habits, late hours, inadequate study, and environment.

Application may be measured by having the student keep a check list of how his time is spent for

1. May, A. M., "Predicting Academic Success", in Journal of Educational Psychology, Vol. XIV, pp. 439-440, (1923).

a period of two weeks, and again later for a two weeks period, giving an accurate account for every hour in the day.[1]

i. Predicting college success from entrance examinations. The value of entrance examinations as evidence of success in college ranks next to that of high-school marks, the correlations averaging .47 (range .22 to .64) in colleges of arts and sciences. Special examinations given at entrance in specialized schools, such as those of engineering, seem to be a better basis of admission than high-school marks. In one case the correlation between the high-school marks and marks in the college of engineering was .29; between the marks in the college of engineering and special entrance examination, .55. At Carnegie Institute of Technology the Iowa Content Examination correlated approximately .50 with first-year college marks, whereas high-school marks usually have given correlations approximately .30. The objective examinations have slightly greater value than the old-type entrance examinations, as we would expect on account of their

1. Toops, H. A., "Prediction of Scholastic Success in College", in School and Society, Vol. XXV, pp. 265-268, (Feb. 26, 1927).

greater objectivity and reliability, and probably greater comprehensiveness.[1]

j. The scholastic records of students failing a general intelligence test. The general intelligence test has been used very widely as a means of predicting success in college. Some have held that a single test can make a better prediction than can be made from the high-school grades. In getting correlations between college grades and the high-school grades the results have been about the same as the correlations between college marks and general intelligence scores. The general intelligence test showed no superiority over the high school records reported by Ohio State University.

Lately there has been an attempt to keep high school graduates from entering college because of the greatly increasing number of people going to college for higher education and because of the educational philosophy which advocates an aristocracy. Colleges have tried to select their candidates. The general intelligence test has been used as one of the selecting instruments. The Ohio General Assembly, in 1923, passed a law requiring students entering a

1. Brooks, Fowler D., op. cit., pp. 575-578.

teacher-training institution to take an English test and a general ability test approved by the state director of education.

Out of 881 students entering Ohio State University in 1926, 32 or 3.6 per cent failed the intelligence test. Of this 32 three withdrew, and six passed in every subject for the whole year. In June five were dropped for poor scholarship. According to this about 13 per cent of these students were dropped in June for poor scholarship. Twelve returned for their second year. One of these students took two tests and failed them both, yet she made an average better than C during her freshman year. The University kept similar records for the years 1927, 1928, and 1929.

No student failing the Ohio University test has ever made an average of A during his first year at Ohio University. A few, however, have made an average of B.

Dilley says:

> "(1) A general intelligence test is fairly accurate in failing a group of students who will not be found in the higher scholarship ranks in college.
> "(2) The test is not accurate when used as a means of exclusion, because many in the lowest ranks in intelligence scores do make satisfactory scholastic records in college".1

1. Dilley, F. B., "Scholastic Records of Student's Failing a General Intelligence Test", in School and Society, Vol. XXXVIII, pp. 311-314, (Feb. 28, 1931).

Summary of The Scholastic Records of Entering Students who Failed the Ohio State University Entrance Tests in 1926, 1927, 1928 and 1929.[1]

General Statement	'26	'27	'28	'29
No. taking the test.	881	906	938	921
No. failing the test.	32	125	108	172
1. Withdrew during first semester	3	13	12	11
2. Completing one semester only	4	16	15	22
(a) Receiving "A""C" average	1	1	0	2
(b) Placed on probation at end of first semester	1	12	11	3
(c) Not placed on probation "between C" average and probation.	2	3	4	17
3. Completing the year	25	96	81	139
(a) Receiving "C" average	8	19	26	36
(b) Placed on probation first or second semester	8	15	36	57
(1) Placed on probation at end of first semester	7	38	26	48
a. Dropped in June	5	19	16	21
b. Not dropped in June	2	19	10	27
(2) Placed on probation at end of second semester	1	18	10	9
(c) Not placed on probation not including "C" average students	9	21	19	46
(1) Including "C" average students	17	40	45	82

k. Intelligence of 1002 students of a foreign language. That something must be wrong with the diagnosis of failures is evident from the study of intelligence made

1. Ibid., p. 314.

of 1002 students, distributed through eight semesters of Spanish in 18 junior and senior high schools of San Diego and Los Angeles. From this study it is evident that the personnel of the Spanish classes is distinctly select. For the girls, the mean shows a deviation of nearly eight points from the normal; the median, one of approximately seven points. Among the boys the selection was shown to be even more conspicious.

When as many as 19 per cent of foreign language fail in the high schools, and when the general intelligence of these students and even of the failing groups is above that of pupils in general, the suspicion comes strong that the high rate of failures may be due to faulty teaching and organization of the courses, rather than to deficiencies in the students.[1]

1. How prediction of college success can be improved. Certain possible means of improving the prediction of academic success in college promises valuable results; they are also applicable to predicting high-school scholarship. Workers in educational

1. Koulfers, M., "Intelligence of 1002 Students of Foreign Language", in School and Society, Vol. XXVIII, pp. 597-598, (Nov. 1928).

measurements are aware of the fact that one very promising method of increasing the accuracy of prediction is to use measures having greater reliability. (Both high-school and college marks can be improved in this respect through greater objectivity and comprehensiveness of the data upon which they are based). They will then be more significant. Similarily, entrance examinations and intelligence tests can be improved.

Colleges probably can improve the predictive value of high-school marks by carefully studying the records of students so as to determine the actual value of the marks from each school for predicting college scholarship. If the marks from any one school are too high, the college can ascertain that fact, and can also determine the extent of adjustment.

Hawks studied the value of high-school marks for predicting first-term freshman scholarship at Gettysburg College, Johns Hopkins University, and Vanderbilt University. She found that a plan for adjusting marks which she worked out for one class at Johns Hopkins was valuable in raising the corre-

lations for two other entering classes at Johns Hopkins and for an entering class at each of the other institutions, the correlations for the two other entering classes at Johns Hopkins being raised from .64 to .77 and from .62 to .72. If students had been admitted upon the basis of "adjusted" high-school marks, no successful college student would have been refused admission; but 38 per cent, 18 per cent, and 30 per cent, respectively, of the first-term failures would have been excluded.

This investigation gives us a basis for further conclusion. If carefully followed up, college admission or research bureaus may possibly be able to select better college material for admission.

Additional research in this and similar lines is needed to eliminate the waste of unsuccessful college students' time and of college resources.

In such a program, the closer articulation of high-school and college, and the improvement of many aspects of the work of both is a vital problem. If any part of the criticism be true which is directed against the secondary school by college faculties,

and against the college by thoughtful school superintendents and men in secondary schools. Then one may conclude that there is room for improvement in both the secondary schools and colleges.[1]

5. Miscellaneous.

a. The correlation between college grades and the Alpha Intelligence Tests. S. T. Hunter found a correlation of .52 between the Alpha intelligence test scores and college grades for 159 women students in Southern Methodist University. At Brown University, Colvin reported correlations between army test and college marks were to be as follows:

Army test and marks of first semester, .44;
Army test and marks of second semester, .39;
Army test and average marks of two semesters, .45.

The differences could be due to different reasons, as difference in the group, studied, or to the method of marking, method of weighing college grades to obtain numerical scores.

"In addition to a general intelligence test for all students there should be specific tests for the students of different colleges."[2]

1. Brooks, Fowler D., op. cit., pp. 583f.
2. Bridges, J. W., "The Correlation Between College Grades and the Alpha Intelligence Tests", in Journal of Educational Psychology, Vol. II, p. 365,(1920).

b. Professor Watson sums up the good and bad in intelligence tests in substance as follows: How seriously should intelligence test scores be taken in guiding the life of a child? Does the IQ give a fair and full index of the worth of an individual to society? Most of the harm that has arisen in connection with the use of intelligence tests seems to have grown out of misunderstandings of the answer to these questions. Even scientifically trained psychologists have not always been careful to emphasize the distinction between a relationship which holds with great masses of data, and that which exists in a particular case, only in extreme cases can individual predictions of a far-reaching nature safely be made. A child born feeble-minded can be recognized within the first year or two of life and it can be ventured that he will never pass college entrance examinations and will probably never be elected to Congress. He may, however, as the best institutions have shown, be trained to earn his own living at useful tasks. A child with an IQ of 150 may have trouble with school work, but it is unlikely and the trouble is likely to be of an unusual sort.

When the intelligence test score of an ordinary person is known, that does not tell very much about him. Even in school work, where intelligence would seem to be more useful than anywhere else, the relationship is far from close. Spelling ability is very slightly related to intelligence. Handwriting shows almost no relationship. Exceptions are numerous even in the more "intellectual" subjects. If pupils are grouped by intelligence test scores into three sections, one bright, one average, and one dull, and if all three sections are given the same reading test, some of the dull section will prove better readers than some of the bright section. If the test be given in arithmetic, in language or science or history, the same result will be found.

Many other factors enter in to determine who succeeds in school. In one junior high school, 56 per cent of the failures had IQ's below 90, but it must be noted that nearly half of the failures come from a group normal or better in intelligence. A mid-western university carried on its customary process of sending home after Christmas those freshmen who were proving hopeless failures. To their dismay they later discovered that the average intelligence rating of students sent home was slightly higher than that of the students who were "making good". In an eastern college for men, a recent study

showed that 64 per cent of the failures during sophomore year were made by men above the campus average in intelligence.

Once outside the classroom the significance of an intelligence test score becomes much more doubtful. Tests in other fields have shown that an individual varies in his abilities. Some things he does well. Others he does poorly. The truth of the matter is that individual intelligence scores do not predict any other known ability of the individual with an accuracy that is 50 per cent better than chance.[1] Though we know in general that in the following abilities 1,000 children of high intelligence would excel on the average 1,000 children of low intelligence, we might about as well base our guess as to a particular child's achievement in them on a lottery number, or the length of his big toe, as on his IQ. The list is not exhaustive. The point, however, may be clear. Whatever may be true about people in large numbers, individual IQ's cannot be taken too seriously. In

1. Italics mine.

the past many school systems (including that of the New York City schools at present) employed psychologists who did little but give intelligence tests. The opposite tendency is exemplified by the "Psychological Consultation Centre" at Speyer Hall of Teacher's College, which is centering especial attention upon discovering the specific abilities possessed by each individual.

In answering the general question, "What good are the intelligence tests?" we have so far emphasized only the answer that they are not much good for sizing up a total personality. That is a far from adequate reply.[1] If we turn from predictions about specific persons to generalizations about groups of human beings, we come upon the major contributions of this movement in the last dozen years. We have learned that intelligence is distributed in much the same fashion that height is. There are a few very short persons, an equal number of very tall persons, with a completely continuous scale of heights in between. The largest

1. Italics mine.

number would be found near the average. In spite of some journalistic assumptions, we are not a nation of morons with a sprinkling of good minds at the top of the scale. About 1 per cent of the population is so mentally deficient as to need life-long institutional care. About the same proportion will be found possessing IQs in that superior class of 140 and above. Possibly more than half of the population can be expected to have IQ's in the normal range, between 90 and 110.

We have learned, too, that while individual exceptions need to be made, certain vocations, in general, require more intelligence than others. In the Army draft groups, the barbers had more intelligence than the farm laborers, the brakeman more than the bricklayers, the auto-mechanics more than the brakemen, the shipping clerks more than the auto-mechanics, the bookkeepers more than the shipping clerks, the dentists more than the bookkeepers, and the engineering officers and chaplains more than the dentists, yet this hierarchy is not, of course, absolute. There are certainly some happy and efficient farm laborers who excel in intelligence, some

engineers and ministers who are likewise happy and getting along reasonably well. The more general statement would be that men of high intelligence can succeed at almost any occupation for which they have the taste and other specialized abilities, whereas men of low intelligence are much less likely to succeed in the more complex and higher-level jobs.

One of the useful results of intelligence tests has been the undermining of a common superstition to the effect that men are intellectually superior to women. During childhood, at least, no such differences can be found. The slightly superior average test scores of boys in some tests given in the high school years is usually accounted for in terms of selection. Stupid boys are more likely to drop out and go to work than are stupid girls, who get on better in school as a rule than do boys of similar intelligence.

Of extraordinary value is the aid given by intelligence testing to the shattering of the popular notion that hard study of useless subjects is espec-

ially likely to develop the mind. This month, I suppose, fully 2,000,000 high school boys and girls in the United States will be misled into supposing that, while algebra or geometry or Latin may not appeal to them and may not have any direct use in their careers, nevertheless, these subjects will have special value in improving their mental faculties. Dr. E. L. Thorndike has given intelligence tests to some 11,000 high school pupils at the beginning and again at the end of the school year. His results confirm the other psychological findings. General intelligence develops quite as well in the pupil who is busy in a laboratory, enjoying literature, producing plays, learning accounting, practicing typewriting or household arts, as it does in a pupil with a classical curriculum. Serious questions about the value of much that is included in the curricula of high schools and colleges are arising from this observation.[1]

1. Watson, G. B., in Teacher's College Record, pp. 194-196, (Nov. 1930).

c. "Poor students in high school are poor in college too." That only one student in eight who ranks in the lower half of his high school class is able to complete an ordinary college course was pointed out by Dean Max McConn, of Lehigh University, visiting lecturer in college administration at Teachers College during the summer session. The lecture in which the point was made was reported by the New York Times.

"Observations over a period of years show that only one student in eight who ranks in the lower half of his high school class is able to complete an ordinary college course," Dean Max McConn said. He continued:

"'Many state universities are circumventing legal statutes, requiring them to admit all graduates of accredited high schools by 'advising' some students not to attend college and shunting others off from cultural and scientific courses into studies in the manuel arts".

"The period before 1875 was the Golden Age in American education", Dean McConn said. "During that era economic conditions were such that many positions were available without a college education. The only people who attended college in those days were natural students who loved learning for its own sake."

"By 1875 the rise of modern industry made training necessary. Students were stimulated to go to college for ulterior motives. In order to stem the barbarian invasion the better colleges set up systems of selection."

Dean McConn held that admission to college should be as highly selective as the circumstances of each particular institution will permit.

"The most effective method of college admissions is the system of selective certification, he said. This means that a student can enter college on a certificate from high school if he is in the first half or first third, or any fraction that any particular institution may care to select, of his class. Thus a college can be as liberal ar as exclusive as it desires. This plan has the additional advantages of requiring practically no administrative expense whatsoever.

> "All inflexible forms of selection were assailed by Dean McConn. He holds that the college admissions office should be de-mechanized and individualized."1

d. How mental tests can tell what you are fitted to do. It has been claimed that the psychologists can tell in a two-hour test whether one has a talent for music, drawing or mathematics. The purpose of this is to help determine what one is fitted to do. These tests are particularly useful to young men and women who are entering college. Often the whole future career of a young man or young woman is determined by financial or chance circumstances, whereas the ability of that person to do well in certain kinds of work should be the chief factor.

Often the father and mother choose a career for their children without considering their abilities. Tests have been devised which very accurately predict whether or not a person will make a success in a given field.

Psychological tests are being used to select the most intelligent and most competent candidates

1. The substance of this interview is taken from Teacher's College Record, p. 79, (Oct. 1930).

from a group of applicants for important posts in business and industrial firms. Dr. Brimhall of Columbia said, "It is astonishing how accurately these tests search out the intelligent and mentally alert employes in a business house." He had picked out the top-notchers of the top-notchers. The president of a firm did not take the tests, but Dr. Brimhall found the three vice-presidents among the first ten in the whole scoring. The young man who made the highest score was the president's right-hand man and confidential secretary. One obscure man was found to have a very high score and from that time on the president kept his eye on him. This test proved that the men who were on top in the organization were men of high intelligence, they were men who deserved to be on top. Those who made the highest scores: secretary, first vice-president, stenographer, auditor, assistant to sales manager, vice-president, cashier. Dr. Brimhall said:

> "The great value of giving intelligence tests to clerical workers is that it takes the misfits out of positions that don't suit them and places the alert ones in the busy corners, and rearranges the force according to an almost exact science of ability."

Dr. Brimhall relates an instance of two girls being employed as a clerk at the same time by the same employer. After twelve years with the same firm one was buying supplies for the company while the other was still doing routine work. These two ladies were recently given the psychological test. The one who had been promoted to the position buying supplies made a score of 140 while the one who was still doing the same routine work made a score of 83. We are getting away from guess work and will soon be able to give as accurate analysis of ability and character as a physician can of the blood and organs.[1]

e. Who should go to college. Young people may perhaps select themselves for higher education better than they can be selected by teachers or examiners.[2]

1. Saunders, J. M., "How Mental Tests can Tell What You are Fitted To Do", in American Magazine, Vol. XCVIII, pp. 46-56, (Dec. 1924).
2. Kirkpatrick, E. A., "Who Should Go To College", in Religious Education, Vol. X, p. 34, (Feb. 1915).

Mr. E. A. Kirkpatrick says:

> "Rapidly increase "open shop" educational activities and substitute for examination and marks, educational and personal history and objective tests that enlighten the individual regarding himself, and above all do I say, place the responsibility for obtaining culture more and more upon the individual. If this is done the persons who for the good of society should have a higher education will be able to select themselves for education and to graduate themselves when it has been properly completed. I hope the time will come when it may correctly be said, "He entered college" and "He graduated from college" instead of "He was admitted to college", and "He was graduated from college."[1]

Kirkpatrick goes on in the manner given below. In order to succeed in college work one must be able to enter into the Great Tradition with a certain minimum degree of ease and appreciation. The criterion for selecting these individuals can best be laid down by inquiring first what are the elements upon which academic success depends. The first requisite for success in college, over and above every other prerequisite, is a certain minimum of native intelligence. It is possible to graduate from a first-rate high school, and still not be a fit subject for the type of work which the college offers. The

1. Ibid., p. 39.

mastery of secondary school contents is not the baccalaureate honor. (2) A certain minimum of preparation is prerequisite to efficient and economical work in college. The extent and variety of specific preparation is not as great as many people would have it. (3) Character and moral habits are very important conditions of college success. Most prominent of the moral habits required is that of hard work. (4) The direct influence of health is an obvious requirement. (5) Interest is a factor of academic success. (6) An important factor is the adjustment of academic load to capacity. The wise choice of courses of study is more potent in producing success or failure than is commonly realized. (7) Worry and distractions of various sorts is a factor which frequently ruins a boy's academic record.

Such are the pillars of college success. The majority of them are subject to control. If a boy is lacking in preparation, but in other respects has the sort of stuff that college graduates are made of, his admission is merely delayed. If his health is poor, he can be sent to the infirmary or

a rest center for a season. His financial embarrassment may be relieved in different ways. His character and habits may be modified and improved. His interests may be developed to a great extent. But if he is low in mentality, regardless of other qualifications, it is not only useless but harmful and wasteful to admit him to an environment in which he is foredoomed to a cruel, discouraging, and demoralizing failure. All the seven factors which have been enumerated are important; one or another of them is, as has been shown, frequently decisive. But native ability is the sine qua non which sets the limits within which the other factors have significance for college work.[1]

6. Summary. From studies made elsewhere as reported in this chapter the instruments predicting college success may be ranked as follows:

a. The most reliable means of predicting academic success is a combination of intelligence and degree of application.

1. Wood, Ben D., Measurement in Higher Education, p. 134f.

> According to Ben D. Wood the intelligence test has been found to be not only as good a criterion for admission to college as any other single criterion thus far used, but it is more efficient and less expensive.

b. According to Brooks the high school marks are at present the greatest single basis for admission to the colleges of arts and sciences which has thus far been extensively investigated.

c. The value of entrance examinations as evidence of college success ranks next to that of high school marks. A general intelligence test is fairly accurate in failing a group of students who will not be found in the higher scholarship ranks in college. The test is not accurate when used as a means of exclusion, because many in the lowest ranks in intelligence scores do make satisfactory scholastic records in college.

d. Success in the freshman year in college can be predicted with greater accuracy from the entrance examination than from the intelligence tests.

e. Freshman grades are the best single index of a student's future success in college both as to his numerical grades and his ultimate chances of graduation from college.

f. In order to obtain an adequate estimate of a student, it is necessary to supplement the Thorndike score with individual tests, questionnaires, and follow-up studies.

g. The combination of high school standing and the score made on psychological tests has a high predictive value.

h. We find fairly uniform increments in both quantity and quality of academic work done as we go up the scale of intelligence scores.

i. In a certain college in Ohio State 81% of the delinquents were found to be students with intelligence scores equal to those received by the lowest 5 per cent of the whole student body.

j. Scholarship prediction is much less accurate for students above the ability threshold than for those below it. This may be due to lack of interest and effort on the part of some intellectually capable student.

k. A number of failures are due to faulty teaching and organization of the courses rather than to deficiencies in the students.

l. Prediction of college success can be improved by using measures having greater reliability.

Nevertheless the general trend of the literature is far from conclusive. It is somewhat vague and indefinite. It is for this reason that the study reported in this thesis has been made.

CHAPTER II

DESCRIPTION OF THIS STUDY

In gathering the material for this investigation the names of all the freshmen students entering the University of Tennessee in September, 1927, and those freshmen entering in September, 1928, were copied from the catalogues furnished by the Registrar's office. The records for a number of the students could not be found; therefore, their names were dropped from the list leaving 1226 students' records for the investigation.

The mental ages and intelligence quotients were obtained from the office of Dr. Joseph E. Avent, Professor of Educational Psychology, University of Tennessee. The intelligence test used by Dr. Avent was the Terman Group Intelligence Test. The English placement test used was the one made up by the English department of the University of Tennessee. The English placement grades for the 1928 class were obtained from the office of Dr. J. C. Hodges, Professor of English, University of Tennessee.

Tables were ruled off into ten or twelve divisions depending upon the number necessary for the grades.

The college grades were grouped under ten to twelve main heads. All natural science grades were put under the heading of natural science. All the English grades were put under the heading of English; all foreign language were grouped under the heading of foreign language and thus each subject was classified accordingly. Physical Education and Military Science were left out, because it was thought that these subjects required very little mental work, as compared with regular academic subjects.

The college grades were copied from the students' record cards in the office of Dean F. M. Massey, Dean of Men, University of Tennessee. The grades for the 1927 class were investigated for a three year period. The 1928 class had their records investigated for a two-year period. In copying these records, notations were made when students had been put on probation; when they had been dropped by the Administrative Council, or when they, for any other reason, had withdrawn. In this way it could, with few exceptions, be told how long each student was in

school and his score could more accurately be equated. Thirty-six of the above described tables were required for the college records. Eight of these tables, however, were not full pages.

In getting the high school records a regular-size sheet of note-book paper was ruled into six divisions, and the grades were grouped into six main heads, as English, mathematics, history, foreign language, science, and vocational subjects. The paper was placed directly over the first page of the table containing the college records to the right of the names. This was done in order to avoid the trouble of recopying the names, and to eliminate the possibility of getting high school records for students who had no college records.

Some of the high school grades were recorded in letters and some of them in figures. In order to get the scores in a position to correlate, it was necessary to assign arbitrarily some certain value to each score. After consulting a number of professors and graduate students in the University of Tennessee the values decided upon were as follows:

I	0,	D	7,	94-100	A,	65-74	D,
X	0,	C	8,	85-94	B,	55-64	E,
F	3,	B	9,	75-84	C,	0-54	F,
E	6,	A	10,				

These values were substituted for the grades.

The same number of tables was used for the high school as were used for the college records. The high school records were then pasted on the college records at the right side of the tables.

The copying of these records involved one hundred and eighty pages of notebook paper and two hundred and thirty hours time. This time was required for copying and making the tables.

Before these correlations could be computed some method of equating the college grades had to be found. It was decided to equate the college grades to two years. Thus, a person in school for five quarters has his score equated with those who were in school six quarters by dividing by five-sixths.

A student's score in his subject or in his whole record is the sum of the values of the letter grades he has made as found in the above described table.

For the high school total the actual total was used. For the subjects, as college English, college mathematics, college foreign language, high school English, and high school mathematics the average to one decimal point was used and multiplied by ten to get rid of the fraction. Those whose records were not complete were left out of the correlations.

During this investigation eleven correlations were computed, as shown in Chapter III. Not one of these correlations contained less than 576 students, and some contained as many as 1187 students. The total time required for these correlations was three hundred and fifty-four hours. Nothing else was attempted during the time that the correlations were being computed, except that which pertained to the computation of the correlations.

Every column of data was labeled at the time it was written. Each of the columns was checked. An adding machine was used for all additions. The additions were checked. In multiplying the deviations, a multiplication table up to 50X50 was used. In squaring the deviations a table, containing the squares of numbers from 1 to 1000, was used.

A study was made of forty students who did not remain in school long enough to receive a grade of any kind. The correlation between Intelligence quotients and English placement grades was r - .81. Twenty-seven, or 67.5% of the forty, had an intelligence score below the median for the University of

Tennessee which was 104. Fourteen out of 20 students, or 70%, had an English placement grade below the median score.

Since completing the correlations mentioned above it has been decided that a correlation be computed between intelligence quotients and English placement grades for those students having high intelligence quotients and also for those having low intelligence quotients. Therefore forty-six students with intelligence quotients ranging from 116 and up were selected for the high group and 37 of those having intelligence scores of 90 or below were taken for the lower group. Of the higher group only five out of forty-six or 10.8 per cent made an English placement grade below the average. The correlation was .80. Of the lower group, six, or 16.3 per cent made above the average English placement grade. The correlation between intelligence scores and English placement grades for the group making intelligence scores of 90 and below was .76.

The data gathered in this study will now be presented in Chapter III.

CHAPTER III

PRESENTATION OF DATA

The findings of this study are as follows:

TABLE XIII

Correlations in the University of Tennessee

Intelligence Quotients and Average College English, 1144 students,	r	.43
Intelligence Quotients and College Foreign Language, 664 students,	r	.38
Intelligence Quotients and English Placement, 596 students,	r	.55
Intelligence Quotients and Average College Record, 1169 students,	r	.25
Intelligence Quotients and College Mathematics, 848 students,	r	.28
Intelligence Quotients and High School Record, 1187 students,	r	.19
College English and High School English, 1131 students,	r	.38
College English and English Placement, 576 students,	r	.51
College Mathematics and High School Mathematics, 835 students,	r	.41
Average College Record and English Placement, 569 students,	r	.21
Average High School and Average College Record, 1145 students,	r	.22
Intelligence Quotients and English Placement grades for 46 students who had IQ of 116 and above,	r	.80
Intelligence Quotients and English Placement grades for 37 students who had IQ of 90 or below,	r	.76
Intelligence Quotients and English Placement grades for 40 students who did not remain in school long enough to receive a grade of any kind,	r	.81

The above table is the report of the real study. It took eight hundred and forty hours of work to gather the data and compute the correlations reported in Table XIII. These correlations were obtained by the"Pearson Product-Moment Method".

TABLE XIV

Correlations Between Success in College and (1) High-School marks, (2) Entrance Examinations, and (3) Intelligence Ratings.[1]

Reported by	Institution	Correlation Between College Marks and		
		High-School Marks	Entrance Examinations	Intelligence
Anderson & Spencer	Yale		.44,.44,.25,.34,.22,.45	.38,.37,.38
Arlitt & Hall	Bryn Mawr		.54,.55,.54,.52,.49,.64	.30,.10,.10,.20,.17, .27,.29,.35
Beatley	Harvard	.56,.56,.69,.58	.50,.46,.47,.41	
Bolenbaugh & Proctor	Stanford	.28,.49		.45,.37
Cocking	Iowa	.55		.44
Columbia College Report	Columbia	.45	.43,.57	
	Cornell	.47		
	Ohio State	.38	.55	
	Smith		.46,.40	
Dempster	Johns Hopkins	.53		.47
Ernest	Pittsburg			.41
Grauer & Root	Pittsburg			.39
Hawks	Gettysburg	.64		
	Johns Hopkins	.66,.77,.72		
	Vanderbilt	.69		
Johnston	Minnesota	.63		.50
Kornhauser	Chicago	.46,.51,.47,47	Read.Test.55,.32,.56,.54	.51,.42,.49,.51,.55
Lincoln	Harvard	.69	.47	
MacPhail	Brown	.29		.47
May	Syracuse	.41		.60
Murray	Sweet Briar			.42,.44
Nelson & Denny	Iowa St.Trs. Col.			.45,.49
Odell	Illinois	.55		.38
Proctor	Stanford	.45		.41
Quiler	Ohio State			.47,.52,.49,.
Rosenow	Kansas			.44
Scates	Chicago	.61	.46	
Seashore	Columbia	.35	.45,.59	
Smith	Iowa	.53		
Spencer	Johns Hopkins			.58,.51,.60,.41
Stone	Dartmouth			.44,.33,.50
Symonds	Hawaii	.52		.41
Terman	Arkansas	.54		.42 to .65
	Columbia	.63	.62,.50,.47,.25	.60
	Iowa	.53		
	Stanford	.54,.42		
	Texas	.69,.74,.65,.38		
Thurstone	26 Colleges			.24 to .56 Av. .45
Whitman	Minnesota	.40		Av. .29
Wood	Columbia	.26	.64	.49,.60,.67,.50,.59
Average		.53	.47	.44
Bott	Toronto Medicine		.27,.40	
Cleeton	Carnegie Inst. Tech.		Ia.Content, .49,.50	.44,.42
Thurstone	43 Engineering Schools	.29		

1. Brooks, Fowler D., op. cit., pp. 576-577.

In the reports which will be given, only the tables showing the findings in the University of Tennessee, and a table taken from Brooks's Psychology of Adolescence are included. The table from Brooks showing the results of other investigations is given in order ~~for~~ to provide a convenient comparison between the results of this study and the investigations made by other people for the past few years.

The tables containing the names of the students whose records were investigated, the intelligence quotient, mental ages, English placement grades, covered one hundred and sixty pages. The tables of correlation covered two hundred and fifty five pages, making a total of four hundred and fifteen pages devoted to tables alone. Since these tables are so voluminous and expensive to type it was thought best to leave them out of this report.

After the above correlations were completed, a survey was made of all the recent literature that could be found upon this subject and reported in Chapter I of this study. The information available indicate that the findings in the University of Tennessee are in keeping with the results of similar investigations recently made in other institutions. Some other investigations show higher coefficients of correlation

on certain subjects, and some show lower correlation than this study indicates.

The coefficient of correlation between intelligence quotients and college English for eleven hundred and forty-four students was found to be r .43. This is very close to that of the average high school English and Intelligence as given by Brooks[1] to be r .44. The correlation of college foreign language and intelligence quotient in this study for 664 students is .38. The correlation of high school foreign language grades and intelligence, as found by others, ranges from .26 to .43 with an average of .39.[2] There is thus practically no difference in the coefficient of correlation between intelligence and college foreign language grades and intelligence and high school foreign language grades.

Intelligence quotients and English placement grades for five hundred and ninety-six students gave the highest correlation of any of this study, being .55. MacPhail at Brown University found the correlation between a preliminary test on English and English I to be .419. Other studies made by Brooks reveal a correlation of .50 between English I in high school and the intelligence test result. The coefficient of correlation between entrance examinations and college

1. Brooks, Fowler D., op. cit. p. 567.
2. Ibid., p. 571.

success at Bryn Mawr was found by Arlitt and Hall to range from .42 to .64 averaging .55. They also found the correlation between intelligence and entrance examinations to be .245. Taking the findings of all the investigations made by other people we find the correlation between entrance examinations and college success ranging from .22 to .64 with average centering around .47. Dempster at Johns Hopkins University reported a correlation of .47 between college marks and intelligence. Johnston at the University of Minnesota reported correlation between intelligence and college marks to be .60. May at Syracuse University reported a correlation of .60 between intelligence and college marks. McCrory at St. Cloud, Minnesota, Teacher's College reported a correlation bf .66 between intelligence and college marks. Symonds at the University of Hawaii reported a correlation of .41 between intelligence and college marks.

In this investigation, the correlation between intelligence test scores and average college record, for 1169 students is .25. This finding is in keeping with Thurston's[1] findings. The correlation in this instance is low, but not as low as the lowest correlations found

1. Brooks, op. cit., p. 577.

by other people.

After examining students in twenty-six institutions Thurston reported a correlation of .24 to .56 between intelligence and college success. This is considerably lower than the correlation of .52 between Alpha intelligence scores and college grades in the case of 159 women students in Southern Methodist University.[1] Other findings show correlations ranging from .10 to .67 with an average of .44.

The correlation between intelligence and scores in college mathematics for eight hundred and forty eight students is .28. In a study very closely related to this, Brooks gives a correlation between Junior High School Mathematics and Intelligence of .44; between average high school mathematics and intelligence of .43; between geometry and intelligence of .51; and between algebra II and intelligence of .49.[2]

The correlation of .19 between intelligence test scores and average high school record for 1187 students seem to be very low. An effort was made to find the results of other investigations on this particular correlation in order to compare the results, but nothing could be found.

1. Bridges, J. W., "The Correlation Between College Grades and the Alpha Intelligence Tests," in Journal of Educational Psychology, Vol. II, p. 365, (1920).
2. Brooks, Fowler D., op. cit., p. 568.

The correlation between college English marks and high school English marks was found in this study to be .38 for 1131 students in the University of Tennessee. In correlating the scores of high school English III and high school English I in high school Brooks obtained a correlation identical with that of this study.

MacPhail[1] at Brown University computed the correlation between the scores on a preliminary English examination and the scores made in college English I. The correlation was found to be .416. The writer found the correlation between college English scores and English placement scores for 596 students in the University of Tennessee to be .51.

The correlation between high school mathematics scores and college mathematics scores is by this study .41.

The average college record scores and the English placement scores gave a correlation of .21. The writer was unable to find any records with which to compare this correlation.

The correlation between average high school marks and average college grades for 1145 students is .22. This is somewhat lower than the average correlation of

1. MacPhail, A. M., "Classification of Freshmen at Brown University", in Journal of Educational Research, Vol. XIV, pp. 365-369, (1926).

Table XIV which is .53. From the results of other investigations it seems that high school marks have a high predictive value of college success. Indeed one would expect the two to bear a reasonably close relation. Dempster at Johns Hopkins University reported a correlation between college marks and average high school marks to be .53. May at Syracuse University reports a correlation between college marks and average high school marks to be .66. Symonds, at University of Hawaii, reported a correlation of college marks with high school average to be .52. All the above mentioned correlations are considerably higher than that found in the University of Tennessee.

To Quote Brooks, p. 563, foot-note.

> "In another investigation by the author the average marks of 45 freshmen correlated .81 with their average marks the following year; the correlations between sophomore and junior marks were .74 and .85 for two successive classes numbering 36 and 44 pupils, respectively. The corresponding correlations between combined intelligence ratings on two group tests and average school marks were .61, .47, and .34, respectively."

The intelligence quotient and English placement grade for those students who dropped out of school before receiving a grade was computed and found to be .81. From this investigation it seems that students who have low intelligence quotients and also low English placement grades are the ones who drop out of school first.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. Summary.

a. From survey of the literature.

1) In recent years many of our American colleges have been over crowded, and doubtless have enrolled many students who can not, or do not, use profitably the educational facilities provided for them. Because of this fact many colleges have adopted the plan of selecting for admission those students who give promise of profiting most by the training which the college offers. There are being used and proposed various basis for admission. The three following methods singly or in combination have wide use: (a) certificate of graduation from high school, with fifteen acceptable credits; (b) passing marks on entrance examinations; (c) satisfactory scores on entrance examinations.

2) It seems that the most significant application of intelligence tests to university students at the present time is the use of the Thorndike tests by the department of admissions of Columbia College. The test seems to detect the poorer students. The greatest value of the intelligence test lies in the fact that it furnishes data not dupli-

cated from any other source. Better than any other source of information, it tells us what quality of work we have a right to expect. It enables us to discriminate between the intelligent student whose failure is avoidable and the student whose inferior native ability renders him comparatively incapable of obtaining an education. It might be truly said that there are few intelligence tests which have not been tried out on college students, and very few upon which we do not have some kind of a report. Perhaps the most popular group test is the army test. One would not think of using the intelligence examination as the only criterion for admission. A combination of two or more basis is likely to be more effective than any single basis. Proctor has suggested a three-fold basis for admission to college which consists of: (a) a scholarship-rating based on all high school marks; (b) the intelligence test score on the Thorndike test; (c) character ratings by high school teachers. Such a comprehensive basis would naturally be expected to produce better results.

3) Two forms of entrance admissions exist at Yale. Under the old plan students are admitted upon passing a number of examinations total-

ing fifteen entrance credits, and usually involving twelve to fifteen separate papers. Under the new plan students of high preparatory standing may take four examinations on subjects which they studied during their last year in high school, and be admitted on the basis of these scores alone, if their preparatory standing has been high in other subjects. The new plan entrants are probably a higher selection of students. A greater percentage of the new plan entrants gain their degree than those who enter under the old plan.

4) At Brown University, in 1924, the Brown psychological test and the classification test in English was given to 313 freshmen. For both of these tests the prognosis was considerably greater in the low ranges than in the high. Those who score low on either test seldom do well in English, but those who score high very often do a grade of work which is apparently below their ability.

5) There is a very moderate degree of correlation between the Thorndike examination score and the average academic grade for the first two years. This situation holds true for the average academic grade of the entire four years of the college course. The correlation between the Thorndike

score and the average academic grade is too low to justify the exclusion of students from college on the basis of the Thorndike rating alone. A high Thorndike score does not necessarily imply high scholarship, great social intelligence, or pronounced intellectual interests; nor does an average or low Thorndike score imply average or low scholarship, intellect, or social intelligence. Other intellectual elements, exclusive of those measured by the Thorndike tests, are operating in many instances of superior scholarship. The Thorndike tests, although they do not have high predictive value, are very useful in the study of individual cases since they isolate and measure an aspect of intelligence of considerable importance for scholarship. In order to obtain an adequate intellectual estimate of a student, it is necessary to supplement the Thorndike score with individual tests, questionnaires, and follow-up studies.

6) According to Brooks the intelligence test ranks third among the three basis of admission. Many elements may enter into the basis of predicting college success, such as: (a) the record of high school scholarship; (b) the results

of psychological tests; (c) the interest of students; (d) their activities and experience during the high school period; (e) the advanced studies taken in high school; and (f) estimates by principal and teachers. By this more than one-half of those who are unable to do college work are identified in advance. Predicting distinguished scholarship is much more difficult than predicting poor scholarship.

7) High school marks furnish a fairly good, but by no means absolutely satisfactory, basis for predicting college success.

8) Arlitt and Hall at Bryn Mawr found that success in the freshman year in college can be predicted with greater accuracy from the entrance examination than from the intelligence tests. They also found that the intelligence tests selects the students who will do the poorest work in college better than does either the Thurstone test or the entrance examinations. The fact that the scores in intelligence tests and college marks do not show closer agreement may be explained by the fact that the students dealt with are a highly selective group from which the less able ones have

been eliminated by failure to pass the entrance examinations.

9) According to Brooks the high school marks are at present the best single basis for admission to colleges of arts and sciences which thus far have been extensively investigated.

10) In predicting academic success May says: "That general intelligence is the most important single factor there is no doubt." The most reliable means of predicting academic success is a combination of intelligence and degree of application. We have quite a few students who make high intelligence scores but make low scholarship scores. The "reasons" for such behavior may be looked for in terms of such things as poor application, inefficient study habits, late hours, inadequate study, and environment. Brooks makes the statement "that the value of entrance examination as evidence of college success in college ranks next to that of high school marks.

11) "A general intelligence test is fairly accurate in failing a group of students who will not be found in the higher scholarship ranks in college. The test is not accurate when used as a means of exclusion, because many in the lowest ranks in intelligence scores do make satisfactory scholastic records in college."[1]

1. Brooks, Fowler D., op. cit., p. 563.

12) Colleges can probably improve the predictive value of high school marks by carefully studying the records of students so as to determine the actual value of the marks from each school for predicting college scholarship.

13) Dean Max McConn, of Lehigh University has pointed out that only one student in eight who ranks in the lower half of his high school class is able to complete the ordinary college course. Dean McConn also said that the most effective method of college admissions is the system of selective certification. This means that a student can enter college on a certificate from high school if he is in the first half, or first third, or any fraction that any particular institution may care to select, of his class.

14) Mr. Wood says in Summary:
The first requisite for success in college is a certain minimum of native intelligence. (b) A certain minimum of preparation is prerequisite to efficient and economical work in college. (c) Character and moral habits are very important con-

ditions of college success. (d) The direct influence of health is an obvious requirement. (e) Interest is a factor of academic success. (f) An important factor is the adjustment of academic load to capacity. (g) Worry and distraction are hindrances.

b. From this study.

1) After making an intensive study of the available literature on this subject it was found that the correlations computed in the University of Tennessee are quite in keeping with the results obtained by recent investigations in other institutions. Some of the other investigations show higher coefficient of correlation than this study indicates. However, when the results of the recent studies are averaged, we find that the results of the study made at the University of Tennessee are very close to those previously found in other schools.

2) According to this study intelligence quotients and English placement grades correlate higher than any of the others, beingg .55. It is possible that intelligence quotients and English placement in combination would be a better means of predicting college success than any of the other subjects correlated in this study.

3) The correlation between college English and English placement ranks second, being .51. English placement grades seem thus a fair basis of predicting college success.

4) Intelligence quotients and average college English ranks third, giving a correlation of .43. When intelligence quotients and any kind of English scores or any other college subject are computed we get a correlation which does not greatly differ from each other.

5) College mathematics and high school mathematics give a correlation of .41 which is in keeping with other studies of correlations between high school marks and college marks, found in Table XIV, page 69.

6) When the correlation was computed between intelligence quotients and English placement grades for those students who dropped out of school before they received a grade, it was found to be .81. It is interesting to note that the correlation of .81 for this group is of the same order as for the group having intelligence quotients of 116 or above, while similar correlation for 596 students was considerably lower, being .55.

2. Conclusions:

a. The correlation between no two sets of

scores in this study is sufficiently high to justify their use alone for admission to college. It seems that there is very little difference in the predictive value of high school marks and intelligence scores.

b. A combination of two or more bases is likely to be better than any one basis alone. The evidence indicates that high school marks and intelligence examinations together give better prediction than either one by itself. The more comprehensive the basis, for admission, the better it is. Colleges can probably improve the predictive value of high school marks by making a careful study of the records of the students so as to determine the actual value of the marks from each school for predicting success in college.

c. The low correlations found in this study and also in the survey material are probably due to the fact that most of the marks given in college were subjective rather than objective. It is the writers belief that, if objective methods were used in grading all college examinations, the correlation between intelligence test scores and

college grades would have been much higher.

d. Intelligence rating is only one factor in the total makeup of the individual. Success in college depends upon much more than merely abstract intelligence as measured by the ordinary group test. Information is needed as to a student's purpose and aim in life, his academic, vocational, his character qualities, his health, his family, and his previous life. Intelligence tests throw some light on the question as to whether a student is better fitted for a professional work, if their other qualifications are suitable. Society needs high grade men in the professions. The tests indicate to some extent what type of mind the student possesses. They seem somewhat unfair to men who are plodders, but careful and accurate thinkers. They make possible a distinction between character qualities and mental alertness. Intelligence tests throw light on the home environment and educational equipment of the student. They show the presence or absence of scholarly ambitions and ideals. Intelligence quotients show whether it is desirable for a student to continue in college or withdraw.

3. Recommendations:

a. The writer would not think of recommending either the high school marks, or the intelligence quotients alone, as a sole criterion for admission to college, but a combination of the two.

b. Entrance examination on English is recommended for all students upon entering the university as freshmen. This examination serves not only for prediction, but may be used to help arrange the students into a more homogeneous group for English teaching.

c. High school marks should be examined to determine their real value. In some schools where the subjective method of grading is used the marks on the students' cards may not truly represent his knowledge.

d. Intelligence tests are recommended for use in the following different ways:

1) As one means for determining admission to college or university;

2) For the sectioning of large classes into groups of more homogeneous mentality;

3) As helpful in giving educational advice as to the classes a student should select or the number of hours he should carry;

4) As an element in the vocational guidance of students in helping them decide the profession or occupation they should choose;

5) As helpful in leading to a better understanding of the delinquent student or the student on probation;

6) To stimulate the brighter student to work up to capacity;

7) To select the brightest students and guide them in their work and choice of a career;

BIBLIOGRAPHY

BOOKS

Brooks, F. D., Psychology of Adolescence, pp. 555-583, Houghton Mifflin Company, Chicago, 1929.

Pintner, R., Intelligence Testing, pp. 266-276, Henry Holt and Company, New York, 1923

Wood, Ben D., Measurement in Higher Education, pp. 1-137, World Book Company, Yonkers, New York, 1923.

PERIODICALS

Anderson, J. E., and Spencer, L. T., "Predictive Value of the Yale Classification Test", in School and Society, Vol. XXIV, pp. 305-12, (Sept. 4, 1926).

Arlitt, A. H., and Hall, S. G., "Intelligence Test versus Entrance Examination as a Means of Predicting Success in College", in Journal of Applied Psychology, Vol. VII, pp. 331-333, (1923).

Bridges, J. W., "The Correlation Between College Grades and the Alpha Intelligence Tests", in Journal of Educational Psychology, Vol. II, pp. 365-367, (1920).

Dilley, F. B., "Scholastic Records of Students Failing a General Intelligence Test", in School and Society, Vol. XXXVIII, pp. 311-14, (Feb. 28, 1931).

Grauer, D., and Root, W. T., "Thorndike Intelligence Tests and Academic Grades", in Journal of Applied Psychology, Vol. XI, pp. 298-310, (1927).

Hawks, H. E., Dean of Columbia College, "Intelligence Test as One Basis of Admission to College", in Educational Association, pp. 438-439, (1926).

Johnson, J. B., "Predicting Success or Failure in College at the Time of Entrance", in School and Society, Vol. XIX, pp. 772-776, (1924).

Johnson, J. B., "Predicting Success or Failure for the High School Senior", in The Educational Record, Vol. IX, pp. 17-25, (Jan. 1928).

Koulfers, M., "Intelligence of 1002 Students of Foreign Language", in School and Society, Vol. XXVIII, pp. 597-599, (Nov. 1928).

Kirkpatrick, E. A., "Who Should Go To College", in Religious Education, Vol. X, p. 34, (Feb. 1915).

MacPhail, A. M., "Classification of Freshmen at Brown University", in Journal of Educational Research, Vol. XIV, pp. 365-369, (1926).

McConn, Max, "Poor Students in High School are Poor in College Too", in Teacher's College Record, p. 79, (Oct. 1930).

May, A. M., "Predicting Academic Success", in Journal of Educational Psychology, Vol. XIV, pp. 439-440, (1923).

Saunders, J. M., "How Mental Tests Can Tell What You are Fitted to Do", in American Magazine, Vol. XCVIII, pp. 46-56, (Dec. 1924).

Toops, H. A., "Prediction of Scholastic Success in College", in School and Society, Vol. XXV, pp. 265-268, (Feb. 26, 1927).

Watson, G. B., "The Good and Bad in Intelligence Tests", in Teacher's College Record, pp. 194-196, (Nov. 1930).

STUDENT RECORD

College students records, classes entering 1927, 1928, Registrar's office, University of Tennessee.

English Placement Tests, in University of Tennessee, class entering 1928, office Dr. J. C. Hodges, Professor of English.

High School records, same classes as for college students, Registrar's office, University of Tennessee.

Intelligence records, same classes as for college students, office Dr. Jos. E. Avent, Professor of Educational Psychology and Director of Test service, University of Tennessee.

SUPPLEMENTARY

The tests hereto attached are the ones hitherto mentioned.

Total Score:.....

THE UNIVERSITY OF TENNESSEE

Placement Test in English

September 19, 1928

Name ....
Last name First name Middle initial

High School .....

Year Graduated..... Home Address.....

Name of Last English Teacher.....

In what college of the University do you expect to register?.....

I (20%)

Cross out all incorrect words in the following sentences:

1. One of the students (has, have) just left the room.
2. His disparaging remarks (is, are) not to be tolerated.
3. A complete set of utensils, including all necessary articles, (was, were) ordered.
4. Everyone of the delegates (was, were) present.
5. Each of the members of the cast (is, are) perfect in (his, their) parts.
6. Every loyal person (speak, speaks) well of (his, their) friends.
7. Neither of the studies you suggest (meets, meet) with my approval.
8. You can be sure that (he, him) and (I, me) will do the work.
9. You will be safe in trusting the work to (he, him)and (I, me).
10. There is no point to (us, our) going early.
11. (Who, whom) did you say they chose?
12. Everyone (has, have) (his, their) opinions on this subject.
13. (We, us) boys are going to buy one of (them, those) new cameras.
14. His careful study of these matters (make, makes) him an authority on them.

Score: (20 minus wrongs).....

II (20%)

Punctuate each of the following sentences:

1. When the work was finished the men resumed their journey.
2. There are however serious objections to the plan.
3. The fighting ceased on November 11 1928.
4. Well what are you waiting for?
5. The situation is not as a matter of fact as serious as it was at first thought to be.
6. We had coffee ham and eggs and bread and butter for breakfast.
7. Although I was present I did not take an active part in the meeting.
8. She was not courteous to customers therefore she lost her position.
9. French is difficult for her German is more difficult.
10. I attended classes but I did not recite.
11. The shoes do not fit for the last is too narrow.
12. There are times she said when I wish I had not come.
13. Pardon me but could you tell me where the office is?
14. Ask Mr Jones the information clerk.
15. Now that you are here what do you want?
16. We came late we neglected our studies we failed to write our papers we failed.
17. Being afraid to speak I kept silent.
18. Please pull down the shade the light hurts my eyes.
19. He registered for the following courses English French and Latin.
20. He was not interested in his work therefore he failed to make satisfactory progress.

Score: (20 minus wrongs).....

III (20%)

Some of the following sentences are good and some are bad. Check those which are good and re-write and correct those which are bad.

1. His conduct was consistent with his theory.
2. He said that he had been there and was going again.
3. She was worn out. Chiefly from her hard day at the fair.
4. Though possible, it is not probable.
5. Arriving at midnight, the inn was closed.
6. He asked several girls for a dance in a crude manner.
7. The farm being free from debt when he inherited it.
8. I began to fear that I should not complete the work I had planned.
9. He has bought a new car. Which is what he should have done long ago.
10. She spoiled her letter, she spilled ink on it.

Score; (20 minus two times wrongs).....

IV (40%)

On this and the following page write a theme of about 250 words on one of the following subjects:

1. My Favorite Sport.
2. Gardening.
3. The Kind of Novel I Like.
4. My Favorite Study.
5. My Ambition.

Score: (Percentage of 40).....

Paper read by.....

Total Score:.....

THE UNIVERSITY OF TENNESSEE

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September 19, 1928

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High School .....

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Score: (Percentage of 40).....

Paper read by.....

TERMAN GROUP TEST OF MENTAL ABILITY

For Grades 7 to 12

Prepared by Lewis M. Terman, Stanford University, California

EXAMINATION: FORM A

1. Name ..... (First name / Last name)
2. Boy or girl.....Grade.....High or Low.....
3. Age last birthday.....Date of birthday..... (Month / Day / Year)
4. Name of city (or county).....
5. Name of school.....
6. Name of teacher.....
7. Date of this examination.....19..... (Month / Day / Year)

Do not turn the page until you are told to.

Test	Score	Remarks or Further Data
1. Information		
2. Best Answer		
3. Word Meaning		
4. Logical Selection		
5. Arithmetic		
6. Sentence Meaning		
7. Analogies		
8. Mixed Sentences		
9. Classification		
10. Number Series		
Total		

TEST 1. INFORMATION

Draw a line under the ONE word that makes the sentence true, as shown in the sample.

SAMPLE. Our first President was
Adams Jefferson Lincoln Washington

1 Coffee is a kind of
bark berry leaf root 1

2 Sirloin is a cut of
beef mutton pork veal 2

3 Gasoline comes from
grains petroleum turpentine seeds..... 3

4 Most exports go from
Boston San Francisco New Orleans New York. 4

5 The number of pounds in a ton is
1000 2000 3000 4000..... 5

6 Napoleon was defeated at
Leipzig Paris Verdun Waterloo 6

7 Emeralds are usually
blue green red yellow 7

8 The optic nerve is for
seeing hearing tasting feeling..... 8

9 Larceny is a term used in
medicine theology law pedagogy 9

10 Sponges come from
animals farms forests mines..... 10

11 Confucius founded the religion of the
Persians Italians Chinese Indians..... 11

12 The larynx is in the
abdomen head throat shoulder..... 12

13 The piccolo is used in
farming music photography typewriting 13

14 The kilowatt measures
rainfall wind-power electricity water-power.... 14

15 The guillotine causes
death disease fever sickness 15

16 A character in " David Copperfield " is
Sindbad Uriah Heep Rebecca Hamlet 16

17 A windlass is used for
boring cutting lifting squeezing 17

18 A great law-giver of the Hebrews was
Abraham David Moses Saul..... 18

19 A six-sided figure is called a
scholium parallelogram hexagon trapezium.... 19

20 A meter is nearest in length to the
inch foot yard rod..... 20

Right.....

TEST 2. BEST ANSWER

Read each question or statement and make a cross before the BEST answer, as shown in the sample.

SAMPLE

Why do we buy clocks? Because
1 We like to hear them strike.
2 They have hands.
× 3 They tell us the time.

1 **Spokes of a wheel are often made of hickory because**
1 Hickory is tough.
2 It cuts easily.
3 It takes paint nicely.

2 **The saying, "A watched pot never boils," means**
1 We should never watch a pot on the fire.
2 Boiling takes a long time.
3 Time passes slowly when we are waiting for something.

3 **A train is harder to stop than an automobile because**
1 It has more wheels.
2 It is heavier.
3 Its brakes are not so good.

4 **The saying, "Make hay while the sun shines," means**
1 Hay is made in summer.
2 We should make the most of our opportunities.
3 Hay should not be cut at night.

5 **If the earth were nearer the sun**
1 The stars would disappear.
2 Our months would be longer.
3 The earth would be warmer.

6 **The saying, "If wishes were horses, beggars would ride," means**
1 Wishing doesn't get us very far.
2 Beggars often wish for horses to ride.
3 Beggars are always asking for something.

7 **The saying, "Little strokes fell great oaks," means**
1 Oak trees are weak.
2 Little strokes are best.
3 Continued effort brings results.

8 **A steel battleship floats because**
1 The engines hold it up.
2 It has much air space inside.
3 It contains some wood.

9 **The feathers on a bird's wings help him to fly because**
1 They make a wide, light surface.
2 They keep the air off his body.
3 They decrease the bird's weight.

10 **The saying, "A carpenter should stick to his bench," means**
1 Carpenters should not work without benches.
2 Carpenters should not be idle.
3 One should work at the thing he can do best.

11 **The saying, "One swallow does not make a summer," means**
1 Swallows come back for the summer.
2 A single sign is not sufficient proof.
3 Many birds add to the pleasures of summer.

Right..... × 2 = *Score*.....

TEST 3. WORD MEANING

When two words mean the SAME, draw a line under "SAME."
When they mean the OPPOSITE, draw a line under "OPPOSITE."

SAMPLES	fall — drop	same — opposite	
	north — south	same — opposite	
1	expel — retain	same — opposite	1
2	comfort — console	same — opposite	2
3	waste — conserve	same — opposite	3
4	monotony — variety	same — opposite	4
5	quell — subdue	same — opposite	5
6	major — minor	same — opposite	6
7	boldness — audacity	same — opposite	7
8	exult — rejoice	same — opposite	8
9	prohibit — allow	same — opposite	9
10	debase — degrade	same — opposite	10
11	recline — stand	same — opposite	11
12	approve — veto	same — opposite	12
13	amateur — expert	same — opposite	13
14	evade — shun	same — opposite	14
15	tart — acid	same — opposite	15
16	concede — deny	same — opposite	16
17	tonic — stimulant	same — opposite	17
18	incite — quell	same — opposite	18
19	economy — frugality	same — opposite	19
20	rash — prudent	same — opposite	20
21	obtuse — acute	same — opposite	21
22	transient — permanent	same — opposite	22
23	expel — eject	same — opposite	23
24	hoax — deception	same — opposite	24
25	docile — submissive	same — opposite	25
26	wax — wane	same — opposite	26
27	incite — instigate	same — opposite	27
28	reverence — veneration	same — opposite	28
29	asset — liability	same — opposite	29
30	appease — placate	same — opposite	30

Right.....*Wrong*.....*Score*.....

TEST 4. LOGICAL SELECTION

In each sentence draw a line under the TWO words that tell what the thing ALWAYS has. Underline TWO, and ONLY TWO, in each line.

SAMPLE. A man always has
body cap gloves mouth money

1 A horse always has
harness hoofs shoes stable tail 1
2 A circle always has
altitude circumference latitude longitude radius 2
3 A bird always has
bones eggs beak nest song 3
4 Music always has
listener piano rhythm sound violin 4
5 An object always has
smell size taste value weight 5

6 Conversation always has
agreement persons questions wit speech 6
7 A banquet always has
food music persons speeches toastmaster 7
8 A pistol always has
barrel bullet cartridge sights trigger 8
9 A ship always has
engine guns keel rudder sails 9
10 A debt always involves
creditor debtor interest mortgage payment 10

11 A game always has
cards contestants forfeits penalties rules 11
12 A magazine always has
advertisements paper pictures print stories 12
13 A museum always has
animals arrangement collections minerals visitors 13
14 A forest always has
animals flowers shade underbrush trees 14
15 A citizen always has
country occupation privileges property vote 15

16 Controversy always involves
claims disagreement dislike enmity hatred 16
17 War always has
airplanes cannons combat rifles soldiers 17
18 Obstacles always bring
difficulty discouragement failure hindrance stimulation .. 18
19 Abhorrence always involves
aversion dislike fear rage timidity 19
20 Compromise always involves
adjustment agreement friendship respect satisfaction ... 20

Right .....

TEST 5. ARITHMETIC

Find the answers as quickly as you can.
Write the answers on the dotted lines.
Use the bottom of the page to figure on.

---

1 How many hours will it take a person to go 66 miles at the rate of 6 miles an hour? *Answer*.....

2 At the rate of 2 for 5 cents, how many pencils can you buy for 50 cents? *Answer*.....

3 If a man earns $20 a week and spends $14, how long will it take him to save $300? *Answer*.....

4 $2 \times 3 \times 4 \times 6$ is how many times as much as 3×4? *Answer*.....

5 If two pies cost 66 cents, what does a sixth of a pie cost? *Answer*.....

6 What is $16\frac{2}{3}$ per cent of $120? *Answer*.....

7 4 per cent of $1000 is the same as 8 per cent of what amount? *Answer*.....

8 A has $180, B has $\frac{2}{3}$ as much as A, and C has $\frac{1}{2}$ as much as B. How much have all together? *Answer*.....

9 The capacity of a rectangular bin is 48 cubic feet. If the bin is 6 feet long and 4 feet wide, how deep is it? *Answer*.....

10 If it takes 7 men 2 days to dig a 140-foot ditch, how many men are needed to dig it in half a day? *Answer*.....

11 A man spends $\frac{1}{4}$ of his salary for board and room, and $\frac{3}{8}$ for all other expenses. What per cent of his salary does he save? *Answer*.....

12 If a man runs 100 yards in 10 seconds, how many feet does he run in $\frac{1}{5}$ of a second? *Answer*.....

Right..... $\times 2 =$ *Score*.....

TEST 6. SENTENCE MEANING

Draw a line under the right answer, as shown in the samples.

SAMPLES	Is coal obtained from mines?	Yes	No	
	Are all men six feet tall?	Yes	No	
1	Does a conscientious person ever make mistakes?	Yes	No	1
2	Is an alloy a kind of musical instrument?	Yes	No	2
3	Is scurvy a kind of medicine?	Yes	No	3
4	Are mysterious things often uncanny?	Yes	No	4
5	Are destitute persons often subjects of charity?.....	Yes	No	5
6	Are anonymous letters ever properly signed?	Yes	No	6
7	Is the mimeograph sometimes used by stenographers?.	Yes	No	7
8	Is a curriculum intended for horses?.....	Yes	No	8
9	Are proteids essential to health?	Yes	No	9
10	Does " perfunctory " mean the same as " careful "?..	Yes	No	10
11	Are premeditated deeds always wicked?	Yes	No	11
12	Do alleged facts often require verification?	Yes	No	12
13	Are sheep carnivorous?	Yes	No	13
14	Are aristocrats subservient to their inferiors?	Yes	No	14
15	Are venerable people usually respected?	Yes	No	15
16	Is clematis sometimes cultivated?	Yes	No	16
17	Are ultimate results the last to appear?.....	Yes	No	17
18	Are cerebral hemorrhages helpful to thinking?	Yes	No	18
19	Are all people religious who have hallucinations?.....	Yes	No	19
20	Are intermittent sounds discontinuous?	Yes	No	20
21	Are sable colors preferred for nations' flags?	Yes	No	21
22	Does social contact tend to reduce eccentricities?	Yes	No	22
23	Are tentative decisions usually final?	Yes	No	23
24	Is rancor usually characterized by persistence?	Yes	No	24

Right.....*Wrong*.....*Score*.....

TEST 7. ANALOGIES

SAMPLES

Ear is to hear as eye is to
table see hand play

Hat is to head as shoe is to
arm coat foot leg

Do them all like samples.

---

1 Coat is to wear as bread is to
eat starve water cook..... 1

2 Week is to month as month is to
year hour minute century..... 2

3 Monday is to Tuesday as Friday is to
week Thursday day Saturday..... 3

4 Tell is to told as speak is to
sing spoke speaking sang..... 4

5 Lion is to animal as rose is to
smell leaf plant thorn..... 5

6 Cat is to tiger as dog is to
wolf bark bite snap..... 6

7 Success is to joy as failure is to
sadness luck fail work..... 7

8 Liberty is to freedom as bondage is to
negro slavery free suffer..... 8

9 Cry is to laugh as sadness is to
death joy coffin doctor..... 9

10 Tiger is to hair as trout is to
water fish scales swims..... 10

11 1 is to 3 as 9 is to
18 27 36 45..... 11

12 Lead is to heavy as cork is to
bottle weight light float..... 12

13 Poison is to death as food is to
eat bird life bad..... 13

14 4 is to 16 as 5 is to
7 45 35 25..... 14

15 Food is to hunger as water is to
drink clear thirst pure..... 15

16 b is to d as second is to
third later fourth last..... 16

17 City is to mayor as army is to
navy soldier general private..... 17

18 Here is to there as this is to
these those that then..... 18

19 Subject is to predicate as noun is to
pronoun adverb verb adjective..... 19

20 Corrupt is to depraved as sacred is to
Bible hallowed prayer Sunday..... 20

Right.....

TEST 8. MIXED SENTENCES

The words in each sentence below are mixed up. If what a sentence means is TRUE, draw a line under "TRUE." If what it means is FALSE, draw a line under "FALSE."

SAMPLES	hear are with to ears	true	false	
	eat gunpowder to good is	true	false	
1	true bought cannot friendship be	true	false	1
2	good sea drink to is water	true	false	2
3	of is the peace war opposite.....	true	false	3
4	get grow they as children taller older.....	true	false	4
5	horses automobile an are than slower.....	true	false	5
6	never deeds rewarded be should good	true	false	6
7	four hundred all pages contain books.....	true	false	7
8	to advice sometimes is good follow hard	true	false	8
9	envy bad greed traits are and	true	false	9
10	grow an than strawberries oak tree higher	true	false	10
11	external deceive never appearances us	true	false	11
12	never is man what show a deeds.....	true	false	12
13	hatred bad unfriendliness traits are and	true	false	13
14	often judge can we actions man his by a	true	false	14
15	in are always American cities born presidents	true	false	15
16	certain always death of cause kinds sickness	true	false	16
17	are sheet blankets as as a never warm.....	true	false	17
18	never who heedless those stumble are	true	false	18

Right.....*Wrong*.....*Score*.....

TEST 9. CLASSIFICATION

SAMPLES
1 bullet cannon gun sword ~~pencil~~
2 Canada ~~Chicago~~ China India France

In each line cross out the word that does not belong there.
Cross out JUST ONE WORD in each line.

1	Frank James John Sarah William	1
2	Baptist Catholic Methodist Presbyterian Republican	2
3	automobile bicycle buggy telegraph train	3
4	Collie Holstein Shepherd Spitz Terrier	4
5	hop run skip stand walk	5
6	death grief picnic poverty sadness	6
7	bed chair dish sofa table	7
8	hard rough smooth soft sweet	8
9	mechanic doctor lawyer preacher teacher	9
10	Christ Confucius Mohammed Moses Cæsar	10
11	butterfly hawk ostrich robin swallow	11
12	cloth cotton flax hemp wool	12
13	digestion hearing sight smell touch	13
14	down hither recent up yonder	14
15	anger hatred joy pity reasoning	15
16	Australia Cuba Iceland Ireland Spain	16
17	Dewey Farragut Grant Paul Jones Schley	17
18	give lend lose keep waste	18

Right.....

TEST 10. NUMBER SERIES

SAMPLES	5	10	15	20	25	30	35
	20	18	16	14	12	10	8

In each row try to find out how the numbers are made up, then on the two dotted lines write the TWO numbers that should come next.

1st Row			8	7	6	5	4	3	....
2d Row		3	8	13	18	23	28		....
3d Row		$11\frac{3}{4}$	12	$12\frac{1}{4}$	$12\frac{1}{2}$	$12\frac{3}{4}$			....
4th Row			8	8	6	6	4	4	....
5th Row		1	2	4	8	16	32		....
6th Row		4	3	5	4	6	5	7	....
7th Row			16	8	4	2	1	$\frac{1}{2}$	....
8th Row		8	9	12	13	16	17		....
9th Row	7	11	15	16	20	24	25	29	....
10th Row	31.3	40.3	49.3	58.3	67.3	76.3			....
11th Row					$\frac{1}{25}$	$\frac{1}{5}$	1	5	....
12th Row			3	4	6	9	13	18	....

Right ..... × 2 = *Score* .....