HIGH-SCHOOL SCHOLARSHIP, PSYCHOLOGICAL TEST RANKINGS, AND COLLEGE SCHOLARSHIP INDEXES AS FACTORS OF PREDICTION OF THE SUCCESS OF THE CLASS OF 1932 AT INDIANA STATE TEACHERS COLLEGE

by

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I. INTRODUCTION

A. Aim of Thesis

The aim of this thesis is to study the value of certain variable factors as tools for predicting the scholastic success of students in Indiana State Teachers College.

B. Problem

The problem of this study was to determine the relationship between college scholarship and (1) the average high-school achievement, (2) intelligence, and (3) scholarship for each year in college.

The thesis assumes for purposes of investigation that the success of a student in college can be predicted by application of statistical technique to measures of certain variable factors among which are the student's high-school achievement, his intelligence, and his achievement in successive years in college.

II. THE DATA, THEIR SOURCE AND DESCRIPTION, PRELIMINARY TREATMENT, CLASSIFICATION, AND METHOD OF ANALYSIS

Prognosis is a process of taking measures of known factors and by the application of statistical technique predicting future outcomes. It assumes that the criterion or object of prediction is related to the factors used in prognosis. In this study the relationship of college success is measured with each of certain other factors.

A. The Data

1. The Criteria. The criteria used in this study were the scholastic achievement in Indiana State Teachers College for the various years, as measured by the students' yearly scholarship indexes. An additional criterion was the ultimate college success of a number of the same students who finished four years' work, the ultimate college success being measured by the students' accumulated indexes for the four years. For certain phases of administration this information is of positive use to the college itself; however, its greatest value is to administrators in the field as an indication of scholastic success rather than as an absolute indication of the students' teaching success.

2. Prognostic Factors. The factors used in the determination of the success of college freshmen were: (1) high-school achievement and (2) intelligence. The factors used in predicting the degree of ultimate success in the institution were: (1) high-school achievement, (2) intelligence, and (3) the scholarship indexes for each of the four years in college.

3. Subjects of the Study. The subjects of the study were the students who entered Indiana State Teachers College as freshmen in the fall of 1929.

B. Source and Description of the Data

1. The Criteria. The scholarship index of each student's college work was examined. The records, which are kept by the college in the registrar's office, revealed in marks the school's estimate of the students' college scholastic achievement. For most administrative purposes and for purposes of this study these marks are considered valid.

2. The Prognostic Factors. The high-school scholastic average for each student was calculated from the official high-school transcripts on file in the registrar's office. Again the marks were considered valid. The scholarship indexes were calculated from the official college records. The percentile ranking each student made on the psychological test was read directly from the files in the office of the dean of the faculty.

3. The Subjects. The names of the students whose records were used in the study were procured from a separate collection of data on file in the registrar's office.

C. Preliminary Treatment of the Data

1. The Criteria. It was necessary to calculate the scholarship index for each year for each student. Each year's work for each student was taken from his official

record in terms of letter grades, and placed on individual cards. A numerical value was assigned to each letter of the five-point grading system in use. This process of calculation is used by the college and is illustrated and explained by Table I.[1]

TABLE I

THE GRADING SYSTEM OF THE INDIANA STATE TEACHERS COLLEGE AND THE CREDIT POINT VALUE OF EACH GRADE*

Grade	Credit Point Value Per Term Hour of Credit
A	4
B	3
C	2
D	1
F	0

*To illustrate the calculation of a scholarship index from this table assume that a given student earned five C's, four D's, and two F's. In the table one sees that he earned sixteen credit points while he attempted forty-eight term hours. The ratio of his earned credit points to the number of credit hours attempted, 16/48 = 33, equals his scholarship index.

2. The Prognostic Factors.

a. The High-School Average. The calculation of the high school averages involved two problems. First, the grades from transcripts from high schools which used letter

[1]Catalogue, Indiana State Teachers College, 1934-1935, p. 28.

marking systems had to be converted into numerical equivalents. Second, there was variation among the high schools in the passing mark used. This latter problem was of little significance, for only a small per cent of the high schools used a passing mark other than 75 per cent. After the letter grades had been converted into their numerical equivalents, the high-school averages were calculated. The passing marks for the different schools were reduced to a comparable passing base by means of a table.[2]

b. The Psychological Rankings. The percentile rankings for the entrants on the psychological test were read directly from the card files in the office of the Dean, Indiana State Teachers College. The percentiles were calculated on the basis of the number of persons taking the test at Indiana State Teachers College. The test given was the American Council Psychological Examination. The mental rating shall hereafter be designated by the code letter P.

c. Yearly Scholarship Indexes. Inasmuch as the yearly scholarship indexes enter into this study as prognostic factors, reference has been made to their description and treatment under the topic of description and treatment of the criteria, page 3.

3. The Freshmen Students. The students who entered Indiana State Teachers College in the fall of 1929 were used as the subjects of this study. They were considered a

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[2] Appendix, p. 28.

representative group of entering students. The groups do not vary greatly from year to year with reference to ability and training. Professor Abell's report of mental testing done at this institution bears out this fact. "Each group tested showed a very wide range of scores and a tendency to approach very closely the normal frequency curve. It is noticeable for three fall terms that the distributions showed the same characteristics regardless of the test used or the term when given. It is evident that large groups of beginning students change little from term to term."[3] On the basis of this authority, and because of the fact that Indiana State Teachers College draws students from year to year from about the same high schools with the same environmental conditions, this group may be assumed to be representative of the entering student personnel.

D. Classification of Students

1. The Elementary Group. The elementary group includes all persons who indicated on their enrollment cards that they had chosen curricula leading to an elementary teachers' certificate.

2. The Regular College. The regular college group included those students who enrolled in courses leading to the regular high-school teachers' licenses.

3. The Special Group. The special group includes those students who chose work leading to licenses to teach the

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[3] E. L. Abell, "Mental Testing; Its Forms and Results at Indiana State," The Normal Advance. XXXV:5:1.

special subjects.

E. Method of Analysis of Data

1. The Significant Ratios. The calculation of the means and the probable errors of the means was made to show the significant differences in performance of the groups in the prognostic factors and in the criterion.

2. Zero Order Correlations. Zero order correlations were calculated, using the factors: high-school scholarship, intelligence, each year's scholarship index, and the accumulated scholarship index for each of those students who completed the four years of work.

3. Testing the Coefficients for Use in Regression Equations. The zero order correlations were tested for their value in regression equations by developing the probable error of the estimated value of the criterion predicted from one factor. The value of the coefficients of correlation in regression equations was further studied by calculating the improvement over chance which would result by the use of the zero order "r's".

III. COMPARISON OF THE GROUPS OF STUDENTS BY THE SEVERAL FACTORS

The following discussion is concerned with a comparison of the various groups of students with respect to the factors of this study. The comparisons are made by use of the significant ratio. This is the ratio of the difference of the means of the groups on the various factors to the probable error of the difference of the means. The significant ratio[1] is expressed by the formula:

$$\frac{M_1 - M_2}{\sqrt{(PE_{M_1})^2 - (PE_{M_2})^2}} = \frac{Diff._M}{PE_{diff.}}$$

Garrett[2] gives a table by which one can determine from the significant ratio the chance that a true difference is greater than zero. A ratio of 4 or greater is significant and indicates complete reliability[3] of difference.

A. Comparison of the Groups of Students

1. By the Psychological Test. Table XII[4] shows the

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[1] H. E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green and Co., 1926), p. 133.

[2] Ibid., p. 135.

[3] Ibid., p. 136.

[4] Appendix, p.30.

groups of students, distributed according to psychological test percentile rank. The actual comparison of the groups on the psychological test is made in Table II.

TABLE II

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS ON THE PSYCHOLOGICAL TEST

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E.of Diff.	Chances* in 100 That True Difference is Significant
E	47.30 ± 1.56	E-R	12.44	R	2.38	5.23	100
R	59.74 ± 1.80	R-S	13.01	R	2.26	5.76	100
S	46.73 ± 1.37	E-S	0.57	E	2.07	0.28	58

*This table is read: The mean of the elementary group is 47.30 ± 1.56. The difference of the means of the elementary and college group is 12.44. The probable error of the difference is 2.38. The ratio of the difference of the means to the probable error of the difference is 5.23. There are 100 chances in 100 the difference is significant and completely reliable.

The elementary group scored higher than the special group. The chances were only 58 in 100 that the difference is significant, which is not enough difference to justify any conclusion of superiority of one group over the other. Such difference as this is only a chance difference. Jones[5] two years

[5]J. W. Jones, Scholastic Prognosis and Entrance Requirements in Indiana State Teachers College, Indiana University, 1929, p. 26.

earlier found the same arrangement of groups, but he found no significant difference between the elementary and college groups.' He found a significant difference to exist between the elementary and special groups in favor of the elementary, while the writer found no significant difference between these groups.

2. By the High-School Average. A distribution of the high-school averages is found in Table XIII.[6] The comparison of the groups on high-school average is found in Table III.

TABLE III

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR THE HIGH-SCHOOL AVERAGES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In favor of	P.E. of Diff.	Ratio of Diff. to P.E. of Diff.	Chances in* 100 That True Difference is significant
E	88.93±0.26	E-R	0.49	E	0.41	1.18	79
R	88.44±0.32	R-S	0.54	R	0.39	1.37	82
S	87.90±0.22	E-S	1.03	E	0.34	3.02	98

*This table is read in the same way as Table II, page 8.

The chances are 79 in 100 that the high-school scholarship

[6] Appendix, p.31.

of the elementary group will rank higher than that of the regular group, but this is only a chance difference. The chances are only 82 in 100 that the regular college group will range above the special group in high-school average. Jones[7] found a slight but not significant difference between the elementary and college groups in favor of the elementary group. He found the differences between the regular college and special groups and between the elementary and special groups significant. The average high-school scholarship of the special group is below that of either of the other two groups.

3. By the Freshman Scholarship Index. The distribution of the freshman scholarship indexes for the groups is shown in Table XIV.[8] The comparison of the groups is shown in Table IV.

TABLE IV

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR FRESHMAN SCHOLARSHIP INDEXES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E. of Diff.	Chances* in 100 That True Difference is Significant
E	50.00 ± 0.91	E-R	--	--	--	--	--
R	50.00 ± 1.21	R-S	0.24	S	1.53	0.16	54
S	50.24 ± 0.94	E-S	0.24	S	1.31	0.18	55

*Table IV should be read in the same manner as Table II.

[7] J. W. Jones, op. cit., p. 31.

[8] Appendix, p. 32.

The freshman indexes averaged the same for the elementary and college groups. The special group stood higher than either of the other groups by 54 or 55 chances in 100, but this difference is not significant. This slight difference is interesting in that the comparisons of the groups on the psychological test and high-school averages showed that the special group stood considerably lower than the other groups. Jones[9] found complete reliability of difference in favor of the college group over the elementary group and 83 chances in 100 that the college group would excel the special group. He found that the chances were 97 in 100 in favor of the special group over the elementary group.

4. By the Sophomore Index. The distribution of the indexes for the sophomore year is shown in Table XV.[10] The comparison of the groups for the sophomore indexes is found in Table V.

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[9] J. W. Jones, op. cit., p. 36.

[10] Appendix, p. 33.

TABLE V

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR SOPHOMORE SCHOLARSHIP INDEXES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E. of Diff.	Chances* in 100 That True Difference is Significant
E	53.86 ± 0.98	E-R	1.16	E	1.70	0.68	68
R	52.70 ± 1.37	R-S	1.75	S	1.75	1.00	75
S	54.45 ± 1.07	E-S	0.59	S	1.46	0.41	61

*Read Table V in the same manner as Table II.

It was found that in the sophomore year the chances are 68 in 100 that the elementary group would stand higher than the college group. The chances are 75 in 100 that the special group would stand higher than the college group and 61 in 100 in favor of the special group over the elementary group.

5. By the Junior Index. The same rank in achievement with about the same chance for difference among the groups obtain for the junior year as for the sophomore year. The distribution of the indexes for the junior year is shown in Table XVI.[11] The comparison of the groups for the junior indexes is found in Table VI.

[11]Appendix, p. 34.

TABLE VI

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR JUNIOR SCHOLARSHIP INDEXES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E.of Diff.	Chances* in 100 That True Difference is Significant
E	57.36 ± 1.57	E-R	1.18	R	2.00	0.51	63
R	58.54 ± 1.25	R-S	0.21	S	1.65	0.13	54
S	58.76 ± 1.07	E-S	1.40	S	1.90	0.74	69

*Read Table VI in the same manner as Table II.

6. By the Senior Index. The distribution of the indexes for the senior year is shown in Table XVII.[12] The comparison of the groups by the senior index is found in Table VII.

[12] Appendix, p. 35.

TABLE VII

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR SENIOR SCHOLARSHIP INDEXES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E.of Diff.	Chances* in 100 That True Difference is Significant
E	61.57 ± 2.34	E-R	0.21	R	2.75	0.08	51
R	61.78 ± 1.44	R-S	5.27	S	1.98	2.66	97
S	67.05 ± 1.36	E-S	5.48	S	2.70	2.03	91

*Read Table VII in the same manner as Table II.

The chances are 51 in 100 that students of the regular college group excel those of the elementary group. The chances are 97 in 100 in favor of the special group over the regular group and 91 in 100 in favor of the special group over the elementary.

7. By the Four-Year Accumulated Index. The distribution of the four-year accumulated indexes is shown for the groups in Table XVIII.[13] The comparison of the four-year accumulated indexes is found for the group in the Table VIII.

[13]Appendix, p. 36.

TABLE VIII

SIGNIFICANCE OF THE DIFFERENCES IN MEANS OF THE THREE STUDENT GROUPS FOR THE FOUR-YEAR ACCUMULATED INDEXES

E = Elementary Group R = Regular Group S = Special Group

Group	Mean and P.E. of Mean	Groups Compared	Diff. in Means	In Favor of	P.E. of Diff.	Ratio of Diff. to P.E.of Diff.	Chances* in 100 That True Difference is Significant
E	53.86 ± 2.34	E-R	3.14	R	2.66	1.18	79
R	57.00 ± 1.28	R-S	3.39	S	1.66	2.04	91
S	60.39 ± 1.06	E-S	6.53	S	2.57	2.54	95

*Read Table VIII in the same manner as Table II.

The groups remained in the same order of comparison for the accumulated indexes as for those in the senior year. The special group ranked higher than either of the other groups. The regular college group ranked higher than the elementary group by 79 in 100 chances. While the elementary group stood lower than either of the other groups by an insignificant difference, even the slight difference might be due to the insufficient number of cases in the elementary group.

B. Conclusions

On the basis of the comparison of the groups by the several factors the writer found:

1. The differences between the regular college group

and the other groups on the psychological test were significant in favor of the regular group.

2. The special curricula were chosen by the group with the lowest average psychological rankings.

3. The average high-school scholarship of the elementary candidates was slightly higher than that of the other groups.

4. The group that chose the special curricula possessed the lowest average high-school scholarship.

5. The special group made the highest scholarship indexes for the freshman year, but the differences between the special group were insignificant.

6. The special groups stood higher in average scholarship for all the years than did either of the other groups.

7. The college group excelled the elementary group in scholarship for all the years except the freshman year, when the difference was slightly in favor of the elementary group, but the differences were not profound.

IV. RELATIONSHIP OF THE FACTORS

Coefficients of correlation have two purposes: (1) They serve as an index of the existence or absence of relationship; (2) they serve as tools in the prediction of one trait when others are known.[1]

Zero order correlations were calculated for each factor in turn with all other factors used in this study. The calculations were made by the Pearson product moment method.

Code letter subscripts were used instead of numerical subscripts. They are explained as follows:

P--Psychological rank

H--High-school average.

F--Freshman scholarship index.

S--Sophomore scholarship index.

J--Junior scholarship index.

Sr-Senior scholarship index.

A--Accumulated four-year index.

All the zero order correlations made in this study are shown in Table IX.

A. Relationships Explained

1. The Psychological Rating. The correlation between the psychological test and the high-school average was 0.46 ± 0.03. Odell says: "Although the correlations reported vary from near zero up to 0.70 or above, a range of 0.40 to 0.50, or

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[1] C. W. Odell, "The Interpretation of the Probable Error and Coefficient of Correlation," Bulletin of the Bureau of Educational Research, No. 32, (Urbana: University of Illinois, 1926), p. 37.

TABLE IX

ZERO ORDER COEFFICIENTS OF CORRELATION AND PROBABLE ERRORS BETWEEN THE SEVERAL FACTORS

The Factors	Psy. Test	H.S. Aver.	Fresh.Index	Soph.Index	Jr. Index	Sr. Index
H. S. Aver.	0.46 ± 0.03					
Fresh. Index	0.55 ± 0.02	0.38 ± 0.03				
Soph. Index	0.46 ± 0.03	0.51 ± 0.03	0.75 ± 0.02			
Junior Index	0.35 ± 0.04	0.49 ± 0.03	0.66 ± 0.03	0.71 ± 0.02		
Senior Index	0.37 ± 0.05	0.47 ± 0.04	0.64 ± 0.03	0.66 ± 0.03	0.70 ± 0.03	
Four-Yr. Acc. Index	0.48 ± 0.04	0.56 ± 0.04	0.86 ± 0.01	0.90 ± 0.01	0.89 ± 0.01	0.84 ± 0.02

perhaps somewhat higher, may usually be expected between score on an intelligence test and freshman mark."[2] Jones,[3] in his study made two years earlier of a group from the same institution in which the writer worked, found a correlation of 0.44 ± 0.02 between the psychological rating and average high-school scholarship. The correlations between the psychological test and the junior and senior indexes are appreciably lower than the correlation between the psychological test and the high-school averages or the correlation between the psychological test and freshman indexes.

2. The High-School Average. It is interesting to note that the relationship between the high-school averages and the freshmen indexes is relatively low as compared with the findings of Odell,[4] Dearborn,[5] and Jones,[6] who found correlations of 0.55, 0.60, and 0.55, respectively. The high-school averages correlate higher with the four-year accumulated indexes than did the psychological test results.

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[2] C. W. Odell, op. cit., p. 28.

[3] J. W. Jones, Scholastic Prognosis and Entrance Requirements in a State Teachers College, Indiana University, 1929, p. 45.

[4] C. W. Odell, op. cit., p. 28.

[5] W. F. Dearborn, Intelligence Tests (New York: Houghton Mifflin & Co., 1927), p. 37

[6] J. W. Jones, op. cit., p. 48.

3. The Freshman Indexes. The low correlation between freshman scholarship and the high-school average has been referred to on page 19. The relatively high correlation between freshman scholarship and the sophomore scholarship is one point lower than the finding of Dearborn.[7] The fairly high correlation between the freshman scholarship and the four-year accumulated indexes is in contrast with the relatively low correlation between freshman indexes and the junior and senior scholarship.

4. The Sophomore Indexes. High correlation exists between the sophomore indexes and the four-year accumulated indexes. The correlation between the sophomore year and the junior year was 0.71 ± 0.02. This was only slightly lower than the 0.78 relationship found by Dearborn.[8]

5. The Junior Indexes. It was found that the correlations between the junior indexes and all the other factors were low, except with the four-year accumulated index where the writer found a correlation of 0.89 ± 0.01 to exist.

6. The Senior Indexes. The indexes for the senior year correlated higher with the indexes for the other years than with the psychological test and the high-school averages, where the low correlations 0.37 ± 0.05 and 0.47 ± 0.04 were found.

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[7] W. F. Dearborn, op. cit., p. 37.

[8] Ibid., p. 37.

7. The Four-Year Accumulated Index. The four-year accumulated index showed low correlations with the psychological test, 0.48 ± 0.04, and the high-school averages, 0.56 ± 0.04. This factor correlated somewhat higher with the indexes for the various years.

B. Summary

From a study of the zero order correlations one learns:

1. The psychological test correlated higher, 0.55 ± 0.02, with the freshman indexes than with any other factor.

2. The psychological test correlated higher with freshman scholarship than the high-school average did, 0.38 ± 0.03.

3. The low correlation, 0.38 ± 0.03, between high-school average and freshman scholarship is not unusual, in the light of Odell's[9] finding.

4. The correlations between freshman scholarship and subsequent college indexes are much higher than the correlations between psychological test and the subsequent scholarship indexes.

5. The correlations between the psychological test and all the factors are relatively low.

6. The junior and senior indexes do not correlate relatively highly with any of the factors.

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[9] C. W. Odell, op. cit., p. 28.

V. ZERO CORRELATIONS IN PREDICTION

A. Tests for Value

The following discussion is concerned with further analysis of the data as a tool of prediction. The steps are:

1. Testing the zero order correlations to justify their value as factors to use in predicting the criterion. This test of value is applied in two ways:

a. By the probable error of estimate, calculated from the formula $.6745\ \sigma y\sqrt{1-r^2}$. This quantity gives the error of prediction by use of a single score with the regression equation,[1] $y = r.\ \frac{\sigma y}{\sigma x}\ .x.$

b. By improvement over chance in prediction by a single score. This result is expressed in per cent and is calculated by the formula,[2] $I_p = 100\ (1 - \sqrt{1 - r^2})$.

2. Using the factors that have predictive value and using the regression equation, make the prediction.

B. Zero Correlations Tested

The zero correlations, the corresponding probable errors of estimate, and the improvement over chance in prediction from a single score are shown in Table X.

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[1] Karl J. Holzinger, Statistical Methods for Students in Education (Chicago: Ginn and Company, 1928), p. 166.

[2] Ibid., p. 166.

TABLE X

ZERO ORDER CORRELATIONS WITH PROBABLE ERRORS OF ESTIMATE AND IMPROVEMENTS OVER CHANCE IN PREDICTION

Factors Correlated	r's	P.E.$_{(est.)}$	Improvement over Chance in Prediction
Psy. with H. S. Aver.	0.46	± 3	11 Per
Psy. with Fresh. Index	0.55	± 11	17 Cent
Psy. with Soph. Index	0.46	± 10	11
Psy. with Jr. Index	0.35	± 10	7
Psy. with Sr. Index	0.37	± 11	7
Psy. with Acc. Index	0.48	± 8	12
H. S. Aver. with Fresh. Index	0.38	± 12	6
H. S. Aver. with Soph. Index	0.51	± 10	14
H. S. Aver. with Jr. Index	0.49	± 12	13
H. S. Aver. with Sr. Index	0.47	± 10	12
H. S. Aver. with 4-Yr. Index	0.56	± 8	17
Fresh. Index with Soph. Index	0.75	± 8	34
Fresh. Index with Jr. Index	0.66	± 10	24
Fresh. Index with Sr. Index	0.64	± 9	23
Fresh. Index with 4-Yr. Index	0.86	± 5	48
Soph. Index with Jr. Index	0.71	± 9	29
Soph. Index with Sr. Index	0.66	± 9	24
Soph. Index with 4-Yr. Index	0.90	± 4	56
Jr. Index with Sr. Index	0.70	± 8	29
Jr. Index with 4-Yr. Index	0.89	± 4	54
Sr. Index with 4-Yr. Index	0.84	± 6	45

The coefficient of correlation between the psychological rating and the freshman scholarship index is 0.55 ± 0.02. In order to determine the value of this coefficient in a regression equation two statistical factors have been calculated: (1) The probable error of the estimate when the psychological

rating is used to predict the freshman scholarship index, which factor was found to be ± 3; and (2) the improvement over chance of using the coefficient of correlation in the regression equation, which factor was found to be 17 per cent.

The probable error of estimate (±3) indicates that there would be 100 chances in 100 of the estimated freshman scholarship index lying within the limits of the predicted score, ± 12 points.

An improvement over chance of only 17 indicates that in only seventeen per cent of the times a prediction is made would this prediction be better than a guess. These two measures seem to indicate that the use of the psychological rating as a tool to predict the freshman scholarship index is unreliable.

Further examination of Table X shows that with the data in hand in no case can one predict a scholarship index with greater accuracy than the prediction of the four-year accumulated index from the sophomore index. Even in this case one might be incorrect to the extent of ± 16 ($4 \times P.E._{est.}$) points. It is also true that the predictive value of this most reliable factor is only 56 per cent more reliable than pure guess.

C. Summary

In consideration of the data of this section the writer found:

1. The coefficients of correlations were too low to be of any practical value in prediction.

2. The probable errors of estimate of the variables were so large that any predicted value might vary so greatly from

the true value that prediction would be almost wholly unreliable.

3. The improvement over chance in prediction would be so little that prediction would be only slightly better than guessing.

VI. CONCLUSIONS

On the basis of the analysis of these data the writer concludes:

1. High-school scholarship and the psychological test results are not reliable tools with which to predict college scholastic success.

2. The regular college group, according to ranking on the psychological test, possess mentalities significantly higher than those possessed by the other groups.

3. Special students, as a group, had slightly higher scholarship indexes in college than the students of the elementary or regular groups in spite of the fact that the special group students stood lowest in high-school averages and in psychological ratings.

Executives of teachers' colleges who follow the ideal of qualitative selection of students are apt to find little evidence from this study that such a policy can be carried out with effectiveness. There is little to indicate that students who possess high scholarship achievement records in the high school and who possess high psychological test rankings will prove to be superior students in Indiana State Teachers College.

VII. APPENDIX

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B. Supplementary Tables

TABLE XI

VALUE OF TEACHERS' MARKS IN SCHOOLS USING 60, 65, 70, 75, AND 80, AS A PASSING MARK ON BASIS OF 75 AS THE PASSING MARK

Teachers' Marks	Passing Mark				
	60	65	70	75	80
55	71.9				
56	72.5				
57	73.1				
58	73.8				
59	74.4				
60	75.0	71.4			
61	75.6	72.1			
62	76.2	72.9			
63	76.8	73.6			
64	77.5	74.3			
65	78.1	75.0	70.8		
66	78.7	75.7	71.7		
67	79.4	76.4	72.5		
68	80.0	77.1	73.3		
69	80.6	77.9	74.2		
70	81.3	78.6	75.0	70.0	
71	81.9	79.3	75.8	71.0	
72	82.5	80.0	76.7	72.0	
73	83.1	80.7	77.5	73.0	
74	83.8	81.4	78.3	74.0	
75	84.4	82.1	79.2	75.0	68.8
76	85.0	82.9	80.0	76.0	70.0
77	85.6	83.6	80.8	77.0	71.3
78	86.3	84.3	81.7	78.0	72.5
79	86.9	85.0	82.5	79.0	73.8
80	87.5	85.7	83.3	80.0	75.0
81	88.1	86.4	84.2	81.0	76.3
82	88.8	87.1	85.0	82.0	77.5
83	89.4	87.9	85.8	83.0	78.8
84	90.0	88.6	86.7	84.0	80.0

TABLE XI. (Continued)

85	90.6	89.3	87.5	85.0	81.3
86	91.3	90.0	88.3	86.0	82.5
87	91.9	90.7	89.2	87.0	83.8
88	92.5	91.4	90.0	88.0	85.0
89	93.1	92.1	90.8	89.0	86.3
90	93.8	92.9	91.7	90.0	87.5
91	94.4	93.6	92.5	91.0	88.8
92	95.0	94.3	93.3	92.0	90.0
93	95.6	95.0	94.2	93.0	91.3
94	96.3	95.7	95.0	94.0	92.5
95	96.9	96.4	95.8	95.0	93.8
96	97.5	97.1	96.7	96.0	95.0
97	98.1	97.8	97.5	97.0	96.3
98	98.8	98.6	98.3	98.0	97.5
99	99.4	99.3	99.2	99.0	98.8
100	100.0	100.0	100.0	100.0	100.0

To convert teachers' marks issued on a passing base of 60, 65, 70, or 80 to marks with 75 as base, in the column headed "Teachers' Marks", find the given mark. Opposite this mark under the column which gives the based used will be found the equivalent mark with 75 as base. For example, suppose the teacher's mark is 85 in a school using 65 as the passing base. Find 85 in the first column, opposite it under passing mark of 65 is 89.3 which is the equivalent mark with 75 as the passing mark.[1]

[1] J. W. Jones, Scholastic Prognosis and Entrance Requirements in Indiana State Teachers College, Indiana University, 1929, p. 185-6.

TABLE XII

DISTRIBUTION OF THE PERCENTILE RANKINGS FOR FRESHMAN CLASS OF 1929-1930 ACCORDING TO THE PSYCHOLOGICAL TEST AND CLASSIFIED BY GROUPS

Psychological Percentiles	Number of Students			
	Elementary Group	Regular Group	Special Group	Whole Group
96-101	3	12	5	20
90- 95	7	10	10	27
84- 89	8	7	12	27
78- 83	4	6	15	25
72- 77	6	9	11	26
66- 71	6	9	8	23
60- 65	14	9	7	30
54- 59	14	9	7	30
48- 53	7	5	13	25
42- 47	8	5	13	26
36- 41	6	6	17	29
30- 35	14	3	12	29
24- 29	8	7	13	28
18- 23	7	6	14	27
12- 17	9	2	16	27
6- 11	9	6	14	29
0- 5	8	3	11	22
Total	138	114	198	450
$M \pm PE_M$	47.30 $\pm$ 1.56	59.74 $\pm$ 1.80	46.73 $\pm$ 1.37	50.20 $\pm$ 0.89
$SD \pm PE_{SD}$	27.12 $\pm$ 1.10	28.44 $\pm$ 1.27	28.64 $\pm$ 0.97	28.20 $\pm$ 0.63

TABLE XIII

DISTRIBUTION OF AVERAGE HIGH-SCHOOL SCHOLARSHIP FOR THE CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Average High-School Scholarship	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
97-98	5	4	3	12
95-96	6	9	5	20
93-94	15	11	25	51
91-92	23	14	27	64
89-90	20	16	22	58
87-88	22	18	33	73
85-86	18	10	21	49
83-84	17	12	33	62
81-82	7	10	12	29
79-80	3	6	13	22
77-78	1	4	3	8
75-76	1	--	1	2
Total	138	114	198	450
$M \pm PE_M$	88.93 ±0.26	88.44 ±0.32	87.90 ±0.22	88.35 ±0.15
$SD \pm PE_{SD}$	4.32 ±0.18	5.14 ±0.23	4.69 ±0.16	4.72 ±0.10

TABLE XIV

DISTRIBUTION OF FRESHMAN SCHOLARSHIP INDEXES FOR CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Freshman Scholarship Indexes	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
98-	—	—	2	2
92-97	—	—	5	5
86-91	—	2	5	7
80-85	4	3	11	18
74-79	10	8	19	37
68-73	9	8	23	40
62-67	15	11	15	41
56-61	15	14	18	47
50-55	18	15	14	47
44-49	14	8	27	49
38-43	17	19	23	59
32-37	13	6	13	32
26-31	11	2	12	25
20-25	8	9	6	23
14-19	—	5	3	8
8-13	2	3	2	7
2- 7	2	1	—	3
Total	138	114	198	450
$M \pm PE_M$	50. ±0.91	50. ±1.21	50.24 ±0.94	50.11 ±0.60
$SD \pm PE_{SD}$	15.88 ±0.64	19.15 ±0.86	19.74 ±0.66	18.91 ±0.42

TABLE XV

DISTRIBUTION OF THE SOPHOMORE SCHOLARSHIP INDEXES FOR THE FRESHMAN CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Sophomore Scholarship Indexes	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
98-				
92-97	—	1	—	1
86-91	1	3	2	6
80-85	4	2	9	15
74-79	6	3	6	15
68-73	9	6	10	25
62-67	17	10	17	44
56-61	20	9	17	46
50-55	19	13	14	46
44-49	15	6	17	38
38-43	10	11	10	31
32-37	7	5	10	22
26-31	3	6	3	12
20-25	4	2	5	11
14-19	3	1	2	6
8-13		1		1
2- 7	1	1	2	4
Total	119	80	124	323
$M \pm PE_M$	53.86 ±0.98	52.70 ±1.39	54.45 ±1.07	53.80 ±0.65
$SD \pm PE_{SD}$	15.90 ±0.69	18.34 ±0.98	17.68 ±0.76	17.27 ±0.46

TABLE XVI

DISTRIBUTION OF THE JUNIOR SCHOLARSHIP INDEXES FOR THE FRESHMAN CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Junior Scholarship Indexes	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
98-				
92-97	3	—	1	4
86-91	2	3	2	7
80-85	2	1	5	8
74-79	5	3	7	15
68-73	2	14	12	28
62-67	11	8	14	33
56-61	8	8	12	28
50-55	10	13	19	42
44-49	1	6	10	17
38-43	10	2	10	22
32-37	5	3	1	9
26-31		4	1	5
20-25	2	1	2	5
14-19	—	—	2	2
8-13				
2-17	1	—	—	1
		—	—	
Total	62	66	98	226
$M \pm PE_M$	57.36 ±1.57	58.55 ±1.25	58.76 ±1.07	58.18 ±0.72
$SD \pm PE_{SD}$	18.31 ±1.11	14.99 ±0.88	15.76 ±0.76	16.23 ±0.51

TABLE XVII

DISTRIBUTION OF THE SENIOR SCHOLARSHIP INDEXES FOR THE FRESHMAN CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Senior Scholarship Indexes	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
98-	—	1	3	4
92-97	—	0	1	1
86-91	1	1	9	11
80-85	—	4	10	14
74-79	1	7	13	21
68-73	2	6	4	12
62-67	3	8	11	22
56-61	2	7	7	16
50-55	3	9	10	22
44-49	—	5	4	9
38-43	1	4	5	10
32-37	1	—	2	3
26-31	—	—	1	1
20-25	—	1	1	2
14-19	—	1	—	1
8-13	—	—	1	1
2- 7	—	—	—	—
Total	14	54	82	150
$M \pm PE_M$	61.57 ±2.34	61.78 ±1.44	67.05 ±1.36	64.60 ±0.96
$SD \pm PE_{SD}$	12.97 ±1.65	15.74 ±1.02	18.18 ±0.96	17.42 ±0.68

TABLE XVIII

DISTRIBUTION OF FOUR-YEAR ACCUMULATED INDEXES FOR THE FRESHMAN CLASS OF 1929-1930 CLASSIFIED ACCORDING TO GROUPS

Four-Year Accumulated Indexes	Number of Students			
	Elementary Group	Regular Group	Special Group	Total
98-	—	—	—	—
92-97	—	—	1	1
86-91	—	1	1	2
80-85	1	1	6	8
74-79	—	4	8	12
68-73	—	7	11	18
62-67	3	7	9	19
56-61	2	6	8	16
50-55	3	13	19	35
44-49	1	5	12	18
38-43	2	7	2	11
32-37	2	1	4	7
26-31	—	—	—	—
20-25	—	2	1	3
14-19	—	—	—	—
8-13	—	—	—	—
2- 7	—	—	—	—
Total	14	54	82	150
$M \pm PE_M$	53.86 ±2.34	57. ±1.28	60.39 ±1.06	58.56 ±0.78
$SD \pm PE_{SD}$	12.97 ±1.65	13.91 ±0.91	14.23 ±0.75	14.18 ±0.55