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The Relationship between Certain Factors  
and Scholastic Success in the University of  
Minnesota College of Education

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The central problem of this investigation may be stated in the form of the question: Using the measures which are now being made on all students before they enter the University of Minnesota College of Education, with what degree of effectiveness may the admission authorities expect to forecast the ultimate scholastic achievement of those accepted for admission? From a slightly different point of view the question might be put: On, the basis of quantitative information about applicants for admission, to which the college has access at the time of entrance, could effective selection be made of those individuals who would later succeed in their scholastic work? By "effective" selection is meant the acceptance of students who will later succeed in college and the rejection of those who are destined to fail or make unsatisfactory scholastic records should they be admitted.

Evidence from two directions may be cited to support the thesis that admission **officials of** the College of Education might well adopt policies restricting the number of students accepted for en191

trance. In the first place, there is an over supply of teachers; and secondly, the mortality rate among students is high.

For example, records in the Placement Bureau of the College of Education for the three school years 1932-1933 to 1934-1935, inclusive, show that only 576 (or approximately 43 per cent) of the 1,343 graduates of that college had been placed in full time teaching positions by January first following graduation. Allowing for those who continued their professional training in the graduate school, women who married, and a few not accounted for, 593 (or about 44 per cent) of the total were either without jobs altogether or were employed only part-time on relief work or teaching. Admitting that the depression circumstances during the period contributed some

what to this rather dark employment situation, there can be little doubt that the problem is a continuing one and will have to be faced even in normal times. There is no reason to suppose that the situation just described for Minnesota was materially different from that existing in the country as a whole.

The second line of evidence supporting the argument that selective admission policies are needed in the College of Education is found in the mortality rate among students who were admitted to the institution. Considering only those students who entered the College of Education as juniors with two years of pre-education work of college grade, approximately one-third (174 out of a total of 538) dropped out of college before completing the work for a degree.

If the best possible use be made of the available quantitative information, such as age, high school scholarship, pre-education college scholarship, intelligence and achievement test scores, and of units of high school credits in various subject matter fields, would it be possible to select accurately those who would later succeed in the College of Education if admitted?

*Methods and Scope of the Study:* Relationship between each of the factors studied and scholastic success in the College of Education is expressed as a product moment coefficient of correlation. The multiple coefficient of correlation is employed to express relationship between the various groups of two or more factors and college marks. Rectilinear regression equations are used to predict marks of students, and these predicted standings are compared with the actual scholarship in order to determine the efficiency with which scholastic rank can be foretold from the measures at hand.

The sample consists of 538 students who entered the University

of Minnesota College of Education as juniors in 1931, 1932, and 1933. The records of these students on all of the variables included

for study were taken principally from the Office of the Registrar, the College of Education and the University Testing Bureau. Incomplete records were secured directly from high schools or colleges from which the students in question came. Of the 538 students in the sample, 309 entered from the University of Minnesota College of Science, Literature and the Arts, while 229 transferred to the college from other institutions.

In the description of the variables which follows, each of the factors is identified by number. It will be noted that variable number one is the criterion of college success. The remaining variables in the list represent the predictive factors employed in this investigation.

#### 1. *Honor Point Ratio in the College of Education:* Scholastic "

standing in the College of Education is expressed as an honor point ratio. For each quarter hour of credit carrying "A" as the mark, the student receives 3 honor points, a quarter hour of "B" counts 2 honor points; a "C" mark means 1 honor point per quarter hour; a "D" is rewarded with 0 honor points, and a mark of "F" carries -1 honor point per quarter hour. The honor point ratio is the quotient of the total honor points earned divided by the number of quarter hours for which the student receives a mark during his stay in the college. The records of "E" (condition) and "I" (incomplete) are omitted from the computations. Students remaining less than one quarter in residence are not included.

#### 2. *High School Average:* All high school marks are expressed on a percentage basis, with 75 being the lowest passing mark. Five point grading scales are transformed into per cent marks as follows : A=96; B=90; C=84; D=78; F=72. Marks from high

schools with 65 as lowest passing mark are subjected to the transformation,  $7y=5x+200$ ; where x represents the average mark from the given high school and y is the transformed mark used in the study. High school systems with 70 as the lowest passing mark are transformed by means of the equation,  $6y=5x+100$ . Here again x represents marks received in high school and y is the expression of the equivalent mark under the 75-100 system.

#### 3. *High School Rank:* Every spring High School principals in the State of Minnesota furnish the University with lists of their

ing classes ranked from highest to lowest according to scholarship during the three and one-half or four year course. The ranking is transformed into percentile ranks by the admission officials of the University. In this study the percentile ranks are expressed as standard scores, assuming a normal distribution of the variable in question.

4. *College Aptitude Test*: This College Aptitude Test is an English vocabulary test of 480 words prepared by Donald G. Paterson and

L. E. Drake for the Minnesota Association of Colleges. The authors report a reliability coefficient of .95 for the test.<sup>1</sup> The raw scores are used in this study, rather than the percentile ranks which are recorded in the testing Bureau.

5. *Miller Analogies Test*: The Miller Analogies Test is an intelligence test made up of one hundred analogies scaled to a difficulty suitable for college and graduate levels of ability. The test takes forty minutes to administer and is given to all who enter the University of Minnesota College of Education. Reliability coefficients of around .90 have been found for this test when administered to groups of juniors and seniors in the college. The raw scores are used in this investigation.

6. *The Iowa English Test*: Form ET-1 of the Iowa English Test was the one used in the College of Education during the period under investigation. This test takes forty minutes to administer and consists of four parts: Part I, a spelling test; Part II, a test of punctuation and sentence structure; Part III, a grammar and English usage test; and Part IV, a measure of the students ability to distinguish between clear, emphatic sentences and those which are weak, confused and ridiculous. The reliability coefficient, obtained for the examination from one hundred cases, was reported by Stoddard and Harrison to be .90. Its correlation with first semester marks at the University of Iowa, as reported by the same authors, was .54.<sup>2</sup>

7. *Minnesota Reading Examination*: This test is administered to all students at the time of their entrance to the College of Education. It is made up of two parts—a vocabulary test, and a test of

<sup>1</sup> Donald G. Paterson and L. E. Drake "Reliability Analysis of the 1929 Edition of the College Ability Tests Prepared for the Minnesota Association of Colleges." Unpublished Mimeographed Manuscript, University of Minnesota Testing Bureau, 1929.

<sup>2</sup> George D. Stoddard and Harry P. Harrison. "A Study of Placement Examinations," Iowa City, *University of Iowa Studies in Education*, Vol. IV, No. 7, 1928.

reading comprehension. The reliability of each of the parts and of the whole examination, as reported by Enrich, runs as follows: Part I, .91; Part II, .78; total test, .87. These coefficients were obtained from the performance of 216 College of Education juniors and seniors.'

8. *Average Scholarship in High School English.*

9. *Average Scholarship in High School Mathematics.*

10. *Average Scholarship in High School Social Sciences.*

11. *Average Scholarship in High School Foreign Languages.*

12. *Average Scholarship in High School Natural Sciences.*

The average marks in the high school subject-matter fields are expressed in per cent averages in the same way as the total high school average discussed in a preceding paragraph.

13. *Number of Semester Units in High School Social Sciences.*

14. *Number of Semester Units in High School Foreign Languages.*

15. *Number of Semester Units in High School Natural Sciences.*

Because of the fact that almost all students entered with eight semester units in high school English, this variable was not correlated with College success. The number of units of high school mathematics was not used for a similar reason.

16. *Age at Entrance to the College of Education.* The age is expressed to the nearest month.

17. *Average Scholarship in Pre-education.* Honor point ratios of students coming from the University of Minnesota College of Science, Literature and the Arts, are taken at their face value, while scholastic averages of transfer students are subjected to the following transformations:  $y = 1.03 - [(x-a)/(3-a)]$  (1.97), for a student whose average was above that of his own college; and  $y = 1.03 - [(a-x)/(a+1)]$  (2.03), for a student below the average of his college. In both equations above, y is the corrected honor point average used in this study; x is the student's honor point average from his own college; a is the average of all marks given in the student's own college; and 1.03 is the average of all marks given in the University of Minnesota Arts College.

*The Findings:* In Table I are listed the zero order coefficients between the various predictive factors and the College of Education success. Because of the fact that for a majority of the 229 transfer

a Enrich, Alvin C., *The Reading Abilities of College Students*, Minneapolis, The University Press, 1931, p. 23

students no measure exists on high school rank, College Aptitude Test, and Iowa English Test, there are these gaps in the table.

A glance at the data in Table I reveals that the number of high school units in various subject fields does not offer any help in the prediction of college'success. The coefficients of correlation are practically zero. The same observation holds for the age at entrance. Pre-education average, Miller Analogies Test score, and high school scholarship seem to offer the best promise for predictive purposes. It should be noted that the rank in graduating class furnishes a lower coefficient than does high school average. The difference is not great, but furnishes some basis for concluding that high school marks, even though they do come from a large number of high schools with a wide variety of standards and systems of marking, furnish as dependable a basis for predicting college success as does rank in class.

TABLE I

ZERO ORDER COEFFICIENTS OF CORRELATION BETWEEN THE  
PREDICTIVE FACTORS OF THE STUDY AND COLLEGE OF  
EDUCATION HONOR POINT RATIO FOR THE TWO GROUPS  
SEPARATELY AND FOR THE TOTAL GROUP

VARIABLE	229 538	MINNESOTA S. L. A.	TRANSFER	TOTAL GROUP
High School Average.....	.316	.513	.448	
High School Rank.....	.268	-	-	
College Aptitude Test .....	.248	-	-	
Miller Analogies Test.....	.404	.469	.466	
Iowa English Test.....	.175	-	-	
Minnesota Reading Test.....	.282	.376	.361	
H. S. English Average .....	.251	.434	.372	
H. S. Mathematics Average ....	.229	.422	.335	
H. S. Social Sciences Average...	.352	.443	.431	
H. S. Units Social Sciences.....	.028	-.079	.004	
H. S. Units Language.....	-.049	.070	.061	
H. S. Units Sciences.....	.062	.111	.029	

97 TABLE II  
RELATIONSHIP BETWEEN VARIOUS COMBINATIONS OF VARIABLES AND SCHOLARSHIP IN THE COLLEGE OF EDUCATION FOR THE COMPLETE GROUP OF 538 CASES

COMBINATIONS OF VARIABLES	COEFFICIENT	STANDARD ERROR
Average Pre-Educational College Mark Miller Analogies Test.....	.597	
.441 Average Pre-Educational College Mark		
Miller Analogies Test		
High School Average.....	.613	
.435 Average Pre-		
Miller Analogies Test		
H. S. Social Science Average.....	.616	
.433 Average Pre-		
Educational College Mark		
Miller Analogies Test		
High School Average		
Minnesota Reading Test.....	.613	
.435 Average Pre-		
H. S. Social Science Average		
Average H. S. English		
Average		
Minnesota Reading Test.....	.639	.423

NOTE-All of the possible two variable multiple coefficients of correlation were computed, as were many higher order coefficients, but only the highest ones are reported here.

Multiple coefficients of correlation were also computed for the two separate groups of 309 Minnesota Arts students and 229 transfer students, but are not presented in this paper since the results are so nearly the same as those here reported for the 538 cases. The essential fact in connection with the data of Table II is that, with the best possible selection of the factors, multiple correlation coefficients range from .60 to .64. Predictions based on such degrees of relationship are subject to errors approximately .8 as great as those which would be made should the prediction be based on factors with zero correlation with the criterion. In order to determine more specifically the effectiveness of predictions based on combinations of factors yielding the highest multiple correlation coefficients

rectilinear regression equations were employed to predict the scholarship of each of the 538 students in the study.<sup>4</sup> These predicted marks were compared with the actual college scholarship of these students. The data of Tables III and IV are so arranged that TABLE III ACCURACY OF PREDICTING COLLEGE OF EDUCATION HONOR POINT RATIO OF 538 ACADEMIC MAJORS, USING PRE-EDUCATION AVERAGE, MILLER ANALOGIES TEST, AND HIGH SCHOOL SOCIAL SCIENCE AVERAGE AS THE PREDICTIVE VARIABLES IN A MULTIPLE REGRESSION EQUATION

Predicted	1-7 8-31 32-69 70-93 94-100				Total	Percentile "	Percentile
	Per-	Per-	Per-	Per-			
94-100				2 22 13			
Percentile				(1.0) (16.9) (35.1) 37			
70-93	5 51 58 16	Percentile (3:9)	(25.0)	(44.6)			
(29.7) (43.1) (46.1) (27.7) (18.9) 204	(43.2)	130 32-69 11 56 94 36 7	Percentile				
m	8-31 15 49 51 14 1	Percentile (40.5) (37.7) (25.0) (10.8) (2.7)					
130 1-7 11 20 6							
Percentile (29.7) (15.4) (2.9)				37 Total			
37 130 204 130 37 538				pr diction			chance
Per cent correctly placed=	41.82	26.94					
Per cent displaced 1 step=	49.63	43.20					
Per cent displaced 2 steps=	8.37	22.16					
Per cent displaced 3 steps =	0.18	6.72					
Per cent displaced 4 steps =	0.00	0.98					

the comparison of the predicted and actual honor point ratios is facilitated. In this instance pre-educational average, Miller Analogies Test score, and high school social science average formed the combination of three predictive factors used

99 each scale and arranging these in the form of a two-way distribution. The highest 7 per cent of the marks on both scales are headed "94-100 percentile"; the next 24 per cent, "70-93 percentile"; the middle 38 per cent "32-69 percentile"; the next 24 per cent, "8-31 percentile"; and the lowest 7 per cent are designated "1-7 percentile." From this tabulation it will be noted that 11 (29.7 per cent) of the 37 cases which were predicted to fall among the lowest 7 per cent of the total group actually performed as predicted. However, the same number (11) of these 37 actually attained averages in the middle category. Of the 37 who actually scored among the lowest 7 per cent of the total group, 6 were predicted in the middle category and 20 in the next to the lowest group.

Considering the predictions as a whole, 41.8 per cent were predicted correctly 49.6 per cent earned marks one division removed from that predicted, and 8.6 earned honor point averages two or more divisions removed from those predicted from the regression equation. Though this prediction is superior to that which would be possible by pure chance, individual prediction is still too inaccurate for sole dependence to be placed upon it in accepting or rejecting students wishing to enter the College of Education.

The bi-variate frequency distribution (Table IV) of actual and predicted college averages for the 538 cases illustrates quite clearly the inaccuracies which would result should regression equation results be employed to restrict enrolment in the College of Education. It will be observed that 55 of the 538 students earned averages below .875, and these can be considered as unsatisfactory records since a student must average 1.00 in order to be graduated. It is clear from Table IV that the predicted marks of these 55 students fail to indicate poor scholarship in any adequate way. For example, 29 of them were predicted to earn marks of 1.125 or above, which would place these students in the satisfactory class. Less than half of the poor scholarship students were selected by the predictive instrument to be low in scholarship.

If one were to try to select a point on the predicted scale (Table IV) below which even a majority of the students would fail to earn averages below 1.125, this point would have to be .625 and then

dents who will not succeed in the College of Education: Coefficients of correlation between the predictive variable, and the criterion of success in the college would have to be considerably higher than those found in this study before accurate predictions could be made of future scholarship of individual students.

TABLE IV

BI-VARIATE FREQUENCY DISTRIBUTION OF ACTUAL COLLEGE OF EDUCATION HONOR POINT RATIOS AND HONOR POINT RATIOS PREDICTED FROM PRE-EDUCATION AVERAGE, MILLER ANALOGIES TEST, AND HIGH SCHOOL SOCIAL SCIENCE AVERAGE FOR 538 ACADEMIC MAJORS

	Predicted							
	.375	.625	.875	1.125	1.375	1.625	1.875	2.125
								2 2
2.875								3 2 1 6
2.625								1 6 5 4 16
2.375								1 5 14 20
2.125								40
								1 8 15 23 13 4 64
1.875 -								3 15 30 21 7 1 77
1.625								
								2 11 37 38 16 12
1.375								116
								5 24 36 25 19 4
1.125								113
								2 8 15 17 6 1
.875								49

01 *Summary of Results:* The following enumerated list of statements briefly summarizes the findings of this study.

1. The two-year pre-education college average scholarship is more closely associated with College of Education honor point ratio than is any of the other variables included in this investigation. This coefficient was found to be about .55 with the total group of 538 students.
2. High school average and Miller Analogies Test scores come next to pre-education in closeness of association with the criterion. These variables furnish correlation coefficient of .47 and .45 respectively.
3. By combining the best predictive variables, multiple coefficients of correlation around .65 were obtained.
4. The number of units of high school credit in the various subject-matter fields show a **coefficient** of correlation substantially zero with College of Education success.
5. Age at entrance is slightly negatively correlated with College of Education scholarship, but the relationship is too low to offer any aid in prediction.
6. Predictions of scholarship for the 538 cases, based on a linear regression equation in which pre-education average, high school social science average, and Miller Analogies test score were employed as the predictive variables, gave very limited aid in the separation of students who were destined to succeed in college from those who later failed to maintain satisfactory averages.