Proceedings of the Iowa Academy of Science

Volume 37 | Annual Issue Article 93

1930

A Statistical Study of Industrial Science Students of the Class of 1926

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A STATISTICAL STUDY OF INDUSTRIAL SCIENCE STUDENTS OF THE CLASS OF 1926

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This study was carried through with three main objectives in view,

1. To find the relationship between the Iowa State College Aptitude Test (as a whole and in parts), the social and memory tests, work done in high school, and work done in college.
2. To determine the percentage of students;
   (a) who remained in college
   (b) who were dropped from college either by their own request or by the request of the scholarship committee.
3. To see if it is possible to determine which high school students should be allowed to enter Iowa State College.

Since the length of time that the student stayed in college is an important factor, it was necessary to choose a group who entered in the Fall of 1926. For the group of 177 Industrial Science students who entered at that time the following data were collected:

VARIABLE	SYMBOL	VARIABLE	SYMBOL	VARIABLE	SYMBOL
Score	A	College Math. 1	M	H.S. Algebra	Y
Linguistic	1	College English	E	H.S. Geometry	G
Reasoning	2	College Science	Sc	H.S. Literature	L
Information	3	First Quarter Ave.	Q	H.S. Composition	C
Social	4	No. of Qr. in Coll.	N	H.S. Science	S_H
Memory	5			H.S. Average	H

The data were punched upon cards. The cards were then used in the sorting and tabulating machines. The Wallace, H. A. and Snedecor, George W., technique for computing correlations and regression equation was used.*

In order to study the relationship between work done in high school and that done in college, preliminary studies were made respectively upon English, science, and methematics.

This chart shows the table of correlations, standard deviations, and the means for the variables listed.

A and 2 have some intercorrelation.

* "Correlation and Machine Calculation," by Wallace and Snedecor.

CHART I

	2	Y	G	M	Q
A	.7808	.2669	.3751	.3792	.3785
2		.2550	.2961	.2848	.2458
Y			.5494	.2949	.2972
G				.4215	.3976
M					.7087

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A = Score. Y = H. S. Algebra. M = Math. in College.
2 = Reasoning. G = H. S. Geom. Q = First Qr. Ave.

$\sigma_A = 33.2913$ $M_A = 151.8448$
$\sigma_2 = 12.0747$ $M_2 = 53.6465$
$\sigma_Y = 5.5909$ $M_Y = 88.3362$
$\sigma_G = 6.0438$ $M_G = 88.1034$
$\sigma_M = 17.5879$ $M_M = 71.0431$
$\sigma_Q = 8.3703$ $M_Q = 79.5086$

2, the reasoning portion of the score, has consistently low correlations.

Y, the algebra in high school, doesn't seem to be of very great significance.

Notice that mathematics in college has a high correlation with first quarter average.

Mathematics in college has a great amount of variability. Its mean is 71.04 and standard deviation is 17.59. That is, 68% of the pupils made mathematics grades between 53% — 89%. This is a wide range which is partly due to our grading system. 75% is passing, the next lower grade is C or 65%, then N.P. or 40%.

In Chart II*, B_{MA} is the partial regression coefficient, R = Multiple correlation coefficient, and $\overline{M}$ the estimated value of the grade in mathematics.

A better estimation of mathematics grades can be secured by using both the score and the high school geometry grade than by using either one alone. The correlation between mathematics and high school geometry is .42, between mathematics and the score is .38. When $\overline{M}$ is dependent upon geometry and the score the multiple correlation is .48. As the chart shows, the results are not much better when both high school algebra and the reasoning part of the score are included. This indicates that the reasoning section of this test is not as good a measure of ability to do college mathematics as the whole test. High school geometry has a more direct relationship to college mathematics than does high school algebra.

These values of R are not large enough to be of much value in actually estimating the work a student should do in college mathematics. They only indicate certain significant relationships.

The 177 Industrial Science students who entered college in 1926 have the following record:

	Number	Per Cent
Regular	59	34
Reinstated	2	1
Scholarship drop	20	11
College records not available	14	8
Drops for various reasons		
Teach	7	4
Illness	4	2
No reason	39	22
Another college	32	18

58% of those who came with advanced credits dropped out before the end of two years. 34% of those who entered college in 1926 are still here. 18% had their transcripts sent to some other college.

The last objective was to see if it is possible to determine which high school students should be allowed to enter Iowa State College. For this study Chart III shows the table of correlations, standard deviations, and the means.

Chart III

	3	4	5	H	Q	N
A	.6898	.3759	.2507	.5198	.4069	.2692
3		.5228	.2941	.3003	.3131	.2509
4			.3163	—.0220	.0628	.0379
5				.0068	.1165	.1286
H					.4416	.3351
Q						.4944

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A = Score. 4 = Social. Q = First Quarter Ave.
3 = Information. 5 = Memory. N = Number of Qr. in School.
H = H. S. Average.

$\sigma_A = 34.0968$	$M_A = 148.2518$
$\sigma_3 = 6.3700$	$M_3 = 17.9425$
$\sigma_4 = 7.1106$	$M_4 = 21.0144$
$\sigma_5 = 2.9387$	$M_5 = 6.5468$
$\sigma_H = 4.4140$	$M_H = 86.9568$
$\sigma_Q = 9.6642$	$M_Q = 78.1583$
$\sigma_N = 3.0276$	$M_N = 5.3165$

A and 3 have some intercorrelation.

4, the social test, and 5, the memory test, have low correlations.

The first quarter average has the highest correlation with the number of quarters the student remained in college.

The multiple correlation results and the regression equations are shown in Chart IV.** A better estimaton of the number of

quarters that the student will remain in college can be secured by using both the first quarter average and the high school average than by using either average alone. The correlation between number of quarters and the first quarter average is .49; between number of quarters and high school average is .34. When $\overline{N}$ is dependent upon both the high school average and the first quarter average the multiple correlation is .51. Very little value is gained by including the variables A and 3. Notice how low the R drops when the first quarter average is replaced by the score, from .51 to .35. This fact has a great amount of significance. The Iowa State College Aptitude test, as given in 1926, does not have sufficient predictive value to predetermine which high school pupils should be allowed to enter Iowa State College. According to the above results, it is best to let the students come here for one quarter. It should be kept in mind that the Industrial Science students make up only a small percentage of the students who enter Iowa State College.

In another study, which deals with the Engineering students who entered college here last fall, the correlation between the revised form of the test and mathematics is high. In this study, the correlation between mathematics and first quarter average is high, and also the first quarter average is the best predictor of the number of quarters the student will remain in college. Therefore more work will possibly show that the present test does have sufficient predictive value to predetermine which high school students should be allowed to enter Iowa State College.

Chart II *

	B_{MA}	B_{M2}	B_{MY}	B_{MG}	R		
GY2AM	.2835	—.0400	.0713	.2878	.4883	$\overline{M}$ =	.1498A — .0583(2) + .2243Y + .8375G — 42.1760
GYAM	.2547		.0685	.2884	.4883	$\overline{M}$ =	.1346A + .2155Y + .8392G — 42.3680
GY2M		.1684	.0684	.3340	.4570	$\overline{M}$ =	.2453(2) + .2152Y + .9719G — 46.7540
GAM	.2573			.3250	.4843	$\overline{M}$ =	.1359A + .9460G — 32.9384

Chart IV **

	B_{NQ}	B_{NH}	B_{N3}	B_{NA}	R		
A3HQN	.4168	.1451	.1147	—.0547	.5183	$\overline{N}$ =	.1306Q + .0995H + .0545(3) — .0049A — 13.7947
AHQN	.4245	.1337		.0270	.5118	$\overline{N}$ =	.1330Q + .0917H + .0024A — 13.4082
AHN		.2674		.1302	.3530	$\overline{N}$ =	.0116A + .1834H — 12.3511
HQN	.4303	.1451			.5112	$\overline{N}$ =	.1348Q + .0995H — 13.8714