MEASURES OF HIGH SCHOOL ACHIEVEMENT RELATED TO SUCCESS IN POST HIGH SCHOOL TECHNICIAN PROGRAMS

By

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Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1967

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
MASTER OF SCIENCE
May, 1969

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Thesis Approved:

Thesis Adviser

Dean of the Graduate School

ACKNOWLEDGMENTS

The writer wishes to express his sincere appreciation to his advisers, Dr. Maurice W. Roney and Dr. Paul V. Braden, for their constructive criticism and supervision.

The writer also wishes to express thanks to his wife, Beverly, for her sacrifices and constant encouragement.

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CHAPTER I

INTRODUCTION

With the increased focus on science, the gap has widened between the skilled craftsman and the engineer or professional. The title "technician" is given to the person who fits into this gap. Technical education will give technicians the knowledge required for their occupation. This unique form of education places a strong emphasis on mathematics and science while giving the student a depth of knowledge in a technical speciality. The college level technical education curriculum is usually two years in length.

Within the past two decades the junior colleges have become aware of the need for preparing youth for occupational competence. In 1939, the American Association of Junior Colleges obtained financial support from the General Education Board for a study of technical education. This was inaugurated in 1940 and was carried on for five years. Several publications emerged from this study, all of which are evidence that the junior college educators are more and more accepting the preparation for occupational competence as one of their most important objectives (4, p. 22). Conscientious work in the development of technical education is currently being carried on by junior colleges, but many problem areas still exist.

Identification of the Problem Area

A problem which faces many high school and junior college educators is the lack of information concerning a means of predicting scholastic achievement for a student who is enrolled in a technical education curriculum. The information needed should relate directly to success and should be easily accessible so it may be used in student evaluation.

Statement of the Problem

This study is concerned with mathematic and communication achievements as they are related to grade point averages for students entering technical education programs.

Significance of the Problem Area

A high school student who is choosing a vocation may experience the problem of deciding upon an area of post secondary education in which his background will allow him to be successful. Since technical education is a unique form of education, certain characteristics may relate to a student's success. Mathematic and English backgrounds are easily accessible to a student or his counselor. If a positive correlation exists between achievement in these two areas and student success, then the two areas might be used for student evaluation.

High school counselors are not well informed about technical education. The counselors are even less informed as to what characteristics predict success for a technical education student. High school mathematics and English grades along with the level attained in mathematics are characteristics available to high school counselors. If a

counselor knew these characteristics were related to success in technical education, he might do a more effective job of counseling students.

A counselor within a junior college may also guide a student more effectively if the counselor had a means of predicting success. High school mathematics and English grades, level attained in mathematics, score on the mathematics and English portion of the American College Testing Program (ACT) test, and other entrance test scores are available to the junior college counselor. If a student is determined to enroll in technical education, but lacks the characteristics that predict success, the counselor may recommend remedial course work to prepare the student who may otherwise be a drop-out. If the student lacks desirable characteristics and has not definitely chosen technical education, the counselor may guide him into another field of study.

Need for the Study

Only a limited amount of research into technical education has been completed as compared to conventional education. This is possibly due to lack of emphasis on technical education until recent years. Most of the research has been oriented toward establishing the need for technical education and developing technical education curriculums. Only a fraction of the research has been oriented toward finding characteristics of successful junior college students in technical education is almost non-existent. Except for a few theses, the research has been oriented toward technical institutes instead of junior colleges.

Limitations of the Study

Limitations as to Institution

Mathematic and communication abilities of students entering Northeastern Oklahoma Agricultural and Mechanical Junior College technical education program will be correlated with the college grade point average for all course work at the end of the first two semesters.

Northeastern Oklahoma Agricultural and Mechanical College is a public supported junior college located in a county seat city of approximately 13,000 population. The city is located in a rural area approximately 80 miles from the nearest metropolitan city.

The college is fully accredited by the state accrediting agencies and by the North Central Association of Colleges and Secondary Schools. The Associate of Arts Degree is offered to the graduates in the technical education curriculums (7, p. 10).

Limitations as to Mathematic Achievement

The following three areas of concentration in mathematics to be evaluated for each student are: (1) average of high school algebra grades, (2) units of high school algebra, and (3) score received on the mathematics portion of the American College Testing Program (ACT) test.

Limitations as to Communication Achievement

The following three areas of concentration in communications to be evaluated for each student are: (1) average of high school English

grades, (2) score received on the communications portion of the American College Testing Program (ACT) test, and (3) score received on the Nelson-Denny Reading Test.

Limitations as to Student Background

All of the students in the study have completed two semesters of a four semester technical education curriculum. These students have at least a 2.00 grade point average based on a 4.00 grading system. These students enrolled for their first semester of technical education in the fall of 1967. The students who entered the program but did not complete the first two semesters will not be included in the study. Students who did not complete a high school education will not be included in this study.

Limitations as to Technical Curricula

The students in this study were enrolled in one of the following four technical education curriculums: business data processing technology, design and drafting technology, electronics technology, and mechanical technology. These curricula, which are reimbursed by the Technical Education Division of the State Department of Vocational-Technical Education, are included in this study because they are recognized by the state as being technical education curricula. Chemistry technology is reimbursed but is not included since the students do not have to declare a major until the end of the first two semester.

CHAPTER II

REVIEW OF THE LITERATURE

A study of the literature, conceptual framework, and rational for the hypotheses will provide a basis to construct hypotheses concerning success in a junior college technical education program. A review of the literature involving high school grades, level of high school mathematics, American College Testing Program (ACT) tests, and the Nelson-Denny Reading Test as they relate to technical education should relate directly to the hypotheses.

Wayne L. Schroeder and George W. Sledge (8, p. 102) in their article, Factors Related to Collegiate Academic Success say, "High school achievement is generally several times more important, as a predictor of college achievement. Prediction of college achievement in specific course areas is something quite different than prediction of overall college achievement. This is particularly true with reference to mathematics, language, and technical course area predictions." It should be emphasized, after reviewing this article, that the purpose of this study is to evaluate overall college achievement in technical education.

Samson S. Shigetomi (9, p. 38) completed a study related to the academic success of 72 students at Honolulu Technical School in 1963 and arrived at the following conclusions.

> The high school algebra grade missed being significant at the one per cent confidence level. However, there is a possibility that this may prove to be another significant predictor variable. Perhaps with more data and a much more accurate means of interpreting the grades from the high school record, the coefficient of correlation between the algebra grades and G.P.A. may increase. Presently, the secondary schools vary widely in standards, students, and curriculum. The private high schools, rural high schools, and urban high school all have their own methods of listing different grading systems.

The following study concluded that high school backgrounds are significant predictors of success. Predicting Success in Technical Programs, authored by R. Leroy Greenwood (4, p. 22), was written with the purpose of showing the types of results obtained by using statistical procedures to predict student success in technical programs at Broome Technical Community College. The following are the more important results.

> Intelligence test scores, high school mathematics and English averages, and the number of years of high school mathematics are likely to be closely related to academic success in the technical curriculums of community colleges. The value of a predictor may be much higher in one technical curriculum than in another curriculum of the same college. The minimum desirable scores on a predictor may be higher in one technical curriculum than in another technical curriculum of the same college. Most failing students in these technical curriculums did not have just one weakness, such as low intelligence test scores or a low high school mathematics average, but a combination of several weaknesses. Because of the varity of weaknesses with which some students may be successful in these technical curriculums, it is easier to find predictor levels above which most students are likely to pass than it is to find predictor levels below which most students are likely to fail.

The Standard Research Service Report, a report from the American College Testing Program gives correlations of ACT scores and high school grades with overall college grade point averages for Northeastern A. & M. students in the summer of 1968. High school English, high school mathematics, English ACT scores, and Mathematics ACT

scores correlated with overall college grade point gave coefficients of 0.368, 0.339, 0.483, and 0.407 respectively (12, Table-t 2.1, 2.2).

A common measure of student abilities is the American College Testing Program (ACT) test. Donald W. Brown (2, p. 28) in a study of technical institute students at Oklahoma State University obtained the following results.

> The results of the mathematics (ACT) test proved to be confusing since a negative correlation with respect to grade point average was obtained yet the test of significance permitted rejection of the null hypothesis at the one tenth of one per cent level, thus showing a significant difference between mathematics test scores of the successful student versus the unsuccessful students.

Terry P. Spradley (11, p. 32), in a study of three data processing technology programs in Oklahoma, obtained a .45 coefficient for both mathematics (ACT) scores and high school mathematics level when correlated with grade point average at the end of the first year. This indicates that ACT tests and mathematics level may be predictors of success. Spradley, in correlating the ACT scores, including mathematics, natural science, English, social science, and the composite with overall grade point average, says, "English A.C.T. has the highest coefficient of correlation (.66) of the critera analysed."

Roger C. Anderson (1, p. 5) in a study, Predicting Achievement in Technical Programs at North Dakota State School of Science, was concerned with graduate and non-graduate differences in six technical programs. "On the American College Test, mathematics is a consistently reliable differentiator for all six programs. English and the composite score differentiate between graduate and non-graduates in all programs except civil engineering."

Donald P. Hoyt (5, p. 21) in his article, Predicting Grades in Two-Year Terminal Programs, gave the following statements.

> In general, A.C.T. data have useful validities in predicting the academic success of occupational-terminal students. Predictive correlations ranged from .42 to .72 with an average of .56.

The importance of communication skills to the technical education student was stressed by Aaron J. Miller (6, p. 191) in his article, Characteristics of the Technical-Education Student.

> Another essential ingredient is a basic minimal reading ability. The importance of reading ability has been verified in a number of studies which relate academic achievement at the post-high-school level to reading ability. In one typical study by Brown certain selected intellective factors such as abilities in mathematics, science, and reading were related to success in a post-high-school technical institute program. In this study, reading ability was found to be a far more significant predictor of success than any other single academic factor.

Agatha Townsend (13, p. 800), in The Sixth Mental Measurements Yearbook, gave a review of the Nelson-Denny Reading Test.

> The current revision of the old standby for college testing, the Nelson-Denny Reading Test, will probably be welcomed by the chief clientele for its predecessor, teachers of college-bound pupils in grades 11 and 12, and those of college English classes; it may also be useful for college placement. It is a good test for a limited audience. The simple structure is well adapted to the survey purposes to which the test has always held.

In most of the literature reviewed for this study, a single predictor was correlated with a criteria rather than a combination of predictors. Joseph P. Cosand (3, p. 338-364), in his article Admissions Criteria, reviewed seventy-seven studies that derived correlations between predictors and collegiate success which were of significance, either because of a particularly high figure, a low figure, or a series of consistent figures. Of special interest is his chart giving the

multiple correlations, which points out strongly the advantage of several predictors over a single predictor.

Definition of Terms and Conceptual Framework

Definition of Terms

Successful students are defined in this study as those students with a 2.00 to 4.00 grade point average. This grade point average is based on a 4.00 grading system. High school is defined in this study as the last four years of secondary education. Communications abilities are defined in this study as English skills.

Basic Assumptions

It is assumed that students with a 2.00 to 4.00 grade point average at the end of two semesters have shown successful achievements in technical education.

It is assumed that a positive correlation between the predictors and criteria indicates success.

It is assumed that grading systems and tests used in this study will be basically the same for each student and represent the student's achievements.

Since algebra is included in the curricula of all four technical education programs in this study, high school algebra levels and grade point averages may provide a more significant correlation with grade point average than all mathematics combined.

Basic Framework

Since the information gained in this study only relates directly to students at Northeastern Oklahoma Agricultural and Mechanical Junior College, the study is not intended to represent all technical education students. However, a similarity may exist between students at this institution and neighboring institutions.

Other predictors besides those used may be easily accessable, but for specific reasons are not appropriate for this study. An example is the high school vocational-technical background that relates to a student's chosen technology. This predictor was excluded because of the difficulty in determining what courses can be considered vocational-technical. Can all high school business oriented courses be considered vocational-technical for a student enrolled in data processing technology?

Rational for Hypotheses

In the review of the literature a measure such as mathematics scores on the ACT tests might have a high correlation with success in one study, but a low correlation in another study. This is also true with other measures such as reading achievement. However, in most of the studies mathematic and communication achievements related to a student's success.

It is the author's estimate that the literature reviewed indicated the need for a combination of measures to represent a predicting variable such as communication achievements. High school English grades, ACT English test score, and the Nelson-Denny Reading Test score combined should provide a more accurate estimate of a student's

communication achievements than only one measure by itself.

Statement of Hypotheses

The hypotheses to test characteristics of Northeastern Oklahoma Agricultural and Mechanical Junior College technical education students are stated as follows:

1. There is no significant relationship between the students' grade point averages and each of the following: (a) averages of high school algebra grades, (b) averages of high school English grades, (c) ACT mathematics test scores, (d) ACT English test scores, (e) high school algebra levels, and (f) Nelson-Denny Reading Test scores.
2. There is no significant relationship between the combinations of mathematics and communications test measurements and student grade point averages.

CHAPTER III

PROCEDURES AND DESIGN

A description of the procedures and design including operational measures and methodology will provide an understanding of the means by which the results will be obtained.

Operational Measures

High school algebra grades, high school English grades, ACT mathematics scores, ACT English scores, level of high school algebra, and the Nelson-Denny Reading Test scores are the measures which will be used in this study.

Averages of both high school algebra and English grades based on the 4.00 grade point system will be used for each student.

ACT mathematics and English scores will be used as they were recorded from the tests.

A student will be rated 0, 1, or 2 for his level of high school algebra. Those students who have not completed Algebra I or Algebra II will receive a 0. Students who have completed Algebra I will receive a 1, and students who have completed both Algebra I and Algebra II will receive a 2.

There are two comparable forms of the Nelson-Denny Reading Test, each containing 100 items to measure vocabulary and 36 to measure reading comprehension. In this investigation Form A will be used. The

comprehension score is given double weight in arriving at a total score.

Methodology

Subjects

This study will include students who enrolled at Northeastern Oklahoma Agricultural and Mechanical Junior College in the fall of 1967. The students have completed two semesters in either data processing technology, design and drafting technology, electronics technology, or mechanical technology. All of the students are high school graduates.

Specific Procedure and Design

Each of the measures will be correlated with the students' grade point averages. The product moment correlation r will be found by the following formula in which N represents the number of measures to be tested, X represents the measure, and Y represents the student grade point average.

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

The Fisher t test of significance will be used to test the hypotheses. The null hypotheses, that a particular deviation occurred by chance, will be rejected when the probability of an event is 5 times in 100 ($p=.05$) or smaller (14, p. 375).

$$t = \frac{r\sqrt{N - 2}}{\sqrt{1 - r^2}}$$

All combinations of the six measures will be correlated with the students' grade point averages to test the second hypothesis. A multiple correlation computer program will compute the correlation coefficient. Combinations will be represented with numbers by assigning the number 1 to mathematics ACT scores, 2 to English ACT scores, 3 to Nelson-Denny Reading Test scores, 4 to algebra levels, 5 to averages of high school English grades, 6 to averages of high school algebra grades, and 7 to college grade point average.

712	735	7135	7256	71256	712345
713	736	7136	7345	71345	712346
714	745	7145	7346	71346	712356
715	746	7146	7356	71456	723456
716	756	7156	7456	72345	734516
723	7123	7234	71234	72346	745612
724	7124	7235	71235	72456	7123456
725	7125	7236	71236	72356	
726	7126	7245	71245	73456	
734	7134	7246	71246	71356	

An equation will be used for predicting raw scores on one variable from a knowledge of raw scores on the second variable. In constructing a regression line an attempt is made to fit a line to the existing means, that is, to develop a line which passes near all the means. The method used in fitting these lines to the data is called the "method of least squares". The formula for the regression of X on Y is: (14, p. 377)

$$X = r \frac{s_x}{s_y} (Y - M_y) + M_x$$

where X is equal to a predicted score for a particular value of Y, s_x and s_y are standard deviations of X and Y, M_x and M_y are the means of X and Y, and r is the product moment correlation.

The Fisher F table will be used to determine the probability that observed differences among three or more sample means occurred by chance. The number of degrees of freedom for the greater mean square will be calculated as the number of variables minus one. The number of degrees of freedom for the lesser mean square will be calculated as the number of observations minus the number of variables minus one (14, p. 388).

A multiple regression equation will be used to predict scores on the criterion variable from a knowledge of the predictor variables. The following equation can be expanded to six predictor variables. The equation for predicting a raw score from a knowledge of two predictor scores is: (14, p. 388)

$$Y = B_2 \frac{s_1}{s_2} X_2 + B_3 \frac{s_1}{s_3} X_3 + (M_1 - B_2 \frac{s_1}{s_2} M_2 - B_3 \frac{s_1}{s_3} M_3)$$

where s_1, s_2, and s_3 are standard deviations for the criterion and two predictor variables. M_1, M_2, and M_3 are the means of the criterion and two predictor variables.

$$B_2 = \frac{r_{12} - r_{13}r_{23}}{1 - r^2_{23}}$$

$$B_3 = \frac{r_{13} - r_{12}r_{23}}{1 - r^2_{23}}$$

where r_{23} = product moment correlation between the two predictor variables

r_{12} = correlation between the criterion and the first predictor variable

r_{13} = correlation between the criterion and the second predictor variable

CHAPTER IV

ANALYSIS OF DATA

By using simple correlation, each of the six predictor variables was correlated with college grade point averages. A value of significance was calculated for each correlation to test the first null hypotheses. A regression analysis gave the predicted value needed to receive a 2.00 grade point average at Northeastern A. & M. Junior College.

The averages of high school algebra grades gave the highest simple correlation coefficient (.574) and the null hypotheses was rejected at the one per cent level. The regression analysis indicated that a student should have a 1.509 high school algebra grade point average to be successful in college. The correlation coefficient (.574) may not compare too closely with the .407 coefficient of the ACT report because the report included all high school mathematics (12, Table-t 2.1, 2.2).

The averages of high school English grades correlation coefficient was .418. Rejection of the null hypotheses was at the one per cent level. The regression analysis indicated that a student should have a 2.08 high school English grade point average to be successful in college. This correlation compared relatively close to the correlation (.368) published by the ACT report (12, Table-t 2.1, 2.2).

Correlating the level of algebra with grade point average gave a .287 correlation coefficient. The null hypotheses was rejected at the

TABLE I

A LISTING OF THE STUDENTS' INDEPENDENT & DEPENDENT VARIABLES

Student ID Number	Math ACT Score	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Algebra Grade Average	College Grade Average
1	16	16	27	1	3.48	3.50	3.063
2	16	22	53	2	2.13	3.00	2.400
3	17	16	24	2	3.13	3.25	3.194
4	11	13	36	1	3.00	3.50	2.576
5	15	20	33	1	3.00	3.00	2.424
6	25	19	29	2	2.50	2.67	2.303
7	10	21	35	1	3.67	2.00	2.516
8	15	15	24	1	2.25	1.50	2.152
9	23	15	30	2	2.38	3.25	2.382
10	15	14	33	1	2.25	2.00	2.061
11	15	22	26	1	3.38	2.00	3.000
12	16	10	28	1	1.88	1.50	2.500
13	30	19	47	2	3.38	3.50	3.265
14	27	17	48	2	2.75	2.50	2.433
15	05	08	27	0	1.50	0.00	2.040
16	29	27	49	2	3.38	4.00	3.667
17	19	15	31	1	1.00	0.00	2.230
18	12	12	24	0	2.38	0.00	2.265
19	22	22	45	2	3.25	3.50	2.629
20	12	24	57	1	2.63	1.00	2.000
21	22	07	22	2	1.63	1.50	2.057

TABLE I (Continued)

A LISTING OF THE STUDENTS' INDEPENDENT & DEPENDENT VARIABLES

Student ID Number	Math ACT Score	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Algebra Grade Average	College Grade Average
22	14	16	41	0	2.88	0.00	2.343
23	22	18	32	2	0.75	1.50	2.658
24	19	23	47	2	4.00	4.00	3.912
25	29	21	32	2	2.88	3.25	2.879
26	17	13	32	2	2.00	2.25	2.571
27	08	20	37	1	2.63	3.00	3.405
28	22	22	31	2	3.13	3.50	3.636
29	07	17	34	1	2.25	3.50	3.703
30	25	16	43	2	2.63	2.25	2.333
31	17	19	42	1	2.50	3.50	2.353
32	16	20	42	1	2.88	3.00	2.733
33	17	27	48	1	4.00	4.00	3.500
34	15	20	50	1	2.88	2.25	2.000
35	15	17	33	2	2.25	2.50	2.056
36	25	18	33	2	3.38	2.50	2.683
37	16	21	43	1	1.88	2.00	2.303
38	17	17	50	2	3.00	3.50	3.176
39	11	18	32	1	2.75	2.00	3.273
40	25	23	49	2	2.38	3.25	3.677
41	17	17	33	1	1.38	1.00	2.061
42	08	11	43	1	1.63	1.50	2.532

TABLE I (Continued)

A LISTING OF THE STUDENTS' INDEPENDENT & DEPENDENT VARIABLES

Student ID Number	Math ACT Score	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Algebra Grade Average	College Grade Average
43	13	14	35	1	1.50	1.00	2.484
44	21	20	43	2	3.00	1.75	2.515
45	10	15	32	0	2.75	0.00	2.515
46	15	22	41	1	3.63	2.00	2.492
47	16	22	48	1	3.25	3.50	2.794
48	23	20	34	2	3.00	3.00	2.625
49	13	21	33	1	3.13	2.50	2.276
50	15	19	34	1	1.63	1.00	2.667
51	17	16	39	2	2.25	2.25	2.371
52	21	15	29	2	3.63	4.00	3.514
53	11	12	21	1	1.63	1.50	2.000
54	21	20	42	2	3.00	3.00	3.015
55	18	21	31	2	2.63	3.25	2.167
56	19	14	12	1	1.00	2.00	2.317
57	29	18	37	2	1.38	2.00	2.717
58	20	19	27	2	3.00	2.33	2.343
59	15	17	49	1	3.00	2.00	3.303
60	23	16	40	2	1.63	2.67	2.667
61	13	26	56	1	2.38	1.50	2.457
62	10	12	28	1	1.75	1.00	2.059
63	27	21	32	2	1.50	2.75	2.857

TABLE I (Continued)

A LISTING OF THE STUDENTS' INDEPENDENT & DEPENDENT VARIABLES

Student ID Number	Math ACT Score	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Algebra Grade Average	College Grade Average
64	16	19	57	2	4.00	3.75	3.657
65	18	14	51	1	2.50	2.50	3.063
66	23	20	42	2	3.50	2.50	2.485
67	10	09	44	1	0.67	1.00	2.600
68	12	16	38	1	2.38	1.50	2.121
69	23	21	42	2	2.83	2.50	2.645
70	10	08	28	1	4.00	3.50	2.912
71	16	19	39	1	2.25	2.50	2.906
72	10	18	33	1	2.25	1.50	3.520
73	35	04	21	2	1.75	2.00	2.647
74	17	17	26	1	4.00	3.50	3.059
75	16	06	23	2	1.38	0.75	2.750
76	27	23	52	2	3.00	3.75	2.200
77	19	14	26	2	2.50	3.25	3.182
78	17	21	42	1	2.63	2.00	2.000
79	28	19	48	2	2.88	2.50	3.290
80	17	18	50	1	2.38	1.00	2.000
81	10	20	44	1	2.88	1.00	2.069
82	27	23	55	2	2.50	2.75	3.543
83	23	18	36	2	2.00	2.50	2.375
84	03	10	31	1	1.50	1.00	2.020

TABLE I (Continued)

A LISTING OF THE STUDENTS' INDEPENDENT & DEPENDENT VARIABLES

Student ID Number	Math ACT Score	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Algebra Grade Average	College Grade Average
85	25	23	50	2	3.13	2.75	2.353
86	24	17	23	2	1.00	3.00	2.848
87	23	20	29	2	1.50	1.75	2.333
88	23	20	33	2	3.38	2.75	4.000
89	22	10	32	1	2.75	3.00	3.176
90	14	07	14	0	1.38	0.00	2.323

one per cent level. A regression analysis indicated a student should have one year of high school algebra to obtain a 2.00 grade average in college.

TABLE II

RESULTS OF THE CORRELATION OF INDEPENDENT VARIABLES WITH GRADE POINT AVERAGES; t-TEST; AND REGRESSION ANALYSIS

Variable Correlated With G.P.A.	Cor. Coef. r	Results of t-Test	Level of Rejection	Condition of Null Hypotheses	Regression of Variable With 2.00 G.P.A.
Math ACT Score	.228	2.203	.05	Rejected	16
English ACT Score	.253	2.455	.01	Rejected	15
N-D Reading Score	.170	1.682	.05	Rejected	34
Algebra Level	.287	2.819	.01	Rejected	1
English Grade Average	.418	4.323	.01	Rejected	2.08
Algebra Grade Average	.574	6.578	.01	Rejected	1.509

English ACT scores gave a .253 correlation coefficient. The null hypotheses was rejected at the one per cent level. Regression analysis predicted that a student should have an English ACT score of 15 in order to obtain a 2.00 grade average. This .253 correlation coefficient did not compare closely with Spradley's (11, p. 32) .66 correlation coefficient for similar students. However, in both studies there

were positive correlations which could be rejected at the one per cent level. Spradley's study included only data processing students.

Mathematic ACT scores gave a .228 correlation coefficient. The null hypotheses was rejected at the five per cent level. Regression analysis indicated that a mathematics ACT score of 16 would result in a 2.00 grade point average. Brown (2, p. 28) in a study of technical education students at Oklahoma State University obtained a -0.14 correlation coefficient for mathematics ACT scores with grade point average. Spradley (11, p. 32) in a study of data processing students in Oklahoma obtained a .45 correlation coefficient.

Correlating the Nelson-Denny Reading Test scores with grade point averages gave a .170 correlation coefficient. The null hypotheses was rejected at the five per cent level. A regression analysis indicated a student should obtain a Nelson-Denny Reading Test score of 34 to receive a 2.00 grade point average. The correlation coefficient for Browns (2, p. 28) study of the Nelson-Denny Reading Test was equivalent to .331 when weighted by the procedure used in this study. Brown's study included students at a technical institute which was part of a university, rather than junior college students.

By using multiple correlation, each combination of the six predictor variables was correlated with college grade point averages. A correlation matrix giving the correlations between all predictor variables was used to calculate multiple correlations.

Referring to table IV, the highest correlation (.585) was obtained by correlating all six variables together with grade point average. This correlation was only .011 greater than the correlation (.574) between the averages of high school algebra grades and college grade

point averages. This occurred because a considerable gap existed between the predictor variable correlations, so the addition of any variables to the average of algebra grades has little that is unique to add. The second null hypotheses could be rejected at the five per cent level for each combination. Forty-seven of the 57 combinations were rejected at the one per cent level.

TABLE III

MULTIPLE CORRELATION MATRIX INCLUDING INTERCORRELATIONS OF VARIABLES

	English ACT Score	N-D Reading Score	Algebra Level	English Grade Average	Math Grade Average	College Grade Average
Math ACT Score	.252	.115	.731	.085	.409	.228
English ACT Score		.594	.267	.472	.438	.253
N-D Reading Score			.160	.346	.257	.170
Algebra Level				.110	.565	.287
English Grade Average					.585	.418
Math Grade Average						.574

An example of using multiple regression to predict a college grade point average for a student who has a 3.00 grade point average in high school algebra and a score of 16 on the English ACT test if given in the following example. Refer to page 16 for a description of

the regession equation, and TABLE V for coefficients.

$$B_2 = \frac{r_{27} - r_{67}r_{26}}{1 - r^2_{26}} = \frac{(.253) - (.574)(.438)}{1 - (.438)^2} = .001$$

$$B_3 = \frac{r_{67} - r_{27}r_{26}}{1 - r^2_{26}} = \frac{(.574) - (.253)(.438)}{1 - (.438)^2} = .573$$

$$Y = B_2 \frac{s_1}{s_2} X_2 + B_3 \frac{s_1}{s_3} + (M_1 - B_2 \frac{s_1}{s_2} M_2 - B_3 \frac{s_1}{s_3} M_3)$$

$$Y = (.001) \frac{.517}{4.705} (16) + (.573) \frac{.517}{1.049} (3.00) + (2.677 -$$

$$(.001) \frac{.517}{4.705} (17.355) - (.573) \frac{.517}{1.049} (2.299)) = 2.874$$

TABLE IV

MULTIPLE CORRELATION OF ALL COMBINATIONS OF INDEPENDENT VARIABLES WITH GRADE POINT AVERAGES INCLUDING TESTS OF SIGNIFICANCE

Variables *	Multiple Correlation Coefficient	Test of Significance	Degrees of Freedom		Condition of Null Hypotheses	Level of Rejection
712	.305	4.450	2	87	Rejected	.05
713	.270	3.422	2	87	Rejected	.05
714	.288	3.941	2	87	Rejected	.05
715	.460	11.706	2	87	Rejected	.01
716	.574	21.380	2	87	Rejected	.01
723	.254	3.105	2	87	Rejected	.05
724	.340	5.700	2	87	Rejected	.01
725	.423	9.466	2	87	Rejected	.01
726	.574	21.375	2	87	Rejected	.01

TABLE IV (Continued)

MULTIPLE CORRELATION OF ALL COMBINATIONS OF INDEPENDENT VARIABLES WITH GRADE POINT AVERAGES INCLUDING TESTS OF SIGNIFICANCE

Variables *	Multiple Correlation Coefficient	Test of Significance	Degrees of Freedom		Condition of Null Hypotheses	Level of Rejection
734	.313	4.735	2	87	Rejected	.05
735	.419	9.256	2	87	Rejected	.01
736	.574	21.427	2	87	Rejected	.01
745	.483	13.250	2	87	Rejected	.01
746	.576	21.570	2	87	Rejected	.01
756	.583	22.384	2	87	Rejected	.01
7123	.306	2.969	3	86	Rejected	.05
7124	.341	3.761	3	86	Rejected	.05
7125	.461	7.728	3	86	Rejected	.01
7126	.574	14.090	3	86	Rejected	.01
7134	.315	3.146	3	86	Rejected	.05
7135	.461	7.718	3	86	Rejected	.01
7136	.576	14.124	3	86	Rejected	.01
7145	.484	8.762	3	86	Rejected	.01
7146	.577	14.275	3	86	Rejected	.01
7156	.583	14.764	3	86	Rejected	.01
7234	.341	3.778	3	86	Rejected	.05
7235	.423	6.240	3	86	Rejected	.01
7236	.575	14.132	3	86	Rejected	.01
7245	.483	8.735	3	86	Rejected	.01
7246	.576	14.217	3	86	Rejected	.01
7256	.584	14.809	3	86	Rejected	.01

TABLE IV (Continued)

MULTIPLE CORRELATION OF ALL COMBINATIONS OF INDEPENDENT VARIABLES WITH GRADE POINT AVERAGES INCLUDING TESTS OF SIGNIFICANCE

Variables *	Multiple Correlation Coefficient	Test of Significance	Degrees of Freedom		Condition of Null Hypotheses	Level of Rejection
7345	.483	8.735	3	86	Rejected	.01
7346	.576	14.254	3	86	Rejected	.01
7356	.583	14.752	3	86	Rejected	.01
7456	.583	14.762	3	86	Rejected	.01
71234	.341	2.805	4	85	Rejected	.05
71235	.461	5.728	4	85	Rejected	.01
71236	.575	10.478	4	85	Rejected	.01
71245	.484	6.495	4	85	Rejected	.01
71246	.577	10.582	4	85	Rejected	.01
71256	.584	10.995	4	85	Rejected	.01
71345	.484	6.496	4	85	Rejected	.01
71346	.577	10.610	4	85	Rejected	.01
71456	.584	10.983	4	85	Rejected	.01
72345	.483	6.477	4	85	Rejected	.01
72346	.576	10.573	4	85	Rejected	.01
72456	.584	10.981	4	85	Rejected	.01
72356	.584	10.990	4	85	Rejected	.01
73456	.583	10.942	4	85	Rejected	.01
71356	.583	10.945	4	85	Rejected	.01
712345	.484	5.136	5	84	Rejected	.01
712346	.577	8.398	5	84	Rejected	.01
712356	.584	8.702	5	84	Rejected	.01

TABLE IV (Continued)

MULTIPLE CORRELATION OF ALL COMBINATIONS OF INDEPENDENT VARIABLES WITH GRADE POINT AVERAGES INCLUDING TESTS OF SIGNIFICANCE

Variables *	Multiple Correlation Coefficient	Test of Significance	Degrees of Freedom		Condition of Null Hypotheses	Level of Rejection
723456	.584	8.691	5	84	Rejected	.01
734561	.584	8.683	5	84	Rejected	.01
745621	.584	8.720	5	84	Rejected	.01
7123456	.585	7.191	6	83	Rejected	.01

* Refer to page 15 for a definition of the variables.

TABLE V

SIMPLE CORRELATIONS BETWEEN ALL VARIABLES;
STANDARD DEVIATIONS; AND MEANS
OF EACH VARIABLE

Variables Y	X *	Correlation Coefficient	Standard Deviation of X	Standard Deviation of Y	Mean of X	MEAN of Y
7	1	.228	6.206	.517	17.91	2.68
7	2	.253	4.705	.517	17.36	2.68
7	3	.170	9.930	.517	36.74	2.68
7	4	.287	.595	.517	1.42	2.68
7	5	.418	.797	.517	2.52	2.68
7	6	.574	1.049	.517	2.30	2.68
2	1	.252	6.206	4.705	17.91	17.36
3	1	.115	6.206	9.930	17.91	36.74
4	1	.731	6.206	.595	17.91	1.42
5	1	.085	6.206	.797	17.91	2.52
6	1	.409	6.206	1.049	17.91	2.30
3	2	.594	4.705	9.930	17.36	36.74
4	2	.267	4.705	.595	17.36	1.42
5	2	.472	4.705	.797	17.36	2.52
6	2	.438	4.705	1.049	17.36	2.30
4	3	.160	9.930	.595	36.74	1.42
5	3	.346	9.930	.797	36.74	2.52
6	3	.257	9.930	1.049	36.74	2.30
5	4	.110	.595	.797	1.42	2.52
6	4	.565	.595	1.049	1.42	2.30
6	5	.585	.797	1.049	2.52	2.30

* Refer to page 15 for a definition of the variables.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The correlations of six predictor variables with college grade point average and tests of significance for 90 students at Northeastern A. & M. Junior College were used to test the first hypotheses.

Conclusions

Averages of high school algebra grades can be used as predictors of success since the null hypotheses was rejected at the one per cent level.

Averages of high school English grades can be used as predictors of success since the null hypotheses was rejected at the one per cent level.

ACT mathematics test scores can be used as predictors of success since the null hypotheses was rejected at the five per cent level.

ACT English test scores can be used as predictors of success since the null hypotheses was rejected at the one per cent level.

High school algebra levels can be used as predictors of success since the null hypotheses was rejected at the one per cent level.

Nelson-Denny Reading test scores can be used as predictors of success since the null hypotheses was rejected at the five per cent level.

The multiple correlations of all combinations of the six predictor

variables with college grade point averages were used to test the second hypotheses.

Referring to Table IV, all combinations of the six predictor variables can be used as predictors of success since the null hypotheses was rejected in all combinations at the five per cent level. The null hypotheses was rejected at the one per cent level in the majority of the combinations.

If averages of high school algebra grades was included as a variable in a combination, the additional variables had almost no effect on the correlation coefficient.

The regression analysis giving the scores and grade point averages of each variable to obtain a 2.00 grade point average was as follows: (1) a math ACT score of 16, (2) an English ACT score of 15, (3) a Nelson-Denny Test score of 34, (4) an algebra level of 1 (one year of high school algebra), (5) a high school English grade average of 2.08, and (6) a high school algebra grade average of 1.509.

Recommendations

Recommendations for the use of this study and continued study in this area are the following:

(1) Continued statistical analysis of Northeastern A.& M. students in following years, using this study as a model, should be carried on to substantiate the findings of this study.

(2) Emphasis should be placed on high school algebra grades in counseling students who plan to enter technical programs. The standard error of estimate should be calculated to determine the spread of scores within one standard deviation of the mean for the

independent variable.

(3) Even though the addition of more than one independent variable used in this study may not substantially increase the multiple correlation coefficient, a number of variables should be used to provide a more reliable predictor of a student's achievements. Since a substantial gap existed between the correlation coefficient for averages of high school algebra grades and the correlation coefficient for the next highest independent variable, the addition of more variables did not substantially increase the multiple correlation coefficient.

BIBLIOGRAPHY

(1) Anderson, Roger C., "Predicting Achievement in Technical Programs at North Dakota State School of Science." (Center for Research in Vocational and Technical Education, University of North Dakota, 1966).

(2) Brown, Donald W., "The Relationship of Academic Success of Students Enrolled in The Oklahoma State University Technical Institute to Reading Ability and Mechanical Ability." (unpub. M. S. Thesis, Oklahoma State University, 1964).

(3) Cosand, Joseph P., "Admissions Criteria." College and University. XXVIII. 1953.

(4) Greenwood, R. Leroy, "Predicting Success in Technical Programs." Technical Education News. December, 1963.

(5) Hoyt, Donald P, "Predicting Grades in Two-Year Terminal Programs.: Junior College Journal. February, 1966.

(6) Miller, A. J., "Characteristics of the Technical-Education Student." Technical Education Yearbook. 1967.

(7) Northeastern Oklahoma Agricultural and Mechanical College. 1967-1968 College Catalogue. Miami, 1967.

(8) Schroder, W. L. and G. W. Sledge, "Factors Related to Collegiate Academic Success." Journal of College Student Personnel. Vol. 7. 1966.

(9) Shigetomi, Samson S., "Selection and Admittance of Electronics Students to The Honolulu Technical School." (unpub. M. S. Thesis, Oklahoma State University, 1963).

(10) Smith, Leo R. and Lawrence Lipsett, The Technical Institute. McGraw-Hill Book Company, Inc., New York, 1956.

(11) Spradley, Terry P., "The Relationship of Academic Success of Students Enrolled in Business Data Processing at Three Oklahoma Junior Colleges to American College Test Scores (A.C.T.) and Level of Mathematics." (unpub. M. S. Thesis, Oklahoma State University, 1968).

(12) Standard Research Service Report. The American College Testing Program. Iowa City, 1968.

(13) Townsend, Agatha, The Sixth Mental Measurements Yearbook. The Gryphon Press, Highland Park, 1964.

(14) Van Dalen, Deobold B., Understanding Educational Research. McGraw-Hill Book Company, New York, 1966.

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