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

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CHAPTER I

INTRODUCTION

Attention is focused on the nation's manpower problem by the rapid increase in the nation's population and labor force, the problems of unemployment, the need for more and better trained workers, automation and the resultant need for retraining workers. The technical programs scattered throughout the United States are directly involved in the partial solution of these problems.

In order to be successful, the technical programs must attract, hold, and place capable students--capable of completing a rigorous two-year program and capable of fulfilling what industry demands of a technician.

Can a well-staffed, well-equipped technical school, having a good sequence of course work, sit back and watch above-average students flock in on enrollment day? Although this may happen at four-year academic institutions it is not likely to occur at technical institutes. Part of the reason requires a glimpse of the history and heritage of western schools.

The early school in Western Europe centered about Theology, law, and medicine. As a result education was available only to the upper class and the clergy. Therefore, when vocational training was included for the poor and orphaned, it was of secondary importance, and the schools of higher learning remained academically oriented and subordinated to academic ideals and purposes.[1]

As national and state governments became increasingly aware of the need for educated populations to support the economy and fill the labor market, public school laws were enacted that placed education within reach of most of the citizenry.

However, schools did not automatically lose their heritage of academics for the well-to-do as evidenced by the following quotation.

> One of the major problems which continues to arise to plague the technical institute idea in higher education is personal or social status. The status question is inherent in the prevailing American habit of regarding a four-year baccalaureate degree more as a mark of social distinction than as a measure of the fitness and effectiveness of the educational program for the individual receiving it. This traditional over-emphasis on the collegiate baccalaureate program has by direct inference and popular understanding placed the brand of second class status on the technical institute program.[2]

Therefore, the success of technical education depends in part upon the ability of those associated with the movement to change the attitude of the general public concerning the status level of technical education. Conversely, changing the attitude of the general public depends partially upon the success of technical education and an informed public. The attainment of greater prestige for technical programs will contribute toward the ability to select capable students which is an absolute necessity.

> One clear difference between the technical institute program and the vocational-technical program long recognized in both federal and state legislation which has primary relationship toward the area of the secondary school,

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[1] Roy W. Roberts, Vocational and Practical Arts Education, (Harper and Row, 1965), pp. 40-56.

[2] J. Ross Henninger, "The Technical Institute in America," Journal of Engineering Education, Vol. 51, No. 1, p. 33.

> lies, in the contrast in basic orientation of the two programs: (1) the basic objective of the technical institute program is to turn out competent engineering technicians capable of productive service and growth in and with the selected field of engineering technology. This presupposes rigorous screening and selection of entering students to assure appropriateness of aptitude and interest. (2) The basic objective of the vocational-technical program is to accept students as they come along, and to help them make the best use of their talents at whatever level these happen to materialize. Both of these programs are important contributions to society and to the respective participants, but they are distinctly different in philosophy and neither can take the place of the other.[3]

At the present time, little is being done towards the selection of technical students although numerous tests are available to measure intelligence interests, aptitude, etc.

The obvious reason is that there are not enough student applicants to allow selection. It is even necessary, in many instances, to enroll every applicant in order to justify the program. As a result, much time and effort must be devoted by the instructor to the unqualified student who, at some later date, will be dropped from the program. This policy is grossly unfair to the unqualified student as much valuable time may be lost as well as possible damage to his ego and self-confidence. It is also unfair to the qualified student as the progress of the entire class is slowed down and his needs are inadequately met.

Other reasons for inadequate selection procedure relate to the time and effort required to administer the test battery. Should the over burdened school counselor do this or the classroom teacher? Would not the testing have to take place before enrollment? Who would interpret the tests? Will a school whose primary philosophy is steeped in the traditional scholastic attitudes fund such projects? These

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[3] Ibid., p. 36.

questions for the most part have been ignored and selection procedures remain woefully inadequate.

Need for the Study

At the present time, the Business Data Processing technical programs are operating more or less on the open door policy requiring only that the student has taken at least one course in Algebra I and the American College Test (A.C.T.) program test battery. No effort has been made to interpret this information concerning the probability of success in a Business Data Processing Curriculum after having achieved a particular A.C.T. score or level of mathematical training. The need for improvement of the selection procedures is both apparent and urgent. A prime consideration is that the selection procedure be efficient, regarding both time and money, in the gathering and interpreting of the data in order to be usable and acceptable to the schools.

Purpose of the Study

The purpose of the study is to examine the possibility of using existing information on prospective students in order to more nearly determine his probability of success in Business Data Processing. The existing information being specifically the results of the A.C.T. test battery and knowledge of mathematics courses successfully completed.

Specific Statement of the Problem

In the fall semester of 1966 a new curriculum in Business Data Processing was offered by three Oklahoma Junior colleges. The attrition rate for the first year was extremely high, approximately 50 per cent. The problem was to determine whether or not the existing information that is available for all entering college freshmen in Oklahoma, the American College Test (A.C.T.) scores and the level of mathematics completed prior to enrollment in the program, could be used as predictors of success in Business Data Processing. The purpose, of course, being more realistic counseling of potential enrollees. The A.C.T. tests include scores on English, mathematics, social science, natural science, and a composite. These scores were obtained for each student completing the first year of Business Data Processing at Altus Junior College, Eastern Oklahoma State College, and Cameron State College. In addition, the level of math, attained prior to entering the course of study was recorded and coded according to the table in Appendix C. The grade point average at the end of one year was determined for each student. Students were omitted from the sample when the information was incomplete in any part.

The independent variables were: English ACT score, Social Science ACT score, Natural Science ACT score, Mathematics ACT score, Composite ACT score and highest level of mathematics attained. The dependent variable was the grade point average at the end of one year.

Statement of Hypothesis

To determine the validity of using the American College Testing Program scores and level of math course completed prior to admission in evaluating the success of potential Business Data Processing students, the following hypothesis is proposed:

1. There is no significant relationship between ACT scores and the first year grade point averages earned at Cameron State

College, Altus Junior College, and Eastern Oklahoma State College.

2. There is no significant relationship between the level of mathematics taken prior to admission and the first year grade point average earned at Cameron State College, Altus Junior College, and Eastern Oklahoma State College.

Delimitations

Possible potential intervening variables include the inability to assign an absolute sequence of mathematics courses because of the lack of consistent terminology in the names and variations of course work for classes of the same name in different schools and under different instructors. Other factors include the variability of the instructors backgrounds and grading practices between the three schools involved in the study. These limitations, however, are present in any study where more than one teacher is involved regardless of a change of institution. These differences have been deemphasized in that instructors at these institutions gained a large portion of their background and were in close association with one another during a 10 week data processing institute the summer of 1966.

Another variable, the difference in curriculums has been minimized by the close coordination of the Oklahoma State Office of Technical Education and a suggested curriculum for 2 year post high school programs published by the U. S. Office of Education. The similarity between curriculums is readily apparent in Appendix D. The fact that the programs were in state of flux, new curriculums, new teachers, new equipment, and new ideas, would also be another possible intervening variable.

Assumptions

For the purposes of this study the following assumptions are made:

1. That the questionnaries were filled out with valid information.

2. That the Data Processing programs at the three institutions are basically the same.

3. That the grading system used by each teacher is fundamentally the same.

4. That a positive correlation between A.C.T. scores and grade point average actually does indicate that A.C.T. scores can be used as a predictor of success in junior college data processing programs.

CHAPTER II

REVIEW OF THE LITERATURE

For many years scholastic aptitude testing has been used to predict how well the student will succeed in school. The scholastic aptitude test attempts to measure the students capacity for success in school both in subject matter and in adaptation. Capacity cannot be measured directly, therefore this so-called intelligence testing is based upon inference and assumptions. The assumption is that if opportunities for development and motivation have been equal, mental ability--what the individual knows and can do on intellectual tasks--will vary with capacity, since ability cannot be measured directly, what is actually measured is performance. In effect then, by measuring performance, ability is inferred from which capacity is inferred.[4]

This is not to say that there are no reliable predictors of scholastic achievement, but only that there must be an awareness of many non-measurable factors that contribute to success. Some of these factors are socio-economic level, desire, parental interest, and frustration tolerance. However, after several years of public school, the students ability to perform should be indicative of the effect that these non-measurable factors have had in the past and may, therefore,

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[4]Alfred Schaartz and Stuart C. Tredman, Evaluating Student Progress in the Secondary School, (Longman, Green and Company, New York, 1957), p. 297.

indicate their effect on performance in the future.

In order to increase the efficiency of Air Force technical schools and reduce the failure rate, Leland D. Brokaw did a study entitled Prediction of Success in Technical Training from Self-report Information on Technical Achievement. It involved a self report biographical inventory providing 53 educational variables from the responses to 16 questions. Multiple regression analysis for graduates from 8 technical schools showed that--educational information is valid alone, as well as in combination with the aptitude measure, for use in airman selection.[5]

The academic and non-academic achievements of college students were predicted using scores on the American College Test battery, high school grades, and 6 scales measuring non-academic accomplishments in high school. The criteria included college grades, 12 scales designed to measure notable extra-classroom accomplishment in college, and 1 scale to assess recognition for academic accomplishment. The results indicate that:

1. Non-academic accomplishment could be assessed with moderate reliability.

2. Both academic and non-academic accomplishment can be predicted to a useful degree.

3. Non-academic accomplishment is largely independent of academic potential and achievement.[6]

In another report, Robert Nichols, concluded that college achievement could be predicted by non-intellective data and that "the best

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[5] Leland D. Brokaw, "Prediction of Success in Technical Training from Self-report Information on Educational Achievement," USAF PRL tech. docum. Rep., 1963, No. 63-11.

[6] James M. Richards Jr., John L. Holland, Sandra W. Lutz, "The Prediction of Student Accomplishment in College," ACT Research Report, Iowa City, 1956, No. 13.

predictor of college grades was rank in high school class."[7]

A great deal of energy has been expended in an effort to provide a means of predicting academic success at the college level.

> However, the problem of predicting success of technical and vocational school students has received relatively little attention. Also, predictive studies concerning individual areas of learning are few in number. Perhaps the reasons that contribute to this condition are: (1) Apparently few technical and vocational schools utilize a selection procedure in selecting and admitting applicants. (2) Technical schools, unlike colleges, have few staff members who are capable of doing the necessary research or who are interested in doing it. Those of the staff who are capable and interested are usually overburdened with other duties. (3) The majority of the private technical schools are not concerned with selection and admission procedures, but with merely increasing the enrollment. (4) The majority of the students who file applications with the technical schools are unable to master academic subjects and therefore those schools are not able to make any positive selection.[8]

D. W. Brown in his study made at Oklahoma State University in 1962, found that the American College Testing Program (A.C.T.) tests could be used, with the exception of the social studies test, as predictors of success in a two year post-high school technical institute.

> Of all tests or combination of tests given, the composite of the ACT tests resulted in the highest correlation with grade point average (= 0.410), and the result of the t tests was sufficiently high for rejection of the null hypothesis at the one per cent level. The composite of the ACT tests, then can be used as a predictor of success for technical institute student.[9]

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[7] Robert C. Nichols, "Nonintellective Predictors of Achievement in College," Educational and Psychological Measurement, 1966, 24(4), pp. 899-915.

[8] C. H. Patterson, "Predicting Success in Trade and Vocational School Courses," Educational Psychological Measurements, Vol. 16. No. 3.

[9] Donald W. Brown, "The Relationship of Academic Success of Students Enrolled in the Oklahoma State University Technical Institute to Reading Ability and Mechanical Ability," (unpub. Masters Dissertation, Oklahoma State University, 1962, p. 28.

Success was defined in the Brown study as being a 2.0 grade point average or greater at the end of the first year of study.

Many studies have been done indicating the possibility of selecting a test or battery of tests that will predict success in academic, technical, and vocational programs. The American College Testing program continues to gain wide spread acceptance throughout the western part of the United States and their direct correlation with success at the post-high school level is being verified in an increasing number of studies.

Donald P. Hoyt and Leo Munday in a study entitled Academic Description and Prediction in Junior Colleges analyzed results for 85 junior colleges and found a very satisfactory degree of predictive validity for ACT data. The median correlation with overall freshman grades was .64. In specific courses in English, mathematics, social studies, and natural science, medial correlations were .62, .57, .61, and .61 respectively.[10]

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[10] D. P. Hoyt and L. Munday, "Academic Description and Prediction in Junior Colleges," ACT Research Reports, Iowa City, 1966, No. 10.

CHAPTER III

METHODOLOGY, DESIGN, AND PRELIMINARY DATA ANALYSIS

A questionnaire (Appendix B) was sent to Eastern Oklahoma State College and Altus Junior College requesting the following information on each student that completed, either successfully or unsuccessfully, the school year 1966-1967 in the Business Data Processing curriculum; (1) The ACT scores, including Math, Natural Science, English, Social Science, and the Comprehensive, (2) The highest math course completed prior to entering the data processing program according to an arbitrary ranking designed for the purpose of the study (Appendix C), (3) The overall grade point average for the school year 1966-1967. The same information was collected on data processing students at Cameron State College, the site of the study.

From the completed source documents, Table I was compiled. By comparing the ACT scores against the grade point average, the testing of the first hypothesis was accomplished.

The fourteen math courses were subdivided into seven groups and compared against the grade point average in order to test the second hypothesis.

Procedure

The determination of the correlation between the ACT scores and

TABLE I

TABLE OF SCORES AND GRADE POINT AVERAGES

Student Number	A.C.T. Scores					Math Level*	Grade Point Average
	English	Math	Social Science	Natural Science	Composite		
1.	20	09	16	20	16	1	1.469
2.	17	11	14	15	14	2	.969
3.	19	19	23	25	22	4	2.061
4.	15	15	10	15	14	9	2.353
5.	15	01	17	22	14	2	1.307
6.	21	30	25	26	26	11	3.392
7.	19	18	21	25	21	3	2.405
8.	15	12	12	10	12	2	1.964
9.	8	11	10	9	10	3	1.246
10.	19	19	11	17	17	9	2.812
11.	22	23	19	18	21	9	3.170
12.	20	13	13	10	14	4	3.936
13.	16	18	16	09	15	4	1.168
14.	19	13	20	23	19	3	2.592
15.	17	21	19	25	21	4	1.605
16.	19	25	11	10	16	4	1.962
17.	17	17	18	26	20	4	1.438
18.	24	19	14	14	19	3	2.188
19.	18	23	24	20	21	2	1.241
20.	24	26	22	29	25	8	3.82
21.	25	26	30	30	28	8	3.90

*See Appendix (C) for ranking

TABLE I (Continued)

Student Number	A.C.T. Scores					Math Level*	Grade Point Average
	English	Math	Social Science	Natural Science	Composite		
22.	21	21	21	18	20	8	3.92
23.	22	24	24	22	23	8	3.20
24.	20	22	18	22	21	4	3.20
25.	22	27	25	27	25	8	3.82
26.	14	21	21	23	21	3	2.54
27.	19	23	22	20	21	8	3.64
28.	12	12	05	09	10	3	2.22
29.	14	16	17	25	18	4	1.50
30.	14	09	09	14	12	3	3.17
31.	10	09	16	14	12	4	2.90
32.	23	21	13	18	19	4	2.54
33.	21	20	24	30	24	4	3.7
34.	20	16	16	19	18	5	3.2
35.	11	09	16	16	13	2	1.9
36.	20	15	20	21	19	4	3.2
37.	18	10	10	14	13	4	3.6
38.	14	23	20	28	21	9	1.9
39.	20	19	22	23	21	3	3.3
40.	08	11	07	08	09	3	1.0
41.	15	06	20	17	15	2	3.0
42.	06	02	11	07	07	2	1.0

*See Appendix (C) for ranking

TABLE I (Continued)

Student Number	A.C.T. Scores English	Math	Social Science	Natural Science	Composite	Math Level*	Grade Point Average
43.	17	18	16	14	16	4	3.1
44.	20	20	16	11	17	3	2.0

*See Appendix (C) for ranking

math courses taken against a criterion of first year grade point average is a problem in statistical inference. For this study, the Pearson product moment coefficient of correlation, designated r, is the measure which will be used to yield information regarding the relationship of the criterion (grade point average) and the predictor variables (ACT scores and level of math). In addition to telling the degree of relationship, the Pearson r permits the writing of a linear equation for predicting probable grade point average from the predictor variables.

To test the hypothesis regarding the relationship between ACT scores, math level, and G.P.A. (grade point average) the null hypothesis was employed. This hypothesis, which states that there is no correlation, is rejected when the observed data reaches some predetermined level of significance, but is not rejected otherwise.

The t-ratio test of r was used to test the null hypothesis. The t-ratio, designated t, is defined as the ratio of the obtained r to the standard error or r. There is no rule or formula in determining how large a correlation or how large a t is required in order to reject the null hypothesis. There is a balancing of risks; that of failing to reject the null hypothesis when it is indeed false or rejecting it and accepting a chance difference when the hypothesis is actually true. The procedure that was used in this study was to reject the null hypothesis when t was as large as 2.704 (1% level) or larger, accept it when t was 1.684 (10% level), and reserving judgment when it is between the two values of t. This in effect, introduces a region of indecision, and the decision to reject or accept the null hypothesis is postponed until more data are collected.

The steps in constructing a scatter diagram and computing r are outlined as follows:

Step 1

Group the predictor variables into class intervals and enter them on the Y axis. Group the grade point averages into class intervals and enter them on the X axis. See Table II.

Step 2

Place one tally mark for each pair of scores in the appropriate cell of the table. After each of the scores have been plotted, place an Arabic numeral in each cell to denote the number of tallies the cell contains.

Step 3

Add the frequencies in each row and enter the results in the column marked fy. Next add the frequencies in each column and enter the results in the row marked fx. The sums of row fx and column fy should both equal to N, in this case 44.

Step 4

Assume an arbitrary origin near the center of the distribution for each variable and record the deviation values x' and y' in their respective row and column.

Step 5

Multiply the values for fy and y' in same rows and enter the products in fy' column. Next multiply the values for fx and x' in the same column and enter the product in the fx' row.

Step 6

Multiply the values for y' and fy' in the same rows and enter the products in the fy'^2 column. Likewise, multiply the values for x' and fx' in the same columns and enter the products in the fx'^2 row.

Step 7

Total the fy' and fy'^2 column to obtain $\Sigma fy'$ and $\Sigma fy'^2$. Also, total the fx' and fx'^2 rows to obtain $\Sigma fx'$ and $\Sigma fx'^2$.

Step 8

Multiply each tally by both its corresponding x' and y' values and enter the product in the x'y' column. Total the x'y' column to obtain $\Sigma x'y'$.

Step 9

Calculate the corrections and standard deviations for both x and y from the formulas given below. The calculations below are for English ACT vrs. GPA.

$$C'x = \frac{\Sigma fx'}{N} = \frac{22}{44} = .5$$

$$C'y = \frac{\Sigma fy'}{N} = \frac{-13}{44} = .295$$

$$\sigma x = \sqrt{\frac{\Sigma fx'^2}{N} - (C'x)^2} = \sqrt{\frac{174}{44} - (.5)^2} = 1.92$$

$$\sigma y = \sqrt{\frac{\Sigma fy'^2}{N} - (C'y)^2} = \sqrt{\frac{61}{44} - (-.295)^2} = 1.14$$

Step 10

Substitute the values for x'y', N, C'x, C'y, σy, and σx in the equation below and solve for r.

$$r = \frac{\frac{\Sigma x'y'}{N} - (C'x\ C'y)}{\sigma x\ \sigma y} = \frac{1.447}{2.19} = .66$$

To find the slope and y-intercept of the regression equation the following steps are taken. The calculations are for English ACT and GPA.

<u>Step 1</u>

Find $\overline{x}$, $\overline{y}$, and b (slope) using the equations below.

$$b = \frac{N\cdot\Sigma x'y - (\Sigma fx')(\Sigma fy')}{N\cdot\Sigma fx'^2 - (\Sigma fx')^2} \cdot \frac{iy}{ix} = \frac{(44)(57) - (22)(-13)}{(44)(174) - (22)^2} \cdot \frac{4}{.5}$$

$$b = 3.11$$

$$\overline{x} = A + \frac{\Sigma(fx')}{N} \cdot ix = 2.55 + \frac{22}{44}(.5) = 2.8$$

$$\overline{y} = A + \frac{\Sigma(fy')}{N} \cdot iy = 18.5 + \frac{-13}{44}(.4) = 17.32$$

<u>Step 2</u>

Substitute these values into the equation for a.

$a = \overline{y} - b\overline{x}$ $\quad$ $a = 17.32 - 3.11(2.8) = 8.61$

<u>Step 3</u>

Using the derived a and b in the slope-intercept form of a linear equation gives:

$y = bx + a$ $\quad$ $y = 3.11x + 8.61$

which is plotted over each scatter diagram allowing prediction of probable grade point average from the predictor variables.

The same procedure was followed in computing the coefficient of correlation and the regression equation between each test score and GPA and between math level and GPA.

TABLE II

CORRELATION TABLE FOR ENGLISH (A.C.T.) AND GRADE POINT AVERAGE

x: Grade Point Average

y: English (A.C.T.)

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^2	x'y'
32-29									0	3	0	0	0
28-25								1	1	2	2	4	6
24-21					1	2	1	5	9	1	9	9	19
20-17			1	6	3	1	5	3	19	0	0	0	0
16-13			3	1	1	3	1		9	-1	- 9	9	2
12-9				1	1	1			3	-2	- 6	12	0
8-5	1	2							3	-3	- 9	27	30
4-1									0	-4	0	0	0
fx	1	2	4	8	6	7	7	9	44		-13	61	57
x'	- 4	- 3	- 2	- 1	0	1	2	3					
fx'	- 4	- 6	- 8	- 8	0	7	14	27	22				
fx'2	16	18	16	8	0	7	28	81	174				

$$C'x = \frac{\Sigma fx'}{N} = \frac{22}{44} = .5$$

$$C'y = \frac{\Sigma fy'}{N} = \frac{-13}{44} = -.295$$

$$\sigma x = \sqrt{\frac{\Sigma fx'^2}{N} - (C'x)^2} =$$

$$\sqrt{\frac{174}{44} - (.5)^2} = 1.92$$

$$\sigma y = \sqrt{\frac{\Sigma fy^2}{N} - (C'y)^2} =$$

$$\sqrt{\frac{61}{44} - (-.295)^2} = 1.14$$

$$r = \frac{\frac{\Sigma x'y'}{N} - (C'xC'y)}{\sigma x\ \sigma y} =$$

$$\frac{\frac{57}{44} - (.5)(-.295)}{(1.92)(1.14)}$$

$$r = \frac{1.447}{2.19} = .66$$

$$t = r\sqrt{\frac{N-2}{1-r^2}} = .66\sqrt{\frac{44-2}{1-(.66)^2}} = 5.8$$

Computations continued from Table II.

$$b = \frac{n \cdot \Sigma x'y' - (\Sigma fx')(\Sigma fy')}{n \cdot \Sigma fx'^2 - (\Sigma fx')^2} \cdot \frac{i_y}{i_x}$$

$$b = \frac{44 \cdot 57 - (22)(-13)}{44 \cdot 174 - (22)^2} \cdot \frac{4}{.5} = 3.11$$

$$\bar{x} = A + \frac{\Sigma(fx')}{n} i_x = 2.55 + \frac{22}{44} (.5) = 2.8$$

$$\bar{y} = A + \frac{\Sigma(fy')}{n} i_y = 18.5 + \frac{(-13)}{44} (4) = 17.32$$

$$a = \bar{y} - b\bar{x} = 17.32 - 3.11 (2.8) = 8.61$$

$$y = bx + a \qquad y = 3.11x + 8.61$$

TABLE III

CORRELATION TABLE FOR MATH (A.C.T.)
AND GRADE POINT AVERAGE

x: Grade Point Average

y: Math (A.C.T.)

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^2	x'y'
32-29								1	1	3	3	9	9
28-25					1			3	4	2	8	16	18
24-21				3	1	1	2	2	9	1	9	9	8
20-17			1	3	3	1	2	1	11	0	0	0	0
16-13			1			2	2	1	6	-1	- 6	6	-7
12-9	1	1		3	2	1	1	1	10	-2	-20	40	8
8-5						1			1	-3	- 3	9	-3
4-1		1	1						2	-4	- 8	32	20
fx	1	2	3	9	7	6	8	9	44		-15	121	53
x'	- 4	- 3	- 2	- 1	0	1	2	3					
fx'	- 4	- 6	- 6	- 9	0	6	16	27	24				
fx'^2	16	18	12	9	0	6	32	81	174				

$C'x = .545$

$C'y = -.341$

$\sigma x = 1.91$

$\sigma y = 1.62$

$r = .447$

$t = 3.26$

$y = 2.5x + 9.54$

TABLE IV

CORRELATION TABLE FOR SOCIAL SCIENCE (A.C.T.) AND GRADE POINT AVERAGE

x: Grade Point Average

y: Social Science (A.C.T.)

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^2	x'y'
32-29								1	1	3	3	9	9
28-25								2	2	2	4	8	12
24-21				2	1	1	2	4	10	1	10	10	15
20-17			2	4		3	3		12	0	0	0	0
16-13			2	2	1	2	1	1	9	-1	-9	9	-1
12-9	1				3	1	1	1	7	-2	-14	28	-4
8-5		2			1				3	-3	-9	27	18
4-1									0	-4	0	0	0
fx	1	2	4	8	6	7	7	9	44		-15	91	49
x'	-4	-3	-2	-1	0	1	2	3					
fx'	-4	-6	-8	-8	0	7	14	27	22				
fx'^2	16	18	16	8	0	7	28	81	174				

$C'x = .5$

$C'y = -.341$

$\sigma x = 1.92$

$\sigma y = 1.47$

$r = .45$

$t = 3.26$

$y = 2.77x + 10.2$

TABLE V

CORRELATION TABLE FOR NATURAL SCIENCE (A.C.T.)
AND GRADE POINT AVERAGE

x: Grade Point Average

y: Natural Science (A.C.T.)

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^2	x'y'
32-29								3	3	3	9	27	27
28-25			1	4	1			2	8	2	16	32	0
24-21			1			2	4		7	1	7	7	8
20-17				2	1	3	1	2	9	0	0	0	0
16-13			1	1	1	2	2	1	8	-1	- 8	8	-6
12-9	1	1	1	1	3			1	8	-2	-16	32	14
8-5		1							1	-3	- 3	9	9
4-1									0	-4	0	0	0
fx	1	2	4	8	6	7	7	9	44		5	115	52
x'	- 4	- 3	- 2	- 1	0	1	2	3					
fx'	- 4	- 6	- 8	- 8	0	7	14	27	22				
fx'^2	16	18	16	8	0	7	28	81	174				

$C'x = .5$

$C'y = .114$

$\sigma x = 1.92$

$\sigma y = 1.62$

$r = .36$

$t = 2.5$

$y = 2.43x + 11.98$

TABLE VI

CORRELATION TABLE FOR COMPOSITE (A.C.T.) AND GRADE POINT AVERAGE

x: Grade Point Average

y: Composite (A.C.T.)

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^2	x'y'
32-29								1	1	3	3	9	9
28-25								3	3	2	6	12	18
24-21				4	1	2	3	2	12	1	12	12	10
20-17			1	3	2	1	2	1	10	0	0	0	0
16-13			3	1	2	3	1	2	12	-1	-12	12	4
12-9	1	1			1	1	1		5	-2	-10	20	8
8-5		1							1	-3	- 3	9	9
4-1									0	-4	0	0	0
fx	1	2	4	8	6	7	7	9	44		- 4	74	50
x'	- 4	- 3	- 2	- 1	0	1	2	3					
fx'	- 4	- 6	- 8	- 8	0	7	14	27	22				
fx'^2	16	18	16	8	0	7	28	81	174				

$C'x = .5$

$C'y = -.091$

$\sigma x = 1.92$

$\sigma y = 1.29$

$r = .477$

$t = 3.54$

$y = 2.53x + 11.8$

TABLE VII

CORRELATION TABLE FOR MATH LEVEL
AND GRADE POINT AVERAGE

x: Grade Point Average

y: Math Level

	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	fy	y'	fy'	fy'^{2}	x'y'
14-13									0	3	0	0	0
12-11							1		1	2	2	4	4
10-9				1	2	1			4	1	4	4	0
8-7						1	1	4	6	0	0	0	0
6-5						1			1	-1	- 1	1	-1
4-3	1	1	2	5	7	5	3	1	25	-2	-50	100	4
2-1		1	2	3		1			7	-3	-21	63	27
fx	1	2	4	9	9	9	5	5	44		-66	172	34
x'	- 4	- 3	- 2	- 1	0	1	2	3					
fx'	- 4	- 6	- 8	- 9	0	9	10	15	7				
fx'^{2}	16	18	16	9	0	9	20	45	133				

$C'x = .159$

$C'y = -1.5$

$\sigma x = 1.73$

$\sigma y = 1.29$

$r = .454$

$t = 3.26$

$y = 1.35x + .4$

CHAPTER IV

FINAL DATA ANALYSIS

Since the hypothesis states that there is a null amount of correlation, it was necessary to test the obtained coefficients of correlation to see if the relationships are real or merely chance relationships. The test of significance used employed Fisher's t formula

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

To test the English ACT correlation with GPA, r = .68 and N = .44.

$$t = .68\sqrt{\frac{44 - 2}{1 - (68)^2}} = .68 \cdot 8.82 = 6$$

Referring to Fisher's t table with N-2 or 44 - 2 = 42 degrees of freedom, it is found that t must be equal to or greater than 2.704 to be significant at the .01 level. Since the calculated t value is greater than 2.704, the conclusion is that the correlation of .68 is real or shows a significant relationship. There is less than one chance in one-hundred that the relationship could be due to chance, therefore the null hypothesis is rejected.

Continuing the t-test on the remaining coefficients of correlation, the results indicate that all are significant. The results of the t ratio test with relation to the coefficients of correlation are shown below in Table VIII.

TABLE VIII

COEFFICIENT OF CORRELATION AND t-TEST RESULTS

Name of Test	r	t-Test	Null Hypothesis
English ACT	.66	5.8	reject
Math ACT	.45	3.26	reject
Social Science ACT	.45	3.26	reject
Natural Science ACT	.36	2.5	reject
Composite ACT	.48	3.54	reject
Math Level	.45	3.26	reject

Although the sample was small, and the regression line is nothing more than an average over the graph of the individual scores, the plotted regression line on each of the scatter diagrams gave plausible results as shown by Table IX. The table is self-explanatory except perhaps in the case of the math level result. Referral to the table in Appendix C indicates level 3 as being geometry. Having already admitted the possibility of an intervening variable relating to difficulty of ranking math courses, perhaps a better interpretation would be that a student should have some math beyond Algebra I in order to expect a C average or better in the business data processing curriculum.

TABLE IX

REGRESSION EQUATION ANALYSIS

Name of Test	Approximate Score to Expect a Grade of C
English ACT	15
Math ACT	14
Social Science ACT	16
Natural Science ACT	16
Composite ACT	17
Math Level	3

CHAPTER V

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to evaluate existing data regarding its use as valid predictor variables for students entering business data processing at Cameron State College, Eastern Oklahoma State College, and Altus Junior College. Specifically, the study sought to:

1. Determine whether there is any significant relationship between the ACT scores and the first year grade point average.
2. Determine whether there is any significant relationship between the level of mathematics taken prior to entering the curriculum and the first year grade point average.
3. To determine by use of a regression equation a specific ACT score and math level to be used in counseling potential students.

Investigation of the above problems were accomplished by first solving for the Pearson product moment coefficient of correlation, designated r. After computing the coefficients of correlation, Fisher's t-test was used to determine whether the null hypothesis would be rejected or not rejected.

Findings

1. English A.C.T. had the highest coefficient of correlation

(.66) of the critera analyzed.

2. Math A.C.T., Social Science A.C.T., and Math level had the same coefficient of correlation (.45) indicating approximately equal value as predictors of success in business data processing.

3. Natural science A.C.T. had the lowest coefficient of correlation (.36).

Conclusions

1. The correlation between all predictor variables and the criterion proved to be significant at the one per cent level indicating that A.C.T. and math level can act as significant predictors for success in business data processing.

2. Minimum A.C.T. scores for success in business data processing can be predicted from regression analysis. The results of the regression equation analysis indicated that potential students should have minimum A.C.T. scores of English 15, Mathematics 14, Social Science 16, Natural Science 16, Composite 17, and have some mathematics beyond Algebra II in order to expect success in business data processing as indicated by a 2.0 (C) grade point average or better.

Recommendations

These findings revealed the need for similar studies, utilizing larger samples, to more closely determine the use of ACT data in counseling students, not only in data processing, but other specific areas of learning.

It is further recommended that this study be considered in developing criteria for selecting and admitting students to the business data processing program at Cameron State College, Eastern Oklahoma State College, and Altus Junior College.

BIBLIOGRAPHY

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, 1962).

Davis, James B., "Factors Which Should Influence a Model Curriculum for Programmers of Business Applications." (Unpub. Ed.D. Thesis, Oklahoma State University, 1966).

Frandsen, A. N. and Handley, J. M., "The Prediction of Achievement in a Radio Training School." Journal of Applied Psychology, XXVII (1943).

Henninger, G. Ross, "The Technical Institute in America," Journal of Engineering Education, Vol. 51, No. 1.

Hoyt, Donald P., and Munday, Leo, "Academic Description and Prediction in Junior Colleges," ACT Research Report, 1966, No. 10.

Levine, Abraham S., "Aptitude Versus Achievement Tests as Predictors of Achievement," Educational and Psychological Measurement, Autumn, 1958.

Nichols, Robert C., "Nonintellective Predictors of Achievement in College," Educational and Psychological Measurement, 1966, Vol. 244.

Patterson, C. H., "Predicting Success in Trade and Vocational Schools Courses," Educational Psychological Measurement, Vol. 16, No. 3.

Richards, James M., Jr., Holland, John L., and Lutz, Sandra W., "The Prediction of Student Accomplishment in College," ACT Research Report, 1966, No. 13.

Richards, J. M., Jr., Rand, Lorraine M., and Rand, L. P., A Description of Junior Colleges. Iowa City: American College Testing Program, 1965.

Schaartz, Alfred and Teedman, Stuart C., Evaluating Student Progress in the Secondary School, (Longman, Green, and Company, New York, 1957.

Stockton, John R., Introduction to Business and Economic Statistics, Southwestern Publishing Company, Cincinnati, Ohio, 1966.

Whitney, George, "The Development and Testing of Instruments and Procedures for a Study of Student Selection Practices in Technical Education Programs," American Technical Education Association, 1966.

APPENDIX A

LETTER USED IN THE STUDY

September 19, 1967

Mr. Woodfin Garrett
Eastern Oklahoma State College
Wilburton, Oklahoma

Dear Mr. Garrett:

I am requesting your help in obtaining some information that is extremely important for the completion of my master's thesis, and I hope, of benefit to our program.

I am proposing to investigate the ability of A.C.T. scores and highest math course taken as predictors of success in Data Processing programs as evidenced by grade point average at the end of the first year.

In filling out the enclosed form, include those data processing majors that completed the first year's work regardless of the grades made and whether or not they returned for the second year. The grade point average should be for the year and based on a 4.0 system. The highest math before D. P. program should be the number that indicated the highest level course completed prior to the 1966-67 school year on the enclosed ranking of mathematics courses. Also, include a copy of the curriculum followed by these students last year.

Thank you for your cooperation; I will send you a copy of the completed thesis.

Sincerely,

T. P. Spradley
Data Processing Instructor

APPENDIX B

INSTRUMENT USED TO COLLECT DATA
ON INDIVIDUAL STUDENTS

Student I.D. No. or Grade Book No.	A.C.T. Scores					Highest Math before D.P. Program*	Grade Point Average for Year '66-'67**
	Math	Natural Science	English	Soc. Sc.	Comp.		
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							

* See attached ranking.

** Based on 4.0 system.

NOTE: Be sure to enclose curriculum.

APPENDIX C

RANKING OF MATH COURSES FOR PURPOSE OF THE STUDY

Level of Math Course in

Reverse Order

1. Business Math (high school)
2. Algebra I (high school)
3. Geometry (high school)
4. Algebra II (high school)
5. Trigonometry (high school)
6. Matrix Algebra (high school)
7. Intermediate Algebra (college)
8. Math Analysis (high school)
   Introduction to analytics and calculus
9. College Algebra
10. Analytic Geometry
11. Analytics and Differential Calculus
12. Differential Calculus
13. Analytics and Integral Calculus
14. Integral Calculus

APPENDIX D

BUSINESS DATA PROCESSING CURRICULUMS FOR ALTUS JUNIOR COLLEGE, EASTERN OKLAHOMA STATE COLLEGE, AND CAMERON STATE COLLEGE

DATA PROCESSING

ALTUS JUNIOR COLLEGE

Altus, Oklahoma

CURRICULUM

<u>First Semester</u>

C117 Programming I
C102 Introduction to Business Data Processing
A104 Accounting I
A105 Electric Accounting Machines (Keypunch, Collator, Verifier, Sorter, Accounting Machine)
English I

<u>Second Semester</u>

C119 Programming II
A144 Accounting II
A106 Electric Accounting Machines II
M163 Fundamentals of Mathematics

<u>Third Semester</u>

C215 Programming III (Fortran)
A263 Cost Accounting
M5 College Algebra
M243 Statistics
A253 Introduction to Business

<u>Fourth Semester</u>

C264 Systems Designs and Development
C225 Programming IV (Cobol)
C262 Data Processing Field Project
C266 Advanced Programming

DATA PROCESSING

EASTERN OKLAHOMA STATE COLLEGE

Wilburton, Oklahoma

CURRICULUM

First Semester

133 Mathematics (College Algebra)
103 DP (Introduction to Business Data Processing)
115 Bus Adm (Calculators, Keypunches, Collator, Sorter, and Accounting Machine)
213 Accounting (Elements of Accounting)
103 English (Communication Skills I)

Second Semester

163 Math (Data Processing Mathematics II)
112 DP (Data Processing Applications)
115 DP (Computer Programming I)
223 Accounting (Accounting II)
203 English (Technical Writing)
152 Phy Ed (Physical Education)

Third Semester

205 DP (Computer Programming)
213 DP (Fortran Programming)
214 Math (Statistics)
113 Hist (American History)
223 Accounting (Cost Accounting)

Fourth Semester

214 DP (Business Systems Design and Development)
216 DP (Advanced Programming Systems)
223 Pol Sci (American National Government)
222 DP (Data Processing Field Project)

DATA PROCESSING

CAMERON STATE COLLEGE

Lawton, Oklahoma

CURRICULUM

First Semester

113 English
112 DP (Introduction to Data Processing)
213 Accounting (Elements I)
143-173 Mathematics
123 DP (Unit Record Equipment)
112 Military Science (Boys)
111 Physical Education (Girls)

Second Semester

123 English
223 Accounting (Elements II)
164 Math (Data Processing Mathematics)
244 DP (Beginning Programming I)
223 History
122 Military Science (Boys)
121 Physical Education (Girls)

Third Semester

233 Accounting (Cost Accounting)
263 Business (Statistics)
254 DP (Programming II Cobol)
2T5 Math (Applied Analytics and Calculus)
212 Military Science (Boys)
211 Physical Education (Girls)

Fourth Semester

213 Government
264 DP (Programming III Fortran)
282 DP (Advanced Programming Problems)
282 DP (Systems Development and Design)
222 Military Science (Boys)
221 Physical Education (Girls)

VITA

Terry Pleas Spradley

Candidate for the Degree of

Master of Science

Thesis: 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

Major Field: Technical Education

Biographical:

Personal Data: Born in Dallas, Texas, January 25, 1935, the son of Mr. and Mrs. Terry Davis Spradley.

Education: Graduated from Capitol Hill High School, Oklahoma City, Oklahoma, in May, 1952; attended the University of Oklahoma in 1952 and 1956 through 1959; received the Bachelor of Arts degree from Oklahoma City University with a major in Psychology in August, 1961; completed additional courses at Oklahoma State Technical Institute, Oklahoma City, and at Central State College, Edmond, 1964; completed requirements for the Master of Science degree with a major in Technical Education in July, 1968.

Professional Experience: Electronic Technician, United States Marine Corps., 1953-55; Electronic Technician, Electronics and Armament Division, Tinker Field, Midwest City, Oklahoma, 1959-61; Electronic Technician, Technical Services Division, Federal Aviation Agency, Will Rogers Field, Oklahoma City, Oklahoma, 1961-63; Electronics Teacher, Star-Spencer High School, Oklahoma City, Oklahoma, 1963-65; Data Processing Instructor, Cameron State College, Lawton, Oklahoma, 1966-68.