A STUDY OF THE RELATIONSHIP OF SCORES MADE ON THE AMERICAN COLLEGE TEST AND ACADEMIC GRADES MADE BY PRE-ENGINEERING AND INDUSTRIAL ARTS STUDENTS

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THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

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Denton, Texas
August, 1964
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CHAPTER I

INTRODUCTION

Many colleges and universities require all beginning freshmen to participate in the American College Testing program prior to their entrance.¹ This program, begun in 1959, is designed to measure the ability of a student to perform intellectual problems similar to those he will confront in his college work.² In the tests emphasis is placed on generalized skills and abilities such as organization, criticism, judgment, and evaluation rather than on a knowledge of the factual organization and content of classroom courses. The battery consists of four tests approximately forty-five minutes long which yield four test scores and a composite score.

One of the battery of tests in the American College Testing program is designated as the English test and measures the student's basic knowledge of punctuation, capitalization, diction, phraseology, and organization of ideas. The mathematics test is composed of quantitative reasoning

¹Benjamin Fine, How to be Accepted by the College of Your Choice (Great Neck, New York, 1960), p. 54.

problems based on practical situations and formal exercises in geometry, first-year algebra, and advanced arithmetic. The social studies reading test measures the student’s ability to read with understanding and do various kinds of reasoning and problem solving related to the social studies field. Factual questions based on prior knowledge are also included. The natural sciences reading test is designed to test the student’s science background and his ability to evaluate reading material in the natural sciences. The composite score is the mean of the four test scores and is an index of the total educational development of the participant.

At the close of 1963 there were 568 colleges and universities in the United States using the American College Test as a part of their entrance requirements, and an additional 283 colleges and universities recommended its use. The American College Test is designed to test general intellectual skills and abilities in the areas of English, social studies, the natural sciences, and mathematics.

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3 The American College Testing Program, Using the ACT Scores on Your Campus, 1963-64 ed. (Iowa City, Iowa, 1960), pp. 3-5.


5 Ibid., p. 125.
North Texas State University began in September, 1962, to use the American College Test as part of its entrance requirements.6

Statement of the Problem

This was a study of the relationship between scores made on the American College Test and academic grades made by pre-engineering and industrial arts students to determine the reliability of American College Test scores when used for counseling and predicting academic grades.

Purposes of the Study

The following were specific purposes of the study:

1. To determine the relationship between the scores made in English on the American College Test and the academic grades made in English 131 by pre-engineering students.

2. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 106 by pre-engineering students.

3. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 110 by pre-engineering students.

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4. To determine the relationship between the scores made in natural sciences on the American College Test and the academic grades made in Chemistry 141 by pre-engineering students.

5. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Industrial Arts 128 by pre-engineering students.

6. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Industrial Arts 141 by pre-engineering students.

7. To determine the relationship between the scores made in English on the American College Test and the academic grades made in English 131 by industrial arts students.

8. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 106 by industrial arts students.

9. To determine the relationship between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 110 by industrial arts students.

10. To determine the relationship between the scores made in mathematics on the American College Test and the
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Hypothesis

The hypothesis of the study is that a high correlation exists between scores made on the American College Test and academic grades made by pre-engineering and industrial arts students; therefore, American College Test scores are reliable for predicting academic grades.

The following sub-hypotheses of the major hypothesis sought answers to specific purposes of the study:

1. There is a significant correlation between the scores made in English on the American College Test and the academic grades made in English 131 by pre-engineering students.

2. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 106 by pre-engineering students.

3. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 110 by pre-engineering students.

4. There is a significant correlation between the scores made in natural science on the American College Test...
and the academic grades made in Chemistry 141 by pre-engineering students.

5. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Industrial Arts 128 by pre-engineering students.

6. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Industrial Arts 141 by pre-engineering students.

7. There is a significant correlation between the scores made in English on the American College Test and the academic grades made in English 131 by industrial arts students.

8. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 106 by industrial arts students.

9. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Mathematics 110 by industrial arts students.

10. There is a significant correlation between the scores made in mathematics on the American College Test and the academic grades made in Industrial Arts 128 for industrial arts students.
Source of Data

The data concerning scores made on the American College Test and academic grades were secured from the students' permanent records, which are filed in the Office of the Registrar, North Texas State University, Denton, Texas. Some data and information were obtained from books, magazines, and pamphlets related to the study.

Limitations of the Problem

This study was limited to American College Test scores and academic grades achieved by 161 students in industrial arts and 110 students in pre-engineering while enrolled at North Texas State University, Denton, Texas, for the school years 1961-1962, 1962-1963, and 1963-1964.

Further examination of the data indicated the following:

(1) 161 industrial arts and 110 pre-engineering students made an academic grade in English 131;
(2) 44 industrial arts and 23 pre-engineering students made an academic grade in Mathematics 106;
(3) 80 industrial arts and 82 pre-engineering students made an academic grade in Mathematics 110;
(4) 112 industrial arts and 103 pre-engineering students made an academic grade in Industrial Arts 128;
(5) 35 pre-engineering students made an academic grade in Industrial Arts 141; and
(6) 58 pre-engineering students made an academic grade in Chemistry 141.
Basic Assumptions

The basic assumptions of this study were as follows:

1. Various entrance examinations such as the American College Test are being used by North Texas State University and other colleges and universities and will continue to be a requirement for admission.

2. Entrance examinations are used as aids in counseling.

3. Scores made on entrance examination are used to determine if a student will be admitted.

4. Students who enroll in colleges and universities will make a grade of some type.

5. Since tests are used for entrance requirements, their continued use should be determined by their reliability for predicting probable success or failure with respect to academic grades.

Definition of Terms

The following are definitions of terms and abbreviations used in this study:

Academic grades have been defined as a system of evaluating a student's achievement often expressed on a letter scale or in percentages. North Texas State University uses the following system of grading: A indicates excellent work;
B indicates good work; C indicates fair work; D indicates passing work; and F indicates failure.8

ACT is an abbreviation of the American College Test, which had its beginning in 1959, and will be used in this study.

ACT score is the grade received in the three sections of the American College Test used in this study. These three sections are English, mathematics, and the natural sciences.

Correlation is the tendency for corresponding observations in two or more series to vary together from the averages of their respective series, that is, to have a similar relative position in their own series.9

Relationship as used in this study refers to resemblance existing between two or more things when studied or treated together.10

Scores mean the numerical statement of the standing of a student on a test.11

Standard deviation is "a widely used measure of variability, consisting of the square root of the mean of the

8North Texas State University, Bulletin, No. 352 (Denton, Texas, 1964), p. 60.
9Good, op. cit.
11Good, op. cit.
Recent and Related Studies

A study was made by Samuye Louise Routt to determine the relationship between scores made on the General Aptitude Test Battery and the academic grades of 155 students in beginning and advanced clerical courses in the School of Business Administration at North Texas State University, Denton, Texas. Data for this study were obtained from the students' permanent record cards and scores made on the General Aptitude Test Battery. Routt concluded the following:

1. No significant relationship was found between the academic grades made by students enrolled in beginning typing courses and the scores made on Aptitudes "V," "Q," and "P" by the same students.

2. Some relationship was found to exist between the academic grades and the scores made on Aptitude "T" by students enrolled in beginning typing courses.

3. There was no significant relationship between the academic grades and scores made on Aptitudes "Q" and "P" by students enrolled in beginning shorthand courses.

4. Some relationship was found to exist between the academic grades and the scores made on Aptitudes "V" and "T" by students enrolled in beginning shorthand courses.

5. There was no significant relationship between the academic grades and the scores made on Aptitudes "V," "Q," and "P" by students enrolled in advanced

12Ibid.
typing courses; however, a relationship of some significance was found to exist between academic grades and the scores made on Aptitude "F" by these same students.

6. No relationship of any significance was found to exist between academic grades and the scores made on Aptitudes "Q" and "T" by students enrolled in advanced shorthand courses.

7. Some relationship was found to exist between the scores made on Aptitudes "V" and "F" and the academic grades made by the same students.

8. The data indicated that there was no relationship between the academic grades and the scores made on the four aptitudes by students enrolled in secretarial practice.

9. There was no significant relationship between the scores made by students enrolled in beginning courses and students enrolled in advanced courses on Aptitudes "Q," "T," and "F."

10. The data indicated that a significant relationship did exist between the scores made on Aptitude "V" by students enrolled in beginning and advanced courses.15

Routt's study relates to the stated purposes numbered 1, 2, 3, 7, 8, and 9 in this study where a comparison was made between scores received on Sections "Q," quantitative, and "V," verbal, of the General Aptitude Test Battery and academic grades made by a select group of students.

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15Sammye Louise Routt, "A Study to Determine the Relationship of the Occupational Aptitude Scores and Academic Grades of Students Enrolled in Beginning and Advanced Typing and Shorthand Courses and in Secretarial Practice in the School of Business Administration at North Texas State College," unpublished master's thesis, School of Business Administration, North Texas State College, Denton, Texas, 1951, pp. 61-62.
Alvin G. Erickson made a study to determine what relationship exists between the entrance examination scores and student achievement in the Trade and Industrial Program at Trinidad State Junior College, Trinidad, Colorado. Data were obtained from the permanent records of the students. Erickson found that a high correlation existed between the total score taken from the California Progressive Achievement Test and the students' grades in the areas of radio electronics, building trades, and automobile mechanics. The study revealed that industrial education students with a good background in mathematics had a higher degree of success in skilled trade courses. Erickson concluded that the California Progressive Achievement Test is the best single instrument for predicting student achievement in trade and industrial education.14

In Erickson's study a comparison was made between California Progressive Achievement Test scores and academic grades of a select group of students taking industrial arts courses, and his study was related to the present one in that it was seeking answers to problems similar to the stated purposes numbered 7, 8, 9, and 10 as set forth earlier in this study.

Noel Oren Gray, in a study made at North Texas State University, Denton, Texas, sought to ascertain the relationship of scores made on parts of the General Aptitude Test Battery and academic grades made in industrial arts courses by 148 students. Data were obtained from permanent records and General Aptitude Test Battery scores of the students. Scattergrams were used in presenting the scores made on the General Aptitude Test Battery and grades made in each of the academic courses. The means of the scores and academic grades and the standard deviation were determined by treating them statistically. The Pearson Product-Moment Method was used to determine the coefficient of correlation. No significant relationship was found to exist between aptitude scores and the academic grades at the .01 and .05 levels.\(^\text{15}\)

Gray's study relates to stated purposes 1, 2, 3, 7, 8, and 9 of this study in that he compared scores made on Sections "I," arithmetic reasoning, and "V," verbal, of the General Aptitude Test Battery to academic grades received in beginning mathematics courses and beginning English.

A study by Merlin D. Staatz sought to find the relationship of academic grades and standard test scores for a group of 111 industrial education majors at Kansas State Teachers

College, Pittsburg, Kansas. Data were obtained from a comparison of the grade point average with the college average, correlation of grades and industrial education grades with the American Council on Education Psychological Examination, and the correlation of grades and industrial education grades with mechanical and artistic interests of the Kuder Preference Record. Findings from comparisons made with grades and the mechanical and artistic areas of the Kuder Preference Record verify other studies in that the existing correlations were low. The correlation between artistic interest and total grades was -.16 and .01 when industrial education grades were correlated with artistic interest. The standard error in both cases was .06. The degree of correlation with respect to mechanical interest was higher but still so low as to be insignificant. Motivation due to interest appeared to play a small part as shown by the coefficients of correlation of grades with a mechanical and artistic interest. Staatz found industrial education majors to have a lower grade point average (1.49) than the overall grade point average of 1.68 for the college. Industrial education majors were found to have a higher grade point average in industrial education courses than they had in other subjects.16

Staatz's study relates to stated purposes 7, 8, 9, and 10 of this study in that he made a comparison of test scores made on the American Council on Education Psychological Examination and Kuder Preference Record to the academic grades of a select group of industrial education majors.

Wayne Felbarth, in a study conducted at the University of Detroit, sought to determine if any correlation existed between scores made by freshmen engineering students on the Pre-Engineering Inventory and the students' academic grades for three terms in engineering drawing. The data were taken from each student's personal record. Felbarth concluded:

There is a dependable relationship between the scores on the Pre-Engineering Inventory and grades earned by freshmen students in the College of Engineering at the University of Detroit. The validity coefficients are relatively high, therefore, the sub-tests seem to be of practical usefulness.

Data seems to indicate that any young engineering student has excellent possibilities of completing Engineering Drawing if he falls within the 61.05 scale score range and obtains a mean composite of approximately 52.73; a good chance of success if he scores approximately 57.91 on the Spatial Visualization and a composite score of 52.1; a fair chance, if he scores around 36.50 on the visualization portion and a composite score of 46.67. Any student falling below the 36.50 range, in relationship to the Spatial Visualization, and scoring 40.25 will have a difficult time making the grade.17

Felbarth found the Pre-Engineering Inventory to be an excellent predictor of student achievement in Engineering College.

However, he further stated that the Pre-Engineering Inventory should be used with caution.

Felbarth's study relates to stated purposes 5 and 6 of this study as he compared scores made on the Pre-Engineering Inventory with academic grades made on engineering drawing by a select group of pre-engineering students.

A study by Lawrence B. Bruns sought the relationship between scores made on the General Aptitude Test Battery, the American Council on Education Psychological Examination, and academic grades made by a select group of industrial arts students at North Texas State University, Denton, Texas. The data for this study were obtained from the permanent records of the students. A low correlation was found to exist between scores made on various parts of the two tests and the academic grades achieved by the students. Bruns concluded the following:

1. The data presented and treated in this study indicate that Aptitudes "N" and "V" of the General Aptitude Test Battery measure the same general capacity of an individual, namely, linguistic and quantitative ability as the American Council on Education Psychological Examination.

2. The data indicate, in general, that the use of the various scores made on the General Aptitude Test Battery and the American Council on Education Psychological Examination would be unreliable if used by the various staff members for predicting the probable success, in terms of academic grades, of students enrolled in industrial arts courses.18

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18 Lawrence B. Bruns, "Relation of Scores Made on the General Aptitude Test Battery and the American Council on..."
The purposes of Bruns's study were similar to purposes 1, 2, 3, 7, 8, and 9 of this study in that he compared scores made on numerical and quantitative sections of the General Aptitude Test Battery and American Council on Education Psychological Examination with academic grades made in beginning mathematics courses, and the scores made on the verbal and linguistic sections of the General Aptitude Test Battery and American Council on Education Psychological Examination with academic grades made in beginning English courses.

William R. Weeks made a study to determine the predictability of high school grades and the Differential Aptitude Tests for predicting success in a two-year terminal program at Western Michigan University, Kalamazoo, Michigan. Data were taken from the permanent records of 106 two-year vocational technical students to whom the Differential Aptitude Test Battery was administered. It was found that high school grade point averages did not show any significant relationship to grades made by the same student in the two-year terminal technical program at Western Michigan University. A high correlation was found to exist in four of the five sections of the Differential Aptitude Test Battery.

These sections of the test were verbal, numerical, abstract, and spatial.  

In Week's study the comparison made between Differential Aptitude Test scores and academic grades of a select group of students taking industrial courses was similar to purposes 7, 8, 9, and 10 of this study.

The results of the related research presented indicate that in most cases correlations were high between various entrance examination scores and academic grades. Students with training in a certain field made higher scores on corresponding parts of various tests indicating a high aptitude in that particular field. Only the General Aptitude Test Battery was found to yield a low correlation between test scores and academic grades. Results of these studies indicate that it is possible to predict, with some degree of accuracy, academic success.

Organisation of the Study

The material in Chapter I was organized as follows:

1. Background data concerning the ACT were presented.
2. The problem was stated.
3. The purposes of the study were outlined.

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4. The hypotheses were drawn.
5. The source of data was given.
6. Limitations of the problem were stated.
7. Basic assumptions were set forth.
8. Terms were defined.
9. Recent and related studies were presented.

In Chapter II methods of gathering and treating the data were given which included the use of scattergrams and various formulae.

In Chapter III the relationship between the scores made on the ACT and the academic grades made by pre-engineering students was determined and tested for significance. The data were presented by using scattergrams.

In Chapter IV the relationship between the scores made on the ACT and the academic grades made by industrial arts students was determined and tested for significance. The data were presented by using scattergrams.

Chapter V summarized the study with the findings and recommendations presented.

Value of the Study

The American College Test, which began in 1959, is a relatively new test. Studies should be made to determine to what extent it can be used as a predictor of academic success for freshmen college students. This study, by accepting or rejecting the hypothesis that there is a
correlation between the scores made on the various sections of the American College Test and corresponding academic grades, should be of value to counselors.
CHAPTER II

METHODS AND PROCEDURES

The primary data for this study were secured from the Office of the Registrar, North Texas State University, Denton, Texas. To gather the data it was necessary to determine the industrial arts and pre-engineering students. This information was obtained from the student's personal card for the years 1961-1962, 1962-1963, and 1963-1964. The student's name, permanent student number, and choice of major were listed. American College Test scores and academic grades were then obtained from the student's permanent record card and listed.

To treat these data, certain formulae were used. The formulae are as follows:

To determine the mean, the following formula by Garrett was used:¹

\[ M = GA + \left( \frac{fx}{N} \times 1 \right) \]

Where \( GA \) = guessed mean

\( f \) = frequency of scores in each interval

\( x \) = deviation of intervals

\( i \) = the interval

The most common measure of variability is standard deviation. It is calculated from the mean by using the following formula:

\[ \sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{c}^2 \times i} \]

Where:
- \( f \) = frequency of scores in each class interval
- \( x \) = deviation of intervals from the mean
- \( c \) = correction applied to guessed mean
- \( i \) = class interval in steps
- \( N \) = number of scores

The Pearson Product-Moment Method of determining the coefficient of correlation was used to establish the degree of relationship between the scores presented and treated in the study. The formula is as follows:

\[ r = \frac{\sum x'y'}{N} - c_x c_y \]

\[ \sigma_x \sigma_y \]

Where:
- \( x'y' \) = the sum of the products of the deviation of each measure from the central tendency of the X and Y axes
- \( N \) = number of cases
- \( c_x \) = correction on X axis
- \( c_y \) = correction on Y axis
- \( \sigma_x \) = standard deviation of the distribution of the X axis
- \( \sigma_y \) = standard deviation of the distribution of the Y axis

\[ ^2 \text{Ibid.}, \ p. \ 61. \]

\[ ^3 \text{Ibid.}, \ p. \ 287. \]
After the standard deviation and the coefficient of correlation were calculated for the academic grades and the ACT scores, the results were treated to determine the significance of the correlation that was found to exist. The following formula was used:

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

Where \( r \) = the obtained coefficient
\( N \) = the number of cases

The significance of the correlation was tested at the .01 level of confidence.

In order to calculate the correlation of coefficient of the academic grades and the ACT scores, it was necessary to convert the letter or academic grade made by the student to numerical figures as follows:

- A indicates a numerical average of 90-100.
- B indicates a numerical average of 80-90.
- C indicates a numerical average of 70-80.
- D indicates a numerical average of 60-70.
- F indicates failure.

Scattergrams were used to present the data which were statistically treated to determine the relationship between ACT scores and academic grades made by 161 industrial arts students and 110 pre-engineering students. The two groups

\(^4\)Ibid., p. 298.
were further divided into ten sub-groups. The 110 academic grades made by the pre-engineering students were divided into six groups as follows:

1. The grade made by each student in English 131 was paired with his score made on the English part of the ACT.

2. The grade made by each student in Mathematics 106 was paired with his score made on the mathematics part of the ACT.

3. The grade made by each student in Mathematics 110 was paired with his score made on the mathematics part of the ACT.

4. The grade made by each student in Chemistry 141 was paired with his score made on the natural science part of the ACT.

5. The grade made by each student in Industrial Arts 128 was paired with his score made on the mathematics part of the ACT.

6. The grade made by each student in Industrial Arts 141 was paired with his score made on the mathematics part of the ACT.

The 161 academic grades of the industrial arts students were divided into four groups as follows:

1. The grade made by each student in English 131 was paired with his score made on the English part of the ACT.
2. The grade made by each student in Mathematics 106 was paired with his score made on the mathematics part of the ACT.

3. The grade made by each student in Mathematics 110 was paired with his score made on the mathematics part of the ACT.

4. The grade made by each student in Industrial Arts 128 was paired with his score made on the mathematics part of the ACT.

The mean and standard deviation were then computed by the Pearson Product-Moment Method (Formula 44)\(^5\) for each of the ten groups for use in determining the coefficient of correlation between the ACT scores and academic grades. The coefficient of correlation obtained in each set of scores was further treated by Formula 53 and Table 29\(^6\) to determine its significance at the various levels.

\(^5\)Ibid., p. 287.

\(^6\)Ibid., pp. 190-191.
CHAPTER III

THE RELATIONSHIP BETWEEN THE SCORES OF THE AMERICAN COLLEGE TEST AND THE ACADEMIC GRADES MADE BY PRE-ENGINEERING STUDENTS

Figures 1 through 6, inclusive, present the data which show the correlation of the paired academic grades made by pre-engineering students in English 131 and the English score on the ACT; Mathematics 106 and the mathematics score on the ACT; Mathematics 110 and the mathematics score on the ACT; Chemistry 141 and the natural science score on the ACT; Industrial Arts 128 (Engineering Drawing) and the mathematics score on the ACT; Industrial Arts 141 (Descriptive Geometry) and the mathematics score on the ACT.

The Relationship Between the Scores Made on the English Section of the American College Test and the Academic Grades Made by 110 Pre-Engineering Students Enrolled in English 131

In Figure 1 the distribution of the academic grades made by 110 pre-engineering students enrolled in English 131 and the scores made by these same 110 students on the English section of the ACT are shown. The mean of the academic grades made by the 110 students when converted to numerical figures was found to be 67.31. The standard
deviation of this group was 12.29. The mean of the ACT scores made on the English section by the same 110 students was 17.7, and the standard deviation was 4.98. The coefficient of correlation of the academic grades and the ACT

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\[N = 110 \quad M_y = 67.31 \quad \sigma_y = 12.29\]
\[M_x = 17.70 \quad \sigma_x = 4.98 \quad r = .68 \quad t = .97\]

Fig. 1—Scattergram showing the paired academic grades made in English and scores made on the English section of the American College Test by 110 students.

scores made by these students when treated by the Pearson Product-Moment Method was .68. When tested for significance by Formula 53\(^1\) and Table 29, "Table of \(t\),"\(^2\) the coefficient of correlation was significant at the .01 level.

\(^1\)Garrett, op. cit., p. 289.
\(^2\)Ibid., p. 190.
In examining data in Figure 1 it was found that one student made an academic grade of "C" which fell in the 1-4 class interval on the ACT. Two students made an academic grade of "C" which fell in the 9-12 class interval on the ACT. Two students made an academic grade of "B" which fell within the 17-20 class interval on the ACT, and nine students with a score in the same interval made an academic grade of "F." Two students made an academic grade of "F" which fell within the 21-24 class interval on the ACT. One student made an academic grade of "D" which fell within the 25-28 class interval on the ACT.

The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 23 Pre-Engineering Students Enrolled in Mathematics 106

The distribution of grades made by 23 pre-engineering students enrolled in Mathematics 106 and the ACT scores made by them are presented in Figure 2. The mean of the academic grades was 72.09, and the standard deviation was 13.77. The mean of the ACT scores made on the mathematics section by the same group was 16.07, and the standard deviation was 4.69. The coefficient of correlation of the 23 students' grades was .76. When treated by Formula 53 and Table 29, "Table of $t$" "r" was found to be significant at the .01 level.
Further examination of the data in Figure 2 reveals that three students made an academic grade of "B" which fell within the class interval 13-16 on the ACT. One student made an academic grade of "F" which fell within the class interval of 17-20 on the ACT.

\[
\begin{array}{cccccccccc}
4 & 8 & 12 & 16 & 20 & 24 & 28 & 32 & 36 \\
\hline
90-99 & & & & & & & & \\
80-89 & 3 & 2 & 1 & & & & & 6 \\
70-79 & 1 & 4 & 1 & & & & & 6 \\
60-69 & 1 & 1 & & & & & & 2 \\
50-59 & 2 & 6 & 1 & & & & & 9 \\
\end{array}
\]

\( N = 23 \quad M_y = 72.09 \quad \sigma_y = 13.77 \)

\( M_x = 16.07 \quad \sigma_x = 4.69 \quad r = .76 \quad t = 3.5 \)

Fig. 2—Scattergram showing the paired academic grades made in Mathematics 106 and the scores made on the mathematics section of the American College Test by 23 students.

The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 82 Pre-Engineering Students Enrolled in Mathematics 110

Data concerning the academic grades made by 82 pre-engineering students enrolled in Mathematics 110 and the
scores made by the same students on the mathematics section of the ACT are presented in Figure 3. The mean of the academic scores was found to be 67.18, and the standard deviation was 14.76. The mean of the ACT scores was 24.30,

\[ \bar{X} = 24.30, \quad \sigma_X = 4.96, \quad r = .11, \quad \alpha = .10 \]

and the standard deviation was 4.96. The coefficient of correlation was .11 and was found to be significant at the .05 level but not at the other levels.

Figure 3 shows that one student made an academic grade of "A" which fell in the 13-16 class interval of the ACT, and one student made an academic grade of "B" which fell in
the same interval. Another student made an academic grade of "B" which fell in the 17-20 class interval of the ACT, and fourteen students with a score in the same interval made an academic grade of "F." In the 21-24 class interval of the ACT one student made an academic grade of "A," while five students in the same interval made an academic grade of "F." In the 25-28 class interval of the ACT four students made an academic grade of "F," and two students in the same interval made an academic grade of "D." One student made an academic grade of "C" which fell within the 29-32 class interval of the ACT.

The Relationship Between the Scores Made on the Natural Science Section of the American College Test and the Academic Grades Made by 58 Pre-Engineering Students Enrolled in Chemistry 141

Figure 4 presents the data concerning the academic grades made by 58 pre-engineering students enrolled in Chemistry 141 and the scores made by these same students on the natural science section of the ACT. The mean of the academic grades was 68.12, and the standard deviation was 15.16. The mean of the ACT scores was 21.32, and the standard deviation was 5.32. The coefficient of correlation was .11, and it was found to be of no significance at the .01, .02, .05, .10, or .50 levels.

Further examination of Figure 4 shows that one student made an academic grade of "C" which fell within the class
interval 29-32 on the ACT. Of the nineteen students whose ACT scores fell within the 25-28 class interval, three made an academic grade of "D" and four made an academic grade of "F." Four of the students whose ACT scores fell within the

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$N = 58 \quad \bar{y} = 68.12 \quad \sigma_y = 13.16$

$\bar{x} = 21.32 \quad \sigma_x = 5.32 \quad r = -.11 \quad t = -.83$

Fig. 4—Scattergram showing the paired academic grades made in Chemistry 141 and the scores made on the natural science section of the American College Test by 58 students.

21-24 class interval made an academic grade of "F." Five students with ACT scores in the 17-20 class interval made an academic grade of "F." Of the twelve students with ACT scores in the 13-16 class interval, two made an academic grade of "C," one made an academic grade of "B," and another made an academic grade of "A."
The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 103 Pre-Engineering Students Enrolled in Industrial Arts 128

Figure 5 shows the data concerning the academic grades made by 103 pre-engineering students in Industrial Arts 128 (Engineering Drawing) and the scores made by these same students on the mathematics section of the ACT. The mean of the academic grades was 77.31, and the standard deviation was 12.65. The mean of the ACT scores was 20.36, and the standard deviation was 6.06. The coefficient of correlation,

\[ N = 103 \quad M_y = 77.31 \quad \sigma_y = 12.65 \]
\[ M_x = 20.36 \quad \sigma_x = 6.06 \quad r = .53 \quad t = .63 \]
.53, was found to be significant when it was tested at the .01 level.

In examining Figure 5 it was found that the two students with ACT scores that fell within the highest class interval of 33-36 made an academic grade of "B." One student made an academic grade of "C" which fell in the class interval 29-32 of the ACT. Of the twenty-three students with scores falling in the 25-28 class interval of the ACT, six made an academic grade of "A," and two made an academic grade of "F." Four of the students with scores which fell in the 21-24 class interval of the ACT made an academic grade of "A," and one student with scores in the same interval made an academic grade of "F." Of the twenty-nine students with scores falling within the 17-20 class interval of the ACT, six made an academic grade of "A," five made an academic grade of "B," while five made an academic grade of "F." One student made an academic grade of "B" which fell in the 9-12 class interval of the ACT. Three students made an academic grade of "C" which fell in the 5-8 class interval of the ACT.

The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 35 Pre-Engineering Students Enrolled in Industrial Arts 141

Figure 6 presents the data concerning the academic grades made by thirty-five pre-engineering students enrolled in Industrial Arts 141 (Descriptive Geometry) and scores made
on the mathematics section of the ACT. The mean of the academic grades was 75.92, and the standard deviation was 12.51. The mean of the ACT scores was 20.9 and the standard deviation was 6.21. The coefficient of correlation, 1.78, was found to be significant at the .01 level.

Further examination of Figure 6 shows that one student whose scores on the ACT fell in the highest class interval of 33-36 made an academic grade of "B." One student made an academic grade of "F" which fell in the 25-28 class interval. Of the nine students with scores falling within the 21-24
class interval on the ACT, one made an academic grade of "A," and one made an academic grade of "F." Two of the students in the class interval which ranged from 17-20 on the ACT made an academic grade of "F," and one made an academic grade of "A." One of the students in the class interval 13-16 made an academic grade of "B." The two students with grades in the lowest class interval on the ACT which was from 5-8 made an academic grade of "B."
CHAPTER IV

THE RELATIONSHIP BETWEEN THE SCORES OF THE AMERICAN COLLEGE TEST AND THE ACADEMIC GRADES MADE BY INDUSTRIAL ARTS STUDENTS

Figures 7 through 10, inclusive, present the data which show the correlation of the paired academic grades made by industrial arts students in English 131 and the English score on the ACT; Mathematics 106 and the mathematics score on the ACT; Mathematics 110 and the mathematics score on the ACT; Industrial Arts 128 (Engineering Drawing) and the mathematics score on the ACT.

The Relationship Between the Scores Made on the English Section of the American College Test and the Academic Grades Made by 161 Industrial Arts Students Enrolled in English 131

In Figure 7 the distribution of the academic grades made by 161 industrial arts students enrolled in English 131 and the scores made on the English section of the ACT are shown. The mean of the academic grades when converted to numerical figures was 62.15, and the standard deviation of this group of scores was 13.34. The mean of the ACT scores was 14.5, and the standard deviation was 5.27. The coefficient of correlation of the academic grades and the ACT
scores, when treated by the Pearson Product-Moment Method, was .22. When tested for significance by Formula 531 and Table 29, "Table of $r$,"2 the coefficient of correlation was found to be significant at the .01 level.

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$N = 161$  $\bar{y} = 62.15$  $\sigma_y = 13.34$

$N_x = 14.50$  $\sigma_x = 5.27$  $r = .22$  $t = .27$

**Fig. 7**--Scattergram showing the paired academic grades made in English 131 and the scores made on the English section of the **American College Test** by 161 students.

Examination of Figure 7 shows that two students with scores which fell in the 21-24 class interval of the **ACT** made an academic grade of "F." Eleven students with scores


2Ibid., p. 190.
which fell in the 17-21 class interval of the ACT made an academic grade of "F." One student made an academic grade of "B" and a score on the ACT which fell in the 9-12 class interval. Two students with scores which fell in the 5-8 class interval of the ACT made an academic grade of "C," and four students with scores in this same interval made an academic grade of "D."

The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 44 Industrial Arts Students Enrolled in Mathematics 106

The distribution of the academic grades made by 44 industrial arts students enrolled in Mathematics 106 and the scores made on the mathematics section of the ACT are shown in Figure 8. When the academic grades for these students were converted to numerical figures, the mean was found to be 66.10, and the standard deviation was 14.29. The mean of the ACT scores was 14.14, and the standard deviation was 5.38. The coefficient of correlation, .32, was found to be significant at the .05 level.

The highest score made by this group fell in the 17-20 class interval of the ACT. Two students whose scores fell in this interval made an academic grade of "A," and two students with scores in the same interval made an academic grade of "F." One student made an academic grade of "A" and a score on the ACT which fell in the 13-16 class
interval, and two students with scores in the same interval made an academic grade of "B." One student whose score fell in the 9-12 class interval on the ACT made an academic grade of "C." The relationship between the scores made on the Mathematics section of the American College Test and the academic grades made by 80 industrial arts students enrolled in Mathematics 110 is shown in Figure 8. Figure 9 shows the distribution of academic grades made by 80 industrial arts students enrolled in Mathematics 110.
and scores made by these same students on the mathematics section of the ACT. The mean of the academic scores was found to be 61.50, and the standard deviation was 15.90. The mean of the ACT scores was 17.4, and the standard deviation was 4.57. The coefficient of correlation of 0.31 was found to be significant at the 0.01 level.

Further examination of Figure 9 revealed that one student with a score in the 29-32 class interval on the ACT made an academic grade of "C." One of the thirteen students with a score in the class interval of 21-24 on the ACT made
an academic grade of "A" and three made an academic grade of "F." Twenty-six of the thirty-two students with ACT scores falling in the class interval ranging from 17-20 made an academic grade of "F," while one made an academic grade of "A." One student with a score in the 13-16 class interval on the ACT made an academic grade of "A."

The Relationship Between the Scores Made on the Mathematics Section of the American College Test and the Academic Grades Made by 112 Industrial Arts Students Enrolled in Industrial Arts 128

Figure 10 presents the distribution of academic grades made by 112 industrial arts students enrolled in Industrial Arts 128 (Engineering Drawing) and scores made by these same students on the mathematics section of the ACT. The mean of the academic grades was found to be 76.91, and the standard deviation was 10.33. The mean of the scores on the ACT was 15.89, and the standard deviation was 5.11. The coefficient of correlation of .29 was found to be significant at the .01 level.

Further examination of Figure 10 shows that three students made an academic grade of "A," and a score on the ACT which fell in the class interval of 21-24; and one student with a score in the same interval made an academic grade of "C." Four students made an academic grade of "A" and a score on the ACT which fell in the class interval of 17-20, and three students with a score on the ACT in the same
interval made an academic grade of "F." Two students made an academic grade of "A" and a score on the ACT which fell in the class interval 13-16, and eleven students with scores in the same interval made an academic grade of "B." Four

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\(f_x\) | 1 | 7 | 17 | 35 | 36 | 12 | 3 | 1

\(N = 112 \quad M_y = 76.91 \quad \sigma_y = 10.33\)
\(M_x = 15.89 \quad \sigma_x = 5.11 \quad r = .29 \quad t = .32\)

Fig. 10—Scattergram showing the paired academic grades made in Industrial Arts 128 and the scores made on the mathematics section of the American College Test by 112 students.

students made an academic grade of "B" and a score on the ACT which fell in the 9-12 class interval. One student made an academic grade of "B" and a score on the ACT which fell in the class interval of 5-8, and four students with scores in the same interval made an academic grade of "C." An
academic grade of "C" was made by the student whose ACT score fell in the 1-4 class interval.
CHAPTER V

SUMMARY

This was a study to determine the relationship between scores made on the ACT and academic grades made by pre-engineering and industrial arts students to determine the reliability of ACT scores when used for counseling and predicting academic grades.

In Chapter III the academic grades made by 110 pre-engineering students enrolled in English 131, Mathematics 106 and 110, Chemistry 141, Industrial Arts 128 and 141, and scores made on the ACT in English, mathematics, and the natural sciences were treated statistically. This study revealed that the coefficients of correlation obtained for four sets of paired scores were significant at the .01 level. One set of paired scores was significant at the .05 level. The coefficient of correlation for one set of paired scores was not significant.

In Chapter IV the academic grades made by 161 industrial arts students enrolled in English 131, Mathematics 106 and 110, Industrial Arts 128, and scores made on the ACT in English and mathematics were treated statistically. This study revealed that the coefficients of correlation obtained for three sets of paired scores were significant at the .01
level. One set of paired scores was found to be significant at the .05 level.

Findings

The findings of this study were in keeping with the hypothesis in all but one case. They are as follows:

1. A positive correlation of .97 was found to be significant at the .01 level between scores made in English on the ACT and the academic grades made in English 151 by 110 pre-engineering students.

2. A positive correlation of .35 was found to be significant at the .01 level between scores made in mathematics on the ACT and the academic grades made in Mathematics 106 by twenty-three pre-engineering students.

3. A positive correlation of .10 was found to be insignificant at the .05 level between scores made in mathematics on the ACT and the academic grades made in Mathematics 110 by eighty-two pre-engineering students.

4. No significant relationship was found to exist between scores made in the natural sciences on the ACT and the academic grades made in Chemistry 141 by fifty-eight pre-engineering students at any of the various levels.

5. A positive correlation of .63 was found to be significant at the .01 level between scores made in mathematics on the ACT and the academic grades made in Industrial Arts 128 by 103 pre-engineering students.
6. A positive correlation of .47 was found to be significant at the .01 level between scores made in mathematics on the ACT and the academic grades made in Industrial Arts 141 by thirty-five pre-engineering students.

7. A positive correlation of .27 was found to be significant at the .01 level between scores made in English on the ACT and the academic grades made in English 131 by 161 industrial arts students.

8. A positive correlation of .22 was found to be significant at the .05 level between scores made in mathematics on the ACT and the academic grades made in Mathematics 106 by forty-four industrial arts students.

9. A positive correlation of .29 was found to be significant at the .01 level between scores made in mathematics on the ACT and the academic grades made in Mathematics 110 by eighty industrial arts students.

10. A positive correlation of .52 was found to be significant at the .01 level between scores made in mathematics on the ACT and the academic grades made in Industrial Arts 128 by 112 industrial arts students.

Conclusions

The mean of the academic grades in English 131 made by 110 pre-engineering students was 67.31 with a standard deviation of 17.70 as compared to a mean of 62.15 with a standard deviation of 13.34 made by 161 industrial arts students.
This may indicate that pre-engineering students tend to make better grades in English than do industrial arts students. The mean grade for pre-engineering students in Industrial Arts 128 was 77.31 with an ACT mean score of 20.36, while the mean grade for industrial arts students was 76.91 with an ACT mean score of 15.89. Thus, the grades in English 131 and the grades in Industrial Arts 128 made by pre-engineering students and industrial arts students may indicate that pre-engineering students have a better background in English, and the industrial arts students have a better background in drafting.

Recommendations

1. A similar study should be made using a larger number of cases.

2. A study should be made comparing the academic grades and ACT scores of a group of students enrolled in other departments of North Texas State University with those of a group of industrial arts students.

3. A study should be made comparing the academic grades and ACT scores of a group of pre-engineering students with those of a group of industrial arts students.

4. A study should be made comparing the academic grades and ACT scores of a group of North Texas State University industrial arts students with those of a group of industrial arts students from another college or university.
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