DOCUMENT RESUME

ED 097 946		JC 740 440
AUTHOR	Decker, Dwight F.; And Others	
TITLE	Applicability of ACT Scores to the Prediction of Success in Business, Mathematics, and Science Courses at Rhode Island Junior College.	
PUB DATE	20 Jul 74	
NOTE	42p.; Practicum submitted to Nova University in partial fulfillment of requirements for Doctor of Education degree	
EDRS PRICE	MF-$0.75 HC-$1.85 PLUS POSTAGE	
DESCRIPTORS	*Academic Achievement; Data Analysis; *Grades (Scholastic); *Junior College Students; Post Secondary Education; Practicums; *Predictive Validity; Statistical Data; *Test Results	
IDENTIFIERS	ACT Scores; Rhode Island; *Rhode Island Junior College	

ABSTRACT

To determine whether a relationship existed between ACT composite scores and academic success in courses in Accounting I, Quantitative Business Analysis I, and Physical Science at Rhode Island Junior College, random samples of ACT scores of about 70 students in each course were studied. To establish predictability, correlation techniques were used. Results of the study showed Pearson-Product-Moment correlation coefficients of 0.47 for Accounting I, 0.27 for Physical Science, and 0.24 for Quantitative Business Analysis I. Using statistical analysis, the relationships were found to be moderate, low, and nil, respectively. Tables and figures present the study data. Three appendixes are included, as follows: A. Physical Science Data, B. Quantitative Business Analysis I Data, and C. Accounting I Data. (DB)

Applicability of ACT Scores to the Prediction of Success in Business, Mathematics, and Science Courses At Rhode Island Junior College

Applied Research and Evaluation

by

Dwight F. Decker, M.S.E.
Joseph W. Menard, Ed. M.
William E. Squizzero, Ed. M.

A PRACTICUM PRESENTED TO
NOVA UNIVERSITY IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF EDUCATION

NOVA UNIVERSITY

July 20, 1974

Table of Contents

I. Title

Applicability of ACT Scores to the Prediction of Success in Business, Mathematics, and Science Courses at Rhode Island Junior College.

II. Statement of the Problem

The investigators suspected that there was no relationship between the American College Testing (ACT) scores of students and their academic success at Rhode Island Junior College. Rhode Island Junior College has an open admissions policy which consists of accepting all applicants who are Rhode Island residents with high school diplomas (or State equivalency diplomas) who have received favorable recommendations from their high school principal or guidance counselor.

The ACT scores are not being used to accept or reject applicants to the college at this time. They are being used to a limited extent in academic counseling regarding career choice or course choices.

The investigators wished to determine whether or not a relationship exists between ACT composite scores and academic success in courses in Accounting I, Quantitative Business Analysis I, and Physical Science.

III. Hypotheses

Null Hypothesis:

H_o: There is no relationship between ACT composite scores and academic success in Accounting I, Quantitative Business Analysis I, and Physical Science courses at Rhode Island Junior College.

Alternative Hypotheses:

H_a: There is a positive relationship between ACT composite scores and academic success in Accounting I, Quantitative Business Analysis I, and Physical Science courses at Rhode Island Junior College.

H_a1: There is a negative relationship between ACT composite scores and academic success in Accounting I, Quantitative Business Analysis I, and Physical Science courses at Rhode Island Junior College.

IV. Background and Significance

A preliminary study at nearby Bristol Community College (BCC) in Fall River, Massachusetts, has failed to establish a relationship between ACT composite scores and academic success at that college. (This study is being expanded and reported by Joseph Motta of BCC during this module of the Nova University program.) In light of this limited evidence, the investigators asked whether or not Rhode Island Junior College should continue using the ACT program.

Many colleges today use ACT composite scores along with other criteria to determine whether or not applicants for admission will be accepted. Rhode Island Junior College does not use the ACT for this purpose. The college does use ACT scores to a limited extent by the counseling service concerning career choice or course choices.

If the ACT scores were found to have a positive relationship with academic success in the three courses tested, then in the future the ACT scores could be made available to faculty teaching these three courses. The teachers could then encourage those students with low ACT composite scores (scores equal to or less than 10) to use alternate learning techniques in addition to tutorial help from the instructor.

Regardless of whether or not the ACT scores related well with academic success, further studies for other courses were deemed necessary. These broader—based results could then determine whether the ACT would be continued or dropped.

If the ACT could be dropped, two benefits would result:

(1) The student would save the financial cost of the test.

(2) The college would not incur the burden of recording data which have no useful purpose.

Baird and Fiester[1] concluded from their study of several hundred colleges over a five year period that within any given year colleges whose incoming students were bright (as measured by ACT scores) tended to award higher grades. However, there was considerable variance from this trend.

A study of many factors for entering freshmen at black colleges by Berry[2] showed that while performances on the ACT test were below the national average, ninety percent of these students were in the top half of their high school classes. No attempt was made to follow this with grade point averages in college.

Another study conducted by Borup[3] for Texas A. and I. University freshmen noted that while males have higher ACT scores than females, the females have higher grade point averages. Also, Anglo-Americans ore higher on the ACT than Mexican-Americans, but both groups do equally well on grade point averages. Evidently the ACT discriminates against women and Mexican-Americans. The high school grades of students proved to be much better at predicting academic success in college.

Worthington and Grant[4] discovered a moderately good correlation coefficient of +0.57 for ACT scores as pred.ctors of college grades at the University of Utah. They still recommended that many factors other than just ACT scores be used to screen applicants for admission.

Wallace[5] discovered a correlation coefficient of about +0.50 for several colleges reviewed. It was found that ACT data when coupled with high school grades provided an even better prediction of college grade point average.

Engelhart[6] has concluded that much more than ACT scores are needed to engage in useful course and career counseling. The mixed predictability findings based on 132 colleges makes use of the ACT for college admissions doubtful in many cases. Also, Tiedeman[7] has concluded that much more work is needed to establish the ACT's ability to predict college academic success.

Baird[8] discovered in a study of 27 two-year colleges that the best predictor of academic success is high school grades. If the ACT scores are coupled with the high school grades, the ACT scores add only slightly to the prediction of college grades.

In Edward J. Rooney's study at Rhode Island Junior College, ACT scores used as predictors of grade point average show correlation coefficients ranging from +.20 to +.33 over the five year period from 1968 to 1972, all indicating definite but small relationships. (This data has been released but not published.)

Because of the mixture of data in the literature concerning the use of ACT data as a predictor of college academic success, this study was considered worthwhile.

V. Definition of Terms

The American College Testing (ACT) Program:

The ACT program is designed to measure educational development. "Adjustments are made to eliminate any systematic advantages due to educational level and time of year of testing."[9]

The ACT is intended to be "useful in ascertaining patterns of student abilities, goals, and needs, ... and provides helpful counseling leads and points of departure for future exploration".[10]

The ACT Program claims that the test scores bear a high positive relationship to academic success in college courses, with academic success increasing with higher ACT scores.

The ACT Scores:

ACT scores are divided into four specilaized areas--mathematics, English, social studies and natural sciences. In addition to these, the composite score is the average of the four specialized scores rounded to the nearest whole number. The range of the composite score is from a low of 1 to a high of 35. If the words ACT score are used in this report without a specific label attached, then ACT score means ACT composite score.

Final Academic Average:

This is each student's final numerical average for each course ranging from a possible low of zero to a possible high of 100.

Accounting I[11]:

Catalog Course No. 100-101. 4 credits.

This course is designed to present the objectives and basic procedures in accounting. Topics covered include the statement of financial condition and statement of operations; the recording of transactions; trial balances, adjustments, and worksheets; notes and drafts; special books of original entry; and subsidiary ledgers. Laboratory practice consists of supervised work on accounting problems.

Lecture: 3 hours Lab: 2 hours

Quantitative Business Analysis I[12]:

Catalog Course No. 450-107. 3 credits.

The major goal in this course is to acquire selected tools used to solve problems in business and economics. Among the topics emphasized will be: sets, set operations, logical statements, applications of Boolean Algebra, functions, and managerial planning.

(Prerequisite: Two years of high school algebra)

Lecture: 3 hours

Physical Science[13]:

Catalog Course No. 600-100. 4 credits.

This course is designed to meet the needs of students not majoring in science. Physical principles are presented with emphasis on non-quantitative, practical applications of these concepts.

Lecture: 3 hours Lab: 2 hours

Open Admissions Policy:

The open admissions policy consists of accepting all applicants who are Rhode Island residents with high school diplomas (or State equivalency diplomas) who have received favorable recommendations from their high school principal or guidance counselor.

Alternate Learning Techniques:

These include any techniques or learning media used outside of the traditional classroom such as videotapes, computer-assisted instruction, discovery oriented laboratory experiences, etc.

Low ACT Score:

This is any ACT composite score equal to or less than 10. The mean score for students for the three courses in this study was about 15.

VI. Limitations of the Study

(1) This study was confined to three instructors each teaching one specific course at Rhode Island Junior College.

(2) Students were not subdivided according to age, sex, those having full-time and part-time jobs, those of differing high school backgrounds, and those with or without military experience.

(3) Only students who completed the courses in which they were enrolled were included in this study.

(4) No differentiation was made for those who completed the associate degree program and those who did not.

(5) No effort was made to find out if any students had repeated these courses.

(6) Not all the students in these courses took the ACT exam. Therefore, the sampling technique had to be confined to those who did.

VII. Basic Assumptions

(1) Since for each course all the students had the same instructor, it was assumed that different student groups from different semesters had equal opportunities to achieve course success.

(2) It was assumed that a normal distribution of motivational factors existed for all student groups tested.

(3) It was also assumed that a normal distribution of intelligence quotients existed for the groups tested.

(4) The ACT score was assumed to measure educational development as the American College Testing Program maintains.

VIII. Procedures for Collecting Data

ACT composite scores were collected using either the Registrar's records or the Counseling office records. Each student's final numerical average for each course was obtained from each instructor's grade book.

The investigators manually copied the ACT data from student record cards which were either on microfilm or in original form.

Students included in the samples cover classes from the 1974 spring semester back to the 1969-70 academic year for Accounting I and Quantitative Business Analysis I and back to the 1971-72 academic year for Physical Science.

Only students who had completed the courses in the study were used in the population. The population was further limited by eliminating those students who had not taken the ACT test.

These limitations left the investigators with a low of about 200 names for one course and a high of about 350 names for another.

A random sampling technique was used to obtain a sample of about 70 students from each population. Every name in the population had an equal random chance of being in the sample. An example of the procedure used is the following:

(1) Suppose 350 students were involved in the population. This total divided by 70 gives 5, meaning that every fifth name from the class roster listings of all semesters in the population was used. Class rosters were alphabetized by semester and the semester lists were then placed in chronological order.

(2) Numbers from 1 to 5 were placed in a box, thoroughly shaken, and one number was picked at random.

(3) Suppose the number picked from the box was three. Then from the class rosters the third name was chosen. Every fifth name thereafter was chosen, resulting in the third, the eighth, the thirteenth, etc., being chosen.

The test used to see if a relationship existed between the ACT composite scores and the student's numerical average was the Pearson-Product-Moment (PPM) correlation. (The reasons for using the PPM will be explained in the next section.)

By using about 70 names in the calculation of the correlation coefficient (r), the null hypothesis could be rejected with an absolute value of about 0.24 or greater for r. Using about 100 names lowered r only slightly to about 0.20. Thus, about 70 names in the sample was deemed sufficient to test the null hypothesis without making the calculations burdensomely lengthy.

IX. Procedures for Treating Data

In this research undertaking, the authors wished to establish how well ACT composite scores <u>predicted</u> academic success in three courses. To establish predictability, correlation techniques were used to establish the extent of the relationship between ACT scores and student achievement.[14]

The predictor (or independent variable) was the ACT composite score and the criterion (or dependent variable) was the student's overall academic average in the course. The predictor variable was called X and the criterion variable called Y.

It was assumed (prior to collecting the data) that the data would be parametric. Parametric data exhibit the following characteristics:[15]

(1) The distribution of both the X and Y data approximates a normal curve. (The further the distribution curve is from normal, the less valid will be the use of a parametric test.) Histograms were used with frequency polygons to check this assumption.

(2) The variance of the groups involved should be nearly equal. Since variance is the square of the standard deviation, one could suffice by saying the standard deviations (expressed as a percent of perfect score) of the groups involved should be nearly equal. A standard deviation for all groups was calculated to check this assumption.

(3) The dependent or criterion variable (Y) must be expressed in terms of an interval scale. Interval scales show the distance between two observations as well as denoting their rank order. (In this study, both X and Y are expressed using interval scales.)

Because the data in this study met the parametric tests (see next section), the Pearson-Product-Moment (PPM) correlation technique was chosen. The coefficient of correlation (r) was calculated as follows:

$$r = \frac{n.\sum XY - (\sum X)(\sum Y)}{\sqrt{n.\sum X^2 - (\sum X)^2}\sqrt{n.\sum Y^2 - (\sum Y)^2}}$$

where: $\sqrt{}$ = square root sign

$\sum$ = sum of

X = predictor variable (ACT score)

Y = criterion variable (academic average in each course)

n = number of students in sample

. = multiplication sign

A perfect positive correlation coefficient (r = +1.00) would mean that a rise in X would always give a rise in Y. A perfect negative correlation coefficient (r = -1.00) would mean that a rise in X would always be accompanied by a fall in Y and vice versa.

A zero correlation coefficient would indicate no relationship whatsoever between X and Y. A scattergram (X versus Y cartesian plot) would show a "shotgun" effect with data points falling nearly everywhere on the graph. If r = 0, then the data fall in ranges from high X - high Y and low X - low Y as with positive correlations all the way to high X - low Y and low X - high Y as with negative correlations.

Most values of r are neither +1.00, -1.00 nor zero. They are usually fractional numbers somewhere between a low of -1.00 and a high of +1.00.

The PPM test is based on the assumption that if a relationship exists, it will be linear rather than curved.[17] Also, it does not necessarily imply a cause-effect relationship exists; it may be only casual.

X. Results

Data Resulting from the Physical Science Study

Based on a sample of 72 students spaced randomly over five semesters, the calculated Pearson-Product-Moment (PPM) correlation coefficient (r) was +0.27, with a standard error (s_r) of 0.119 as shown below:

$$r = +0.27$$

$$s_r = \frac{1}{\sqrt{n-1}} = \frac{1}{\sqrt{72-1}} = 0.119$$

The absolute value of r necessary to reject the null hypothesis[18] at the .05 level of significance was 0.23 as illustrated by the following equation:

$$|r_r| = \frac{t \text{ at } .05}{\sqrt{n-1}} = \frac{1.96}{\sqrt{72-1}} = 0.23$$

The means, standard deviations, and standard deviations expressed as a percent of the perfect score possibility are shown in the table below:

TABLE I

	ACT Scores (35=perfect score)	Physical Science Grades (100=perfect score)
Mean	$\bar{x} = 14.8$	$\bar{y} = 70.4$
Standard Deviation	$s_x = 4.00$	$s_y = 11.3$
Standard Deviation expressed as a per cent of perfect score	$\frac{4.00}{35} = 11.4\%$	$\frac{11.3}{100} = 11.3\%$

A scattergram of ACT scores (horizontal axis) plotted against the paired values of Physical Science grades (vertical axis) is shown in Figure 1. Figures 2 and 3 are histograms (with superimposed frequency polygons) of the ACT scores and the Physical Science grades, respectively. The data necessary to calculate r are shown in the Appendix A.

Figure 1. Scattergram - ACT scores vs. Physical Science Grades

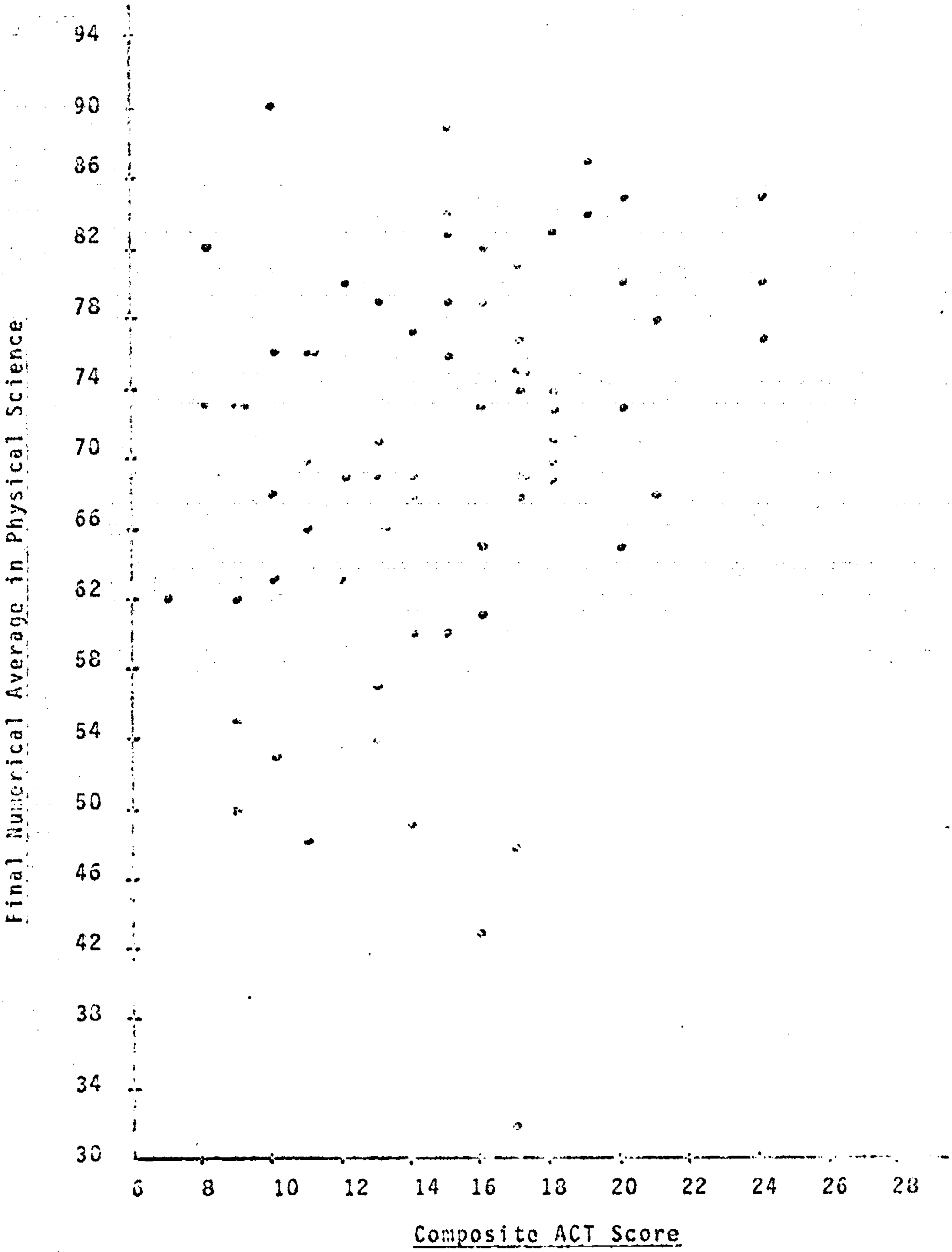


Figure 2. Histogram of 72 Composite ACT Scores

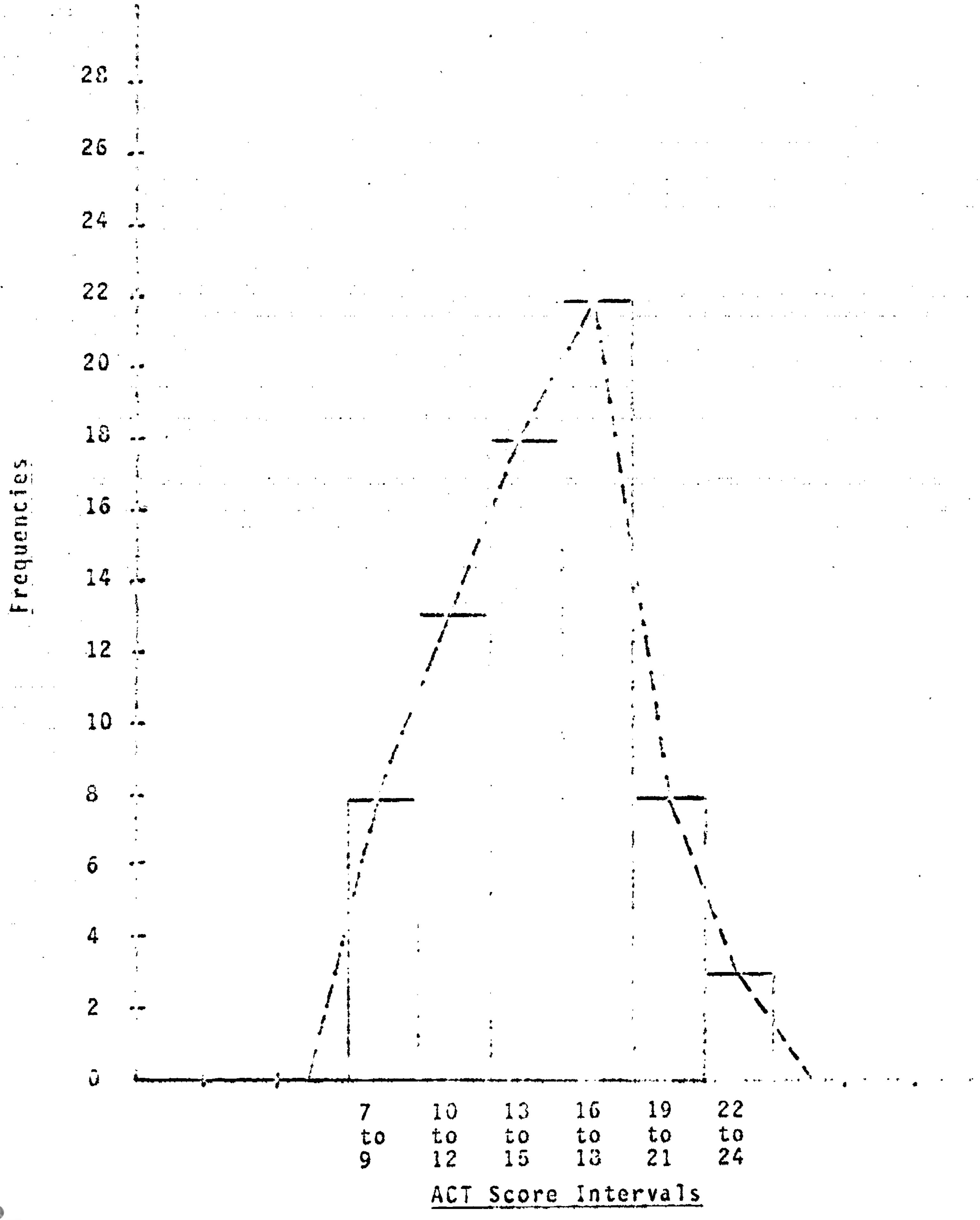
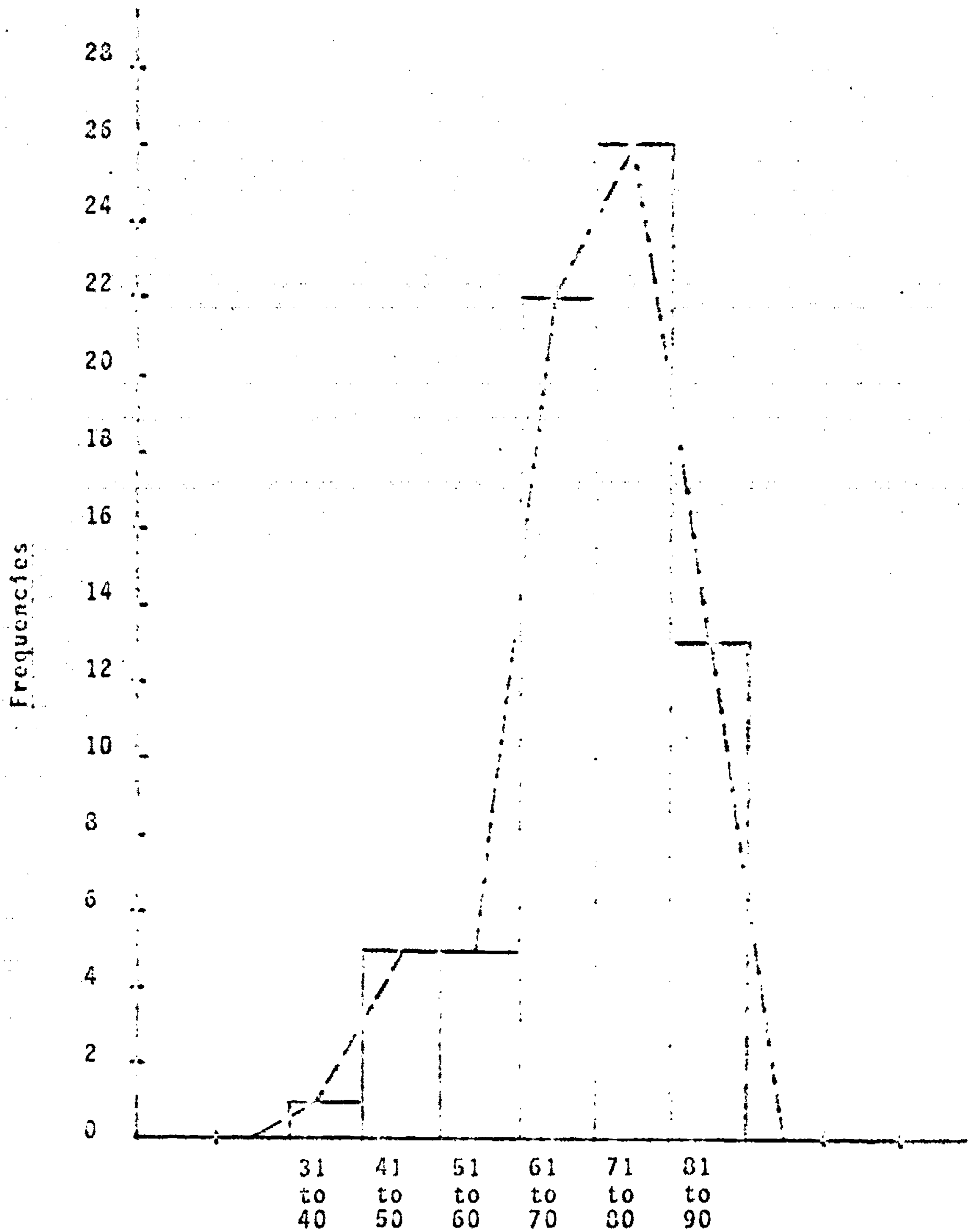


Figure 3. Histogram of 72 Physical Science Scores



Physical Science Score Intervals

Significance of the Physical Science Data

The scattergram (Figure 1) showed a general "shotgun" effect with data missing only in the lower right-hand portion (high ACT scores, low Physical Science Grades). This missing portion of data probably caused the PPM correlation coefficient (r) to be as high as +0.27. If data had appeared in this lower right-hand portion, r would have been much closer to zero.

At the .05 level of significance, the null hypothesis (no relationship between ACT scores and Physical Science Grades) could be rejected if r was less than -0.23 or greater than +0.23. Since r was +0.27, the null hypothesis was rejected. The alternate hypothesis of a positive relationship was accepted, but the relationship was quite small. Generally, r values of +0.20 to +0.40 indicate definite but small relationships.[19]

Figures 2 and 3 showed that neither the ACT score distributions nor the Physical Science grade distributions deviated very far from a normal distribution.

The standard deviations expressed as percentages of perfect score were very close when the ACT data were compared with the Physical Science data.

In addition to being nearly normally distributed and of nearly equal standard deviations, the data were expressed in interval scales. Having met these three criteria, the data were definitely parametric, thus justifying the use of the Pearson-Product-Moment correlation test.

Dwight F. Decker
Associate Professor
Physics Department

Data Resulting from the Quantitative Business Analysis I Study

Based on a sample of 69 students chosen from a five-year period, the calculated Pearson-Product-Moment (PPM) corelation coefficient (r) was +0.24, with a standard error (s_r) of 0.12.

At the .05 level of significance:

$$s_r = \frac{1.96}{\sqrt{n-1}} = \frac{1.96}{\sqrt{69-1}} = 0.24$$

The means, standard deviations, and standard deviations expressed as a percent of the perfect score possible are in Table II.

TABLE II

	ACT Scores (35=perfect score)	Q. B. A. I Grades (100=perfect score)
Mean	$\bar{x} = 17.16$	$\bar{y} = 70.49$
Standard Deviation	$s_x = 4.62$	$s_y = 19.52$
Standard Deviation expressed as a per cent of perfect score	$\frac{4.62}{35} = 13.2\%$	$\frac{19.52}{100} = 19.52\%$

A scattergram of ACT composite scores (horizontal axis) plotted against the paired values of the Quantitative Business Analysis I grades (vertical axis) is shown in Figure 4. Figure 5 is a histogram (with a superimposed frequency polygon) of the ACT composite scores, and Figure 6 is a histogram of the Quantitative Business Analysis I grades, also, with a superimposed frequency polygon.

Appendix B contains the raw data necessary to calculate r for this section of the study.

Figure 4. Scattergram - ACT Scores vs. Quantitative Business Analysis I Grades

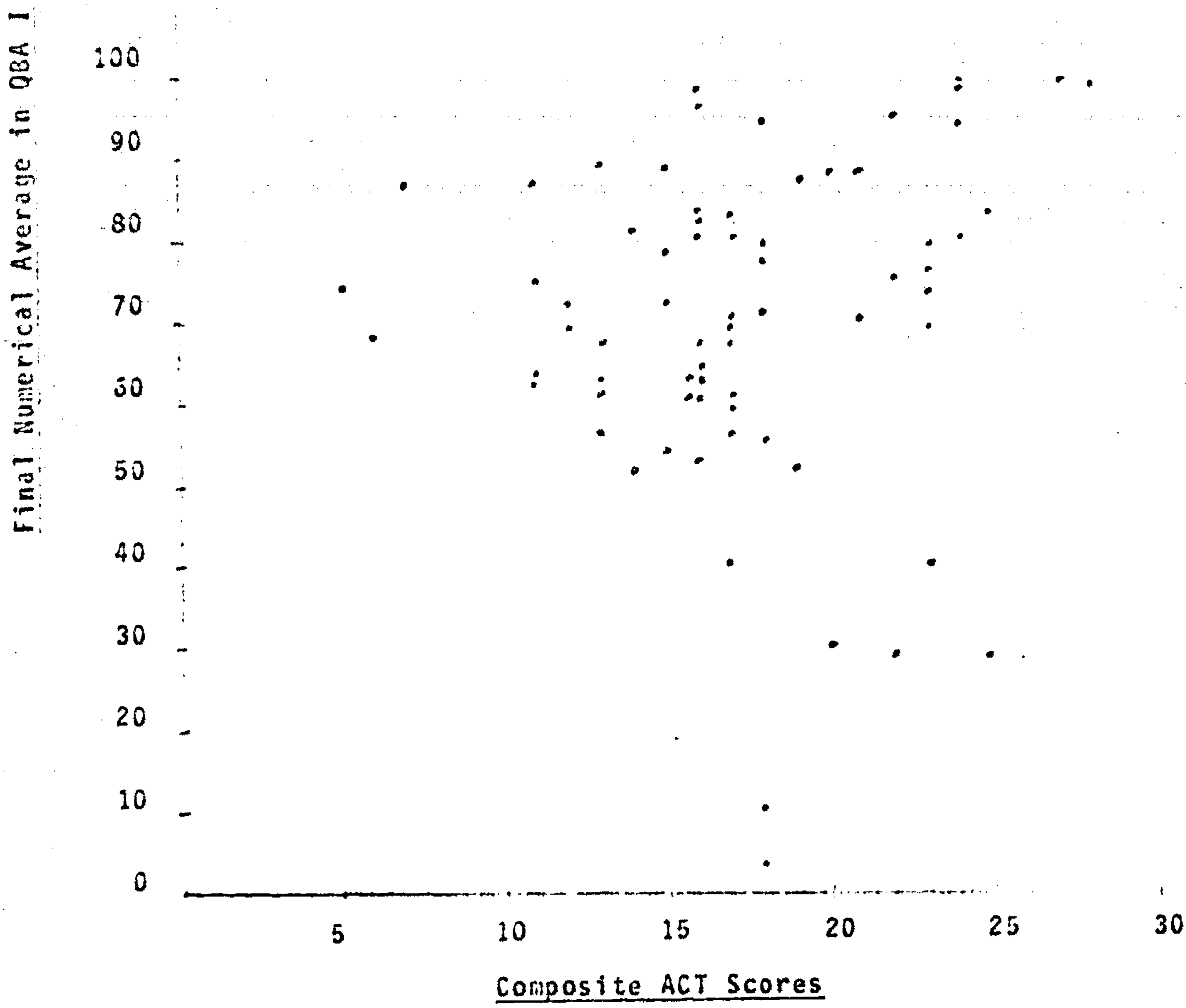


Figure 5. Histogram of 69 Composite ACT Scores

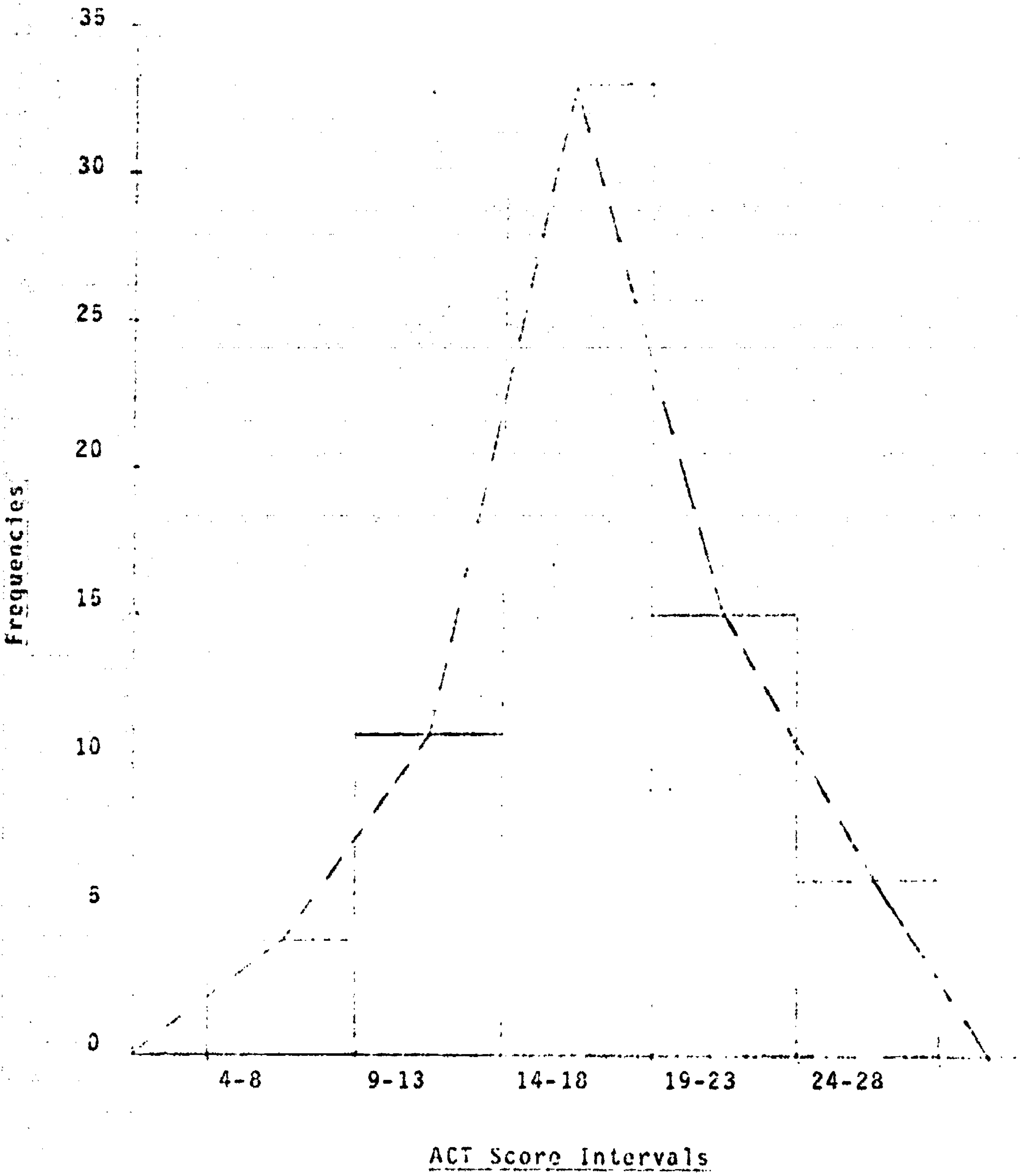
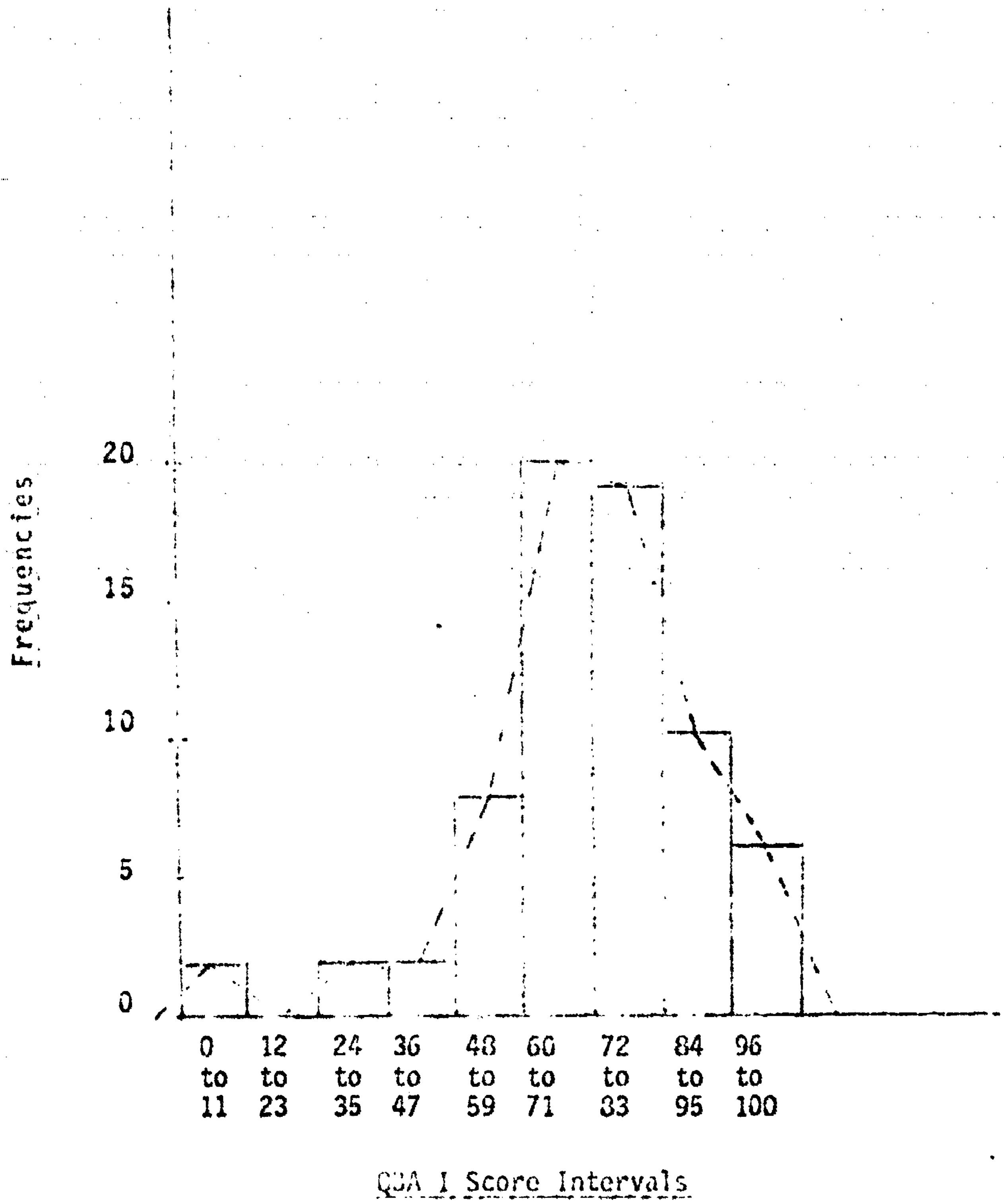


Figure 6. Histogram of 69

Quantitative Business Analysis I Scores



Significance of the Quantitative Business Analysis I Data

The scattergram (Figure 4) displays a cluster of comparisons consistent with the low r which was computed. More scores in the lower left of the figure would have made the r closer to 0 than it was.

At the .05 level of significance, if $-0.24 \leq r \leq +0.24$ the null hypothesis could not be rejected. Since $r = +0.24$ fell within these bounds, the null hypothesis was not rejected.

Figures 5 and 6 seemed to approximate a normal curve distribution for ACT composite scores and the final grades in QBA I.

The standard deviations expressed as a percentage of perfect scores varied by only 6 percentage points.

Joseph W. Menard
Assistant Professor
Mathematics Department

Data Resulting from the Accounting I Study

TABLE III

	ACT Scores (35=perfect score)	Accounting I Grades (100=perfect score)
Mean	$\bar{x} = 15.8$	$\bar{y} = 77.4$
Standard Deviation	$s_x = 4.9$	$s_y = 15.6$
Standard Deviation expressed as a percent of a perfect score	$\frac{4.9}{35} = 13.6\%$	$\frac{15.6}{100} = 15.6\%$

Based on a sample of 70 students spaced over ten semesters (1969 - 74), the Pearson-Product-Moment correlation coefficient (r) was calculated to be +0.47. The data used to calculate r are shown in Appendix C.

A standard error (s_r) of 0.120 was calculated as shown below:

$$s_r = \frac{1}{\sqrt{n-1}} = \frac{1}{\sqrt{70-1}} = 0.120$$

An absolute value of r of 0.24 at the .05 level of significance was necessary to reject the null hypothesis as shown below:

$$|r_r| = \frac{t \text{ at } .05}{\sqrt{n-1}} = \frac{1.96}{\sqrt{70-1}} = 0.24$$

Figure 7. Scattergram - ACT Scores vs. Accounting I Grades

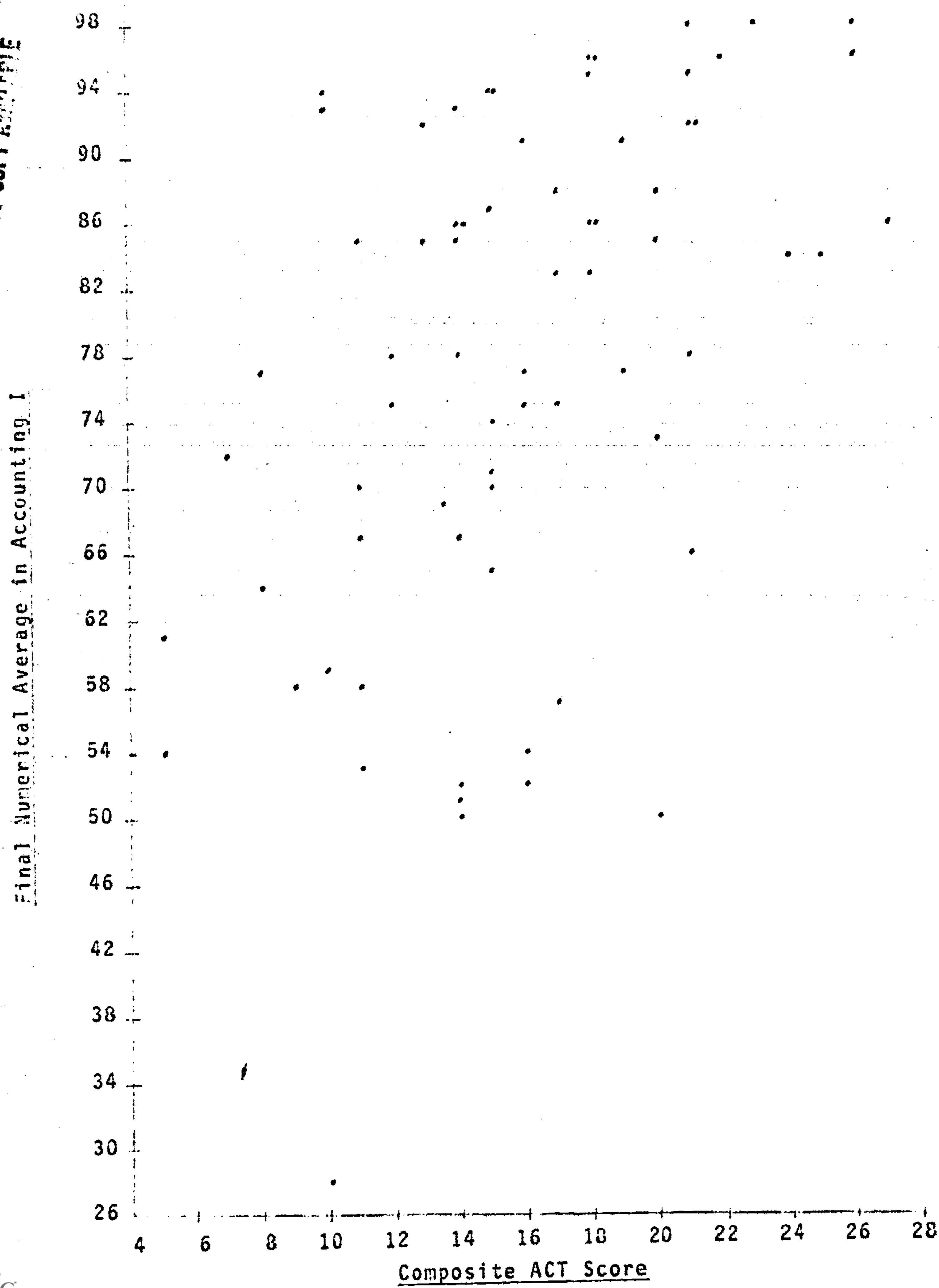


Figure 8. Histogram of 70 Composite ACT Scores

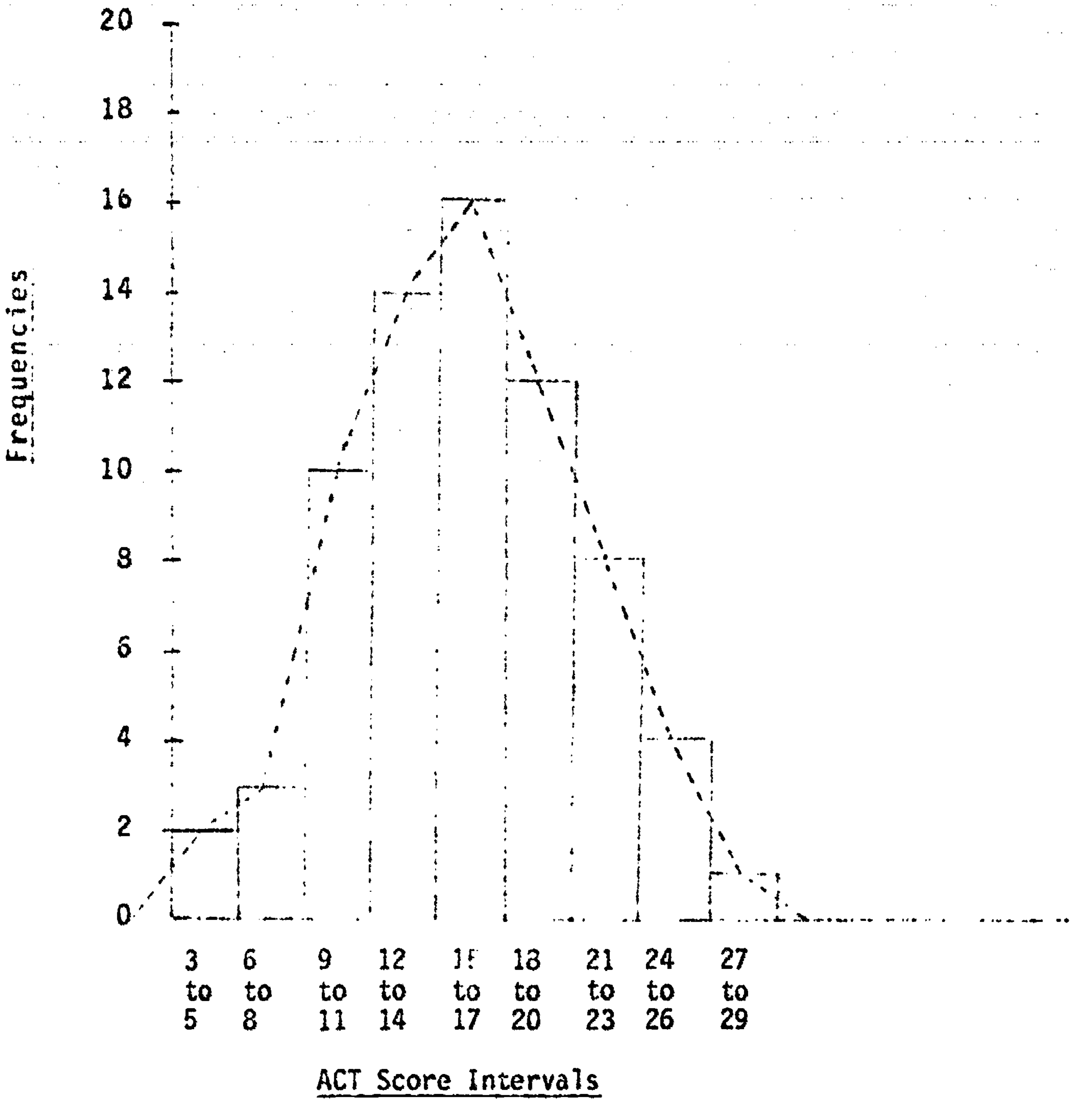
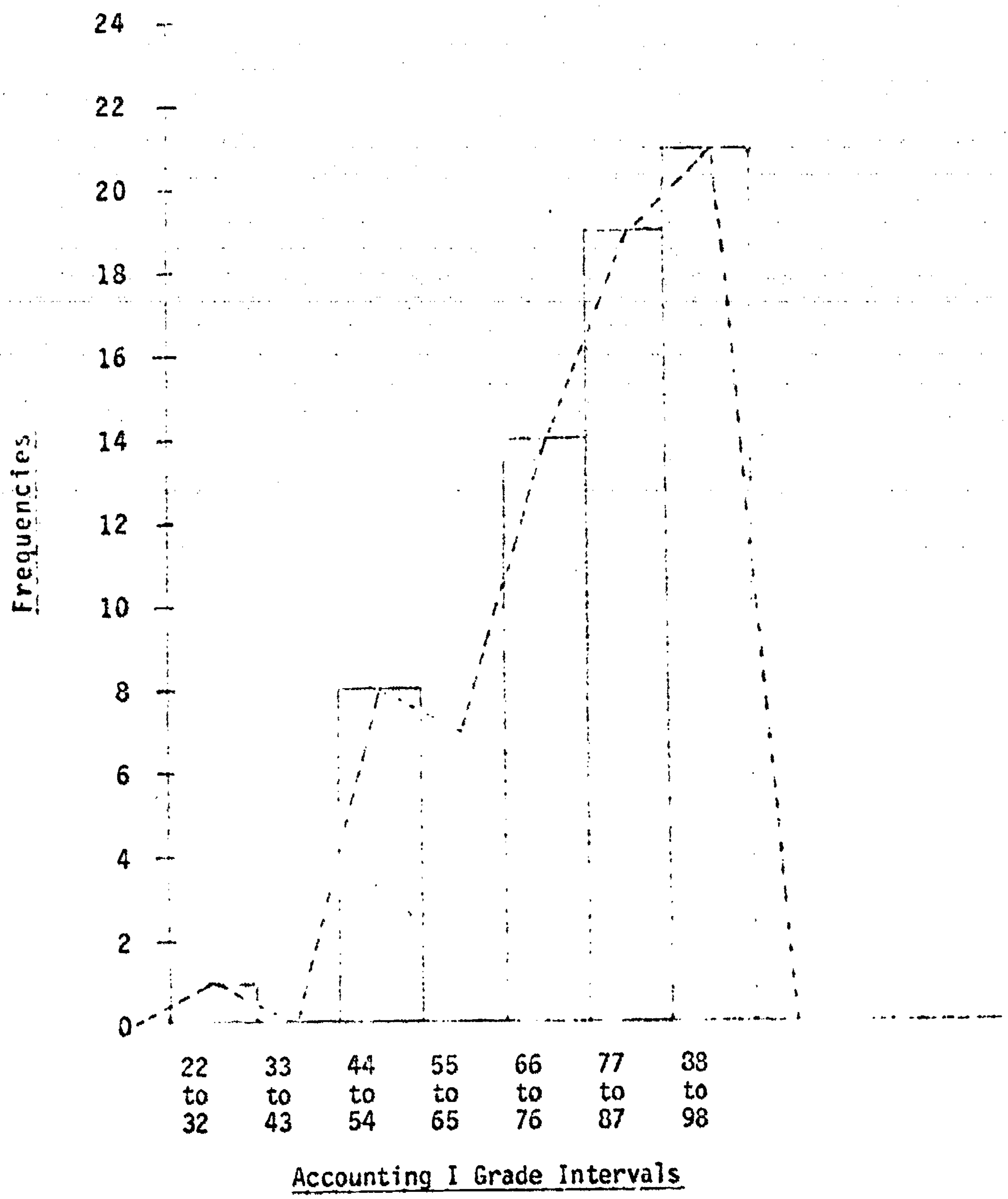


Figure 9. Histogram of 70 Accounting I Grades



Significance of the Accounting I Data

The standard deviations expressed as a percentage of a perfect score (Table III) for both the ACT data and the Accounting I data (13.6% versus 15.6%) were approximately the same.

As shown in the scattergram (Figure 7), the plotted data indicated an r with a positive coefficient of correlation. (Generally, the higher the ACT score, the higher the Accounting I grade, thus resulting in an r of +0.47)

The distribution of ACT composite scores and the distribution of Accounting I grades (as shown in Figure 8 and Figure 9 respectively) do not deviate greatly from a normal distribution.

The data having been parametric--nearly normal distribution of test scores and course grades, nearly equal standard deviations, and data expressed in interval scores--the Pearson-Product-Moment correlation was selected as the methodological technique.

At the .05 level of significance, an r of less than -0.24 or greater than +0.24 was necessary to reject the null hypothesis which stated that no relationship exists between ACT composite scores and final grades in Accounting I. Since the value of r was +0.47, the null hypothesis was rejected. Also, since the value of r was +0.47, the alternate hypothesis which stated that a negative relationship exists between ACT composite scores and final grades in Accounting I was rejected. The alternate hypothesis of a positive relationship between

ACT composite scores and final grades in Accounting I was not rejected. A coefficient of correlation of +0.47 indicated a moderate relationship.

William E. Squizzero
Assistant Professor
Business Administration Dept.

XI. Conclusions and Significance

Physical Science Study

The positive relationship that existed between ACT composite scores and Physical Science grades was so small that the ACT score was concluded to have little usefulness in predicting success in Physical Science.

From scattergram data, it was further concluded the only area of validity was that those with high ACT scores (above 20) would not score low (below 60) in the Physical Science course. These students would not be targeted for alternate learning techniques, so this rendered what little predictability the ACT had to be of no practical significance in Physical Science.

Dwight F. Decker
Associate Professor
Physics Department

Quantitative Business Analysis I Study

This writer failed to reject the null hypothesis and concluded that there is no relationship between ACT composite scores and QBA I final grades. The scattergram (Figure 4) showed a wide dispersion and reinforced the computation of $r = +0.24$ at the .05 level of significance. The correlation coefficient was extremely close to the point between rejection and failure to reject the null hypothesis. Therefore, there must be further study within the mathematics department which might reinforce the failure to reject the null hypothesis, which this study has done.

Based on this study, the mathematics department at Rhode Island Junior College cannot use ACT composite scores as predictors of grades in Quantitative Business Analysis I.

Joseph W. Menard
Assistant Professor
Mathematics Department

Accounting I Study

Contrary to the results of the other two segments of this study, the relationship between ACT composite scores and final grades in Accounting I showed a moderate relationship ($r = +0.47$) as opposed to a small relationship for Physical Science and no relationship for Quantitative Business Analysis I.

The interpretation of the correlation coefficients was based on the following:[20]

Less than .20	Very slight relationship
.20 to .40	Definite but small relationship
.40 to .70	Moderate relationship
.70 to .90	High relationship
.90 to 1.00	Very high and extremely dependable relationship

As can be seen, a coefficient of +0.47 -- although a "moderate relationship" -- falls at the lower limit of the "moderate relationship" category. Thus, in considering the reliability of ACT composite scores as a predictor of academic success in Accounting I, it must be kept in mind that a correlation of +0.47

barely exceeds +.40 which is the upper limit in the "definite but small relationship" category.

These data indicate that there probably will be very limited success in determining which Accounting I students will require alternate learning methods if the ACT composite score is used as the sole method of identifying such students.

William E. Squizzero
Assistant Professor
Business Administration Dept.

XII. Further Studies

The PPM correlation coefficient for ACT scores predicting the Accounting I grades was much higher than for the other two courses tested. Perhaps this study should be done again with separate correlation coefficients--one for those students who have prior bookkeeping experience and one for those who have not.

Many courses at Rhode Island Junior College (other than the three in this study) should be tested to see if a relationship exists between ACT scores and academic success.

If little or no relationship is generally found, a further study could be made using the specialized ACT scores, such as mathematics, English, social studies, and natural sciences. Should any of these prove successful (high relationship), then specialized ACT scores might be used to pinpoint those students (ACT scores of 10 or less) who will require alternate learning techniques and tutorial help from the instructor. The specialized ACT score to be used would depend upon its relationship to the subject matter involved.

If the relationships found for either the composite or specialized ACT scores continue to be moderate or lower, then the investigators will recommend that the college cease using the ACT. This would result in financial savings to the student, and the college would not incur the burden of recording data which have no useful application.

Footnotes

1. Leonard L. Baird and William J. Fiester, "Grading Standards: The Relation of Changes in Average Student Ability to Average Grades Awarded," Educational Testing Service Report No. RB-71-28, (Princeton, N. J., May, 1971), p. 27.

2. Charles A. Berry, "Characteristics of College and Non-College Attendants Who Submitted ACT Scores to a Black College," National Center for Educational Research and Development Report No. BR-2-F-025, (Washington, D. C., November 30, 1972), p. 80.

3. Jerry H. Borup, "The Validity of American College Test for Discerning Potential Academic Achievement Levels --Ethnic and Sex Groups," Journal of Educational Research, Vol. 65, No. 1, (Sept., 1971), 3-6.

4. Lois H. Worthington and Claude W. Grant, "Factors of Academic Success: A Multivariate Analysis," Journal of Educational Research, Vol. 65, No. 1, (Sept. 1971), 7-10.

5. Wimburn L. Wallace, "Review of ACT Test Battery," The Seventh Mental Measurement Yearbook, (Highland Park, N. J.: Gryphon Press, 1972), pp. 612-615.

6. Max D. Engelhart, "ACT Test Battery Review," The Sixth Mental Measurement Yearbook, (Highland Park, N. J.: Gryphon Press, 1965), pp. 2-7.

7. David V. Tiedeman, Journal of Personnel and Guidance 41, (May, 1963), 814-819.

8. Leonard L. Baird, "Prediction of Academic and Non-Academic Achievement in Two-Year Colleges from the ACT Assessment," Educational and Psychological Measurements, Vol. 29, No. 2, (Summer, 1969), 425.

9. Using ACT: on the Campus (1973-74 ed.), (Iowa City, Iowa: ACT Publications), p. 3.

10. Ibid., p. 26.

11. Rhode Island Junior College Catalog (1974-76 ed.), p. 103.

12. Ibid., p. 131.

13. Ibid., p. 140.

14. R. F. Mines and George M. Barton, Applied Educational Research and Evaluation (Ft. Lauderdale, Fla.: Nova University Press, 1973), p. 54.

15. Ibid., p. 53.

16. Benjamin Pearles and Charles Sullivan, Freund and Williams' Modern Business Statistics (Englewood Cliffs, N. J.: Prentice-Hall, 1969), p. 310.

17. Ibid., p. 316.

18. Ibid., p. 318.

19. Mines, op. cit., p. 55.

20. Ibid.

Bibliography

Baird, Leonard L., Prediction of Academic and Nonacademic Achievement in Two-Year Colleges from the ACT Assessment, Educational and Psychological Measurement, Volume 29, No. 2, Summer 1969.

Baird, Leonard L., and Fiester, William J., The Relation of Changes in Average Student Ability to Average Grades Awarded, Educational Testing and Service Report, No. RB-71-28, Princeton, New Jersey, May 1971.

Berry, Charles A., Characteristics of College and Non-College Attendants Who Submitted ACT Scores to a Black College, National Center for Educational Research and Development Report, No. BR-2-F-025, Washington, D.C., November 30, 1972.

Borup, Jerry H., The Validity of American College Test for Discerning Potential Academic Achievement Levels -- Ethnic and Sex Groups, Journal of Educational Research, Volume 65, No. 1, September, 1971.

Engelhart, Max D., ACT Test Battery Review, The Sixth Mental Measurements Yearbook, Gryphon Press, Highland Park, New Jersey, 1965.

Games, Paul A., and Klare, George R., Elementary Statistics: Data Analysis for Behaviorial Sciences, McGraw-Hill, New York, 1967.

Harshbarger, Thad R., Introductory Statistics: A Decision Map, Macmillan Publishing Company, New York, 1971.

Mines, R. F., and Barton, George M., Applied Educational Research and Evaluation, Fort Lauderdale, Florida, Nova University Press, 1973.

Pearles, Benjamin, and Sullivan, Charles, Freund and Williams' Modern Business Statistics, Prentice-Hall, Englewood Cliffs, New Jersey, 1968.

Rhode Island Junior College Catalog, 1974-76 Edition.

The New ACT: Assessment, ACT Publications, Iowa City, Iowa, 1973-74 Edition.

The New ACT: Expanded Reporting Services for Colleges and Universities, ACT Publications, Iowa City, Iowa, 1973.

Tiedeman, David V., Journal of Personnel and Guidance 41, May, 1963.

Using ACT: on the Campus, ACT Publications, Iowa City, Iowa, 1973-74 Edition.

Wallace, Wimburn L., Review of ACT Test Battery, The Seventh Mental Measurement Yearbook, Gryphon Press, Highland Park, New Jersey, 1972.

Worthington, Lois H., and Grant, Claude W., Factors of Academic Success: A Multivariant Analysis, Journal of Educational Research, Volume 65, No. 1, September, 1971.

Appendix A

(Physical Science Data)

X = ACT Score
Y = Physical Science Grade
n = Number of students in sample = 72

Sum of X =	1,066
Sum of Y =	5,067
Sum of X^2 =	16,937
Sum of Y^2 =	365,863
Sum of XY =	75,901
$(\text{Sum of X})^2$ -	1,136,356
$(\text{Sum of Y})^2$ =	25,674,489
n.(Sum of XY) =	5,464,872
n.(Sum of X^2) =	1,219,248
n.(Sum of Y^2) =	26,342,136

(Sum of X) (Sum of Y) = 5,401,422

Appendix B

(Quantitative Business Analysis I Data)

X = ACT Score
Y = QBA I Grade
n = Number of students in sample = 67

Sum of X =	1,184
Sum of Y =	4,864
Sum of X^2 =	21,770
Sum of Y^2 =	368,792
Sum of XY =	84,921
$(\text{Sum of } X)^2$ =	1,401,856
$(\text{Sum of } Y)^2$ =	23,658,496
n.(Sum of XY) =	5,859,549
n.(Sum of X^2) =	1,502,130
n.(Sum of Y^2) =	25,446,648

(Sum of X) (Sum of Y) = 5,758,976

Appendix C

(Accounting I Data)

X = ACT Score
Y = Accounting I Grade
n = Number of students in sample = 70

Sum of X =	1,105
Sum of Y =	5,416
Sum of X^2 =	19,117
Sum of Y^2 =	436,049
Sum of XY =	88,024
$(\text{Sum of } X)^2$ =	1,221,025
$(\text{Sum of } Y)^2$ =	29,333,056
n.(Sum of XY) =	6,161,680
n.(Sum of X^2) =	1,338,190
n.(Sum of Y^2) =	30,523,430

(Sum of X) (Sum of Y) = 5,984,680