A STUDY OF THE RELATIONSHIPS BETWEEN SOME PLACEMENT EXAMINATIONS AND ALGEBRA GRADES FOR CERTAIN STUDENTS AT K.S.U.

by

RAJA SULAIMAN

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CHAPTER 1

Introduction

The concern for placement of students into appropriate mathematics courses is a continuing one. With the decline in students enrollment at many colleges and universities, the need for retention of students, especially the first year students, has intensified. Thus, knowing the predictor variable or combination of variables that best predict student's success in introductory mathematics courses has become the interest of academic advisors, counselors and parents. This would help in advising of students into the proper mathematics courses compatible to their level of mathematics potential.

It's very difficult to predict whether a student will be successful or not in a particular mathematics course since there are several variables that might affect his performance at the same time such as his attitude toward the mathematics course, his total academic load and his mathematical backgrounds. Variables which might be assumed to be obvious predictors of success in college mathematics, such as mathematics standard score on the ACT Test or number of semesters of mathematics completed in high school, were not necessarily those most closely related to the criteria.[1]

[1]Burnside, Lucy Hamblin, "Prediction of Success in Mathematics As A Major Field of Study at The Public Universities in Mississippi", Doctoral Dissertation, The University of Mississippi, 1972.

Nevertheless, within certain limit of error, success in first year college mathematics courses can be predicted using the precollege information normally available.

In this study, the relationship between the ACT Mathematics Usage Test, Mathematical Association of America Mathematics Placement Examination Form A/4A (1981), Intermediate Algebra final grade and grade point average in College Algebra will be investigated.

Placement of beginning students into appropriate mathematics courses has become increasingly important at Kansas State University. The high number of students dropping the introductory mathematics courses or completing it with a grade of D or F every semester clearly indicates the need of an effective mathematics placement procedure. For instance, during the Fall semester 1985, the percentage of students either dropping Intermediate Algebra or completing the course with a grade of D or F ranged from 40% to 51%. For College Algebra, the percentage ranged from 59% to 72%.

Knowing the best predictor variable of College Algebra will help academic advisors to place students into the appropriate introductory mathematics course in which they had a greater chance of success and compatible to their area of studies.

While there have been many studies that used the scores in ACT Mathematics Usage Test and Mathematics Placement

Examination as predictors of College Algebra grade point average, there are relatively few number of studies that are concerned with the use of Intermediate Algebra final grade.

In this study, the student's success in College Algebra was measured by the final grade received.

Purpose

The main purpose of this study is to determine the predictor variables which are significantly correlated at the 0.01 level to the success in College Algebra at Kansas State University. The second purpose is to find the predictor variable which has the highest correlation with the final grade in College Algebra.

The subjects were 134 students who took Intermediate Algebra course during Fall 1985 and completed College Algebra course the following semester. Student records were examined to establish ACT Mathematics Usage Test score, Mathematic Placement Examination score, Intermediate Algebra final grade and College Algebra final grade.

Significance of the Study

The findings of this study would help academic advisors at KSU identify the variable that is highly correlated with student's success in College Algebra. Thus, this would facilitate the placement of beginning students into appropriate introductory mathematics courses compatible to their mathematical ability.

Limitations

This study was limited to 134 students enrolled in Intermediate Algebra and successfully completed the course during the Fall semester of 1985 and completed College Algebra the following semester. Also, this study was limited to those students who had ACT Mathematics Usage Test scores and Mathematics Placement Examination scores.

Definition of Terms

1. Grade:

A measure of scholastic performance. At Kansas State University, the grade policy used is by letter grades, i.e. A, B, C, D, F. In terms of the four point system: A = 4, B = 3, C = 2, D = 1, F = 0.

2. American College Test (ACT):

Before applying for an admission in college, the high school student normally take one of the three major tests of academic ability: the American College Test (ACT), the Scholastic Aptitude Test (SAT), or the National Merit Scholarship Qualifying Test (NMSQT). The ACT academic test covers four subjects: Mathematics, English, Natural Sciences and Social Studies.

In this study, the score on the ACT Mathematics test was used as a predictor variable.

3. Mathematics Placement Examination:

The institutionally designed Mathematics Placement examination has been used by many colleges for predicting academic performance in introductory mathematics courses.

In this study, Mathematical Association of America Mathematics Placement Examination Form A/4A was used as one of the predictor variables.

4. Level of Significance:

A probability value that is considered so rare in the sampling distribution specified under the null hypothesis that one is willing to assert the operation of nonchance factors. Common significance level is 0.05 and 0.01[2].

5. Degrees of Freedom (df):

The number of degrees of freedom is equal to the number of observations minus the number of algebraically independent linear restrictions placed upon them.

6. Null Hypothesis:

A statement that specifies hypothesized values for one or more of the population parameters. Commonly, although not necessarily, involves the hypothesis of "no difference".[2]

7. Correlation Coefficient:

A correlation coefficient is an index of relationship between two variables. The variables are said to be positively correlated if the high score on one variable tends to be paired with a high score on another variable. Similarly, two variables are said to be negatively correlated, if the high score on one variable tends to be paired with a low score on another variable.

The value of the correlation coefficient vary between +1.00 and -1.00. Both extremes represent perfect relationship between the variables and 0.00 represents the absence of a relationship.

In this study, Pearson Product-Moment Correlation was used to find the coefficients. The formula is as follows:

$$r = \frac{SP}{\sqrt{SS_x \cdot SS_y}}$$

Where

$$SP = \Sigma XY - \frac{(\Sigma X) \cdot (\Sigma Y)}{N}.$$

$$SS_x = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

$$SS_y = \Sigma Y^2 - \frac{(\Sigma Y)^2}{N}$$

[2]Runyon, Richard P. and Audrey Haber, Fundamentals of Behavioral Statistics (Addison Wesley Publishing Company, Fifth Edition, June 1984)

Chapter 2

The Review of Related Literature

Finding the best predictor or combination of predictor variables of success in introductory mathematics courses is essential in advising and placement of students into appropriate mathematics courses. Consequently, there have been many predictive studies conducted involving the use of variety of variables. This chapter is divided into three sections:

1. The first section is related to the general studies of ACT Mathematics Usage Test as predictor of academic success in introductory mathematics courses.
2. The second section is related to the general studies of Mathematics Placement Examination as predictor of academic success in introductory mathematics courses.
3. The third section is related to the general studies of the predictors of success in Intermediate Algebra course.

I. General Studies of ACT Mathematics Usage Test as Predictor of Academic Success in Introductory Mathematics Courses.

There have been several studies conducted over the past years on the Mathematics Usage Test of the ACT Assessment Program.

Ferguson and Schmeiser[3] conducted a study on the purpose, content and use of the test. The ACT Assessment Program was established in 1959 by the American College Testing Program (ACT) for students planning to enter post secondary institutions. The important part of the program consists of tests on four subject areas, the Student Profile Section and the Interest Inventory. The scores in the mathematics Usage Test are widely used for guidance and placement in introductory mathematics courses offered by colleges and universities.

Table 1 exhibits the median multiple correlations for predicting first semester college grades in various mathematics courses offered by colleges participating in the ACT Standard Research Service. Column 1 consists of the median correlations when the four ACT test scores were used as predictor variables. Column 2 consists of the median correlations where the predictor variables were the high school grade average. Those in column 3 resulted when ACT

[3]Richard L. Ferguson and Cynthia B. Schmeiser, "The Mathematics Usage Test of the ACT Assessment Program: An Overview of its Purpose, Content, and Use", The Mathematics Teacher, March 1978, pp. 182-191.

test scores and high school grades were used jointly to predict first semester college grades in mathematics.

Table 1 revealed that the ACT test is a valid predictor for placement purposes in introductory mathematics courses.

Table 1

Median Multiple Correlations for Colleges Using High School Self-Reported Grade Averages and ACT Composite Test Scores to Predict First Semester College Grades in Mathematics.

Years of Participation in Standard Research Services	Number of Colleges	(1) ACT Composite Test Scores	(2) High School Grade Average	(3) Combined ACT Composite and High School Grade Average
1968 - 1970	281	0.418	0.428	0.510
1970 - 1973	262	0.440	0.437	0.521
1971 - 1974	245	0.443	0.428	0.519
1972 - 1975	207	0.457	0.432	0.535
1973 - 1976	203	0.458	0.428	0.531

The objective of the study by Boyce[4] was to determine the predictive validity of three tests intended to be used in the prediction of success in basic college algebra. The predictor variables were Educational Testing Service SCAT Q-score, American College Testing Program Mathematics Usage score, and ACE Cooperative Mathematics Pre-Test for College Students. The subjects were 100 qualified freshmen who took the tests during the week of fall orientation. The criterion variables were the final marks earned in the basic algebra course. The correlation coefficients between the predictor variables and criterion variables were computed using the product-moment correlation method.

Table 2 indicates that the ACE Pre-Test and ACT Math were significantly correlated to the success in college algebra.

[4] Richard W. Boyce, "The Prediction of Achievement in College Algebra", Educational and Psychological Measurement, Vol. 24, No. 2, Summer 1964, pp. 419-420.

Table 2

Correlations between Predictor and Criterion Variables

Predictor	Criterion	Correlation	Significance Level
1. ACE Pre-test	course mark	.41	.01
2. ACT Math	course mark	.25	.05
3. SCAT Q-score	course mark	.13	not significant
4. Sex	course mark	.04	not significant

Another study involving prediction of success in college algebra was conducted by Kohler.[5] The purpose of the study was to find the relationship between the Cooperative Mathematics Test, Algebra III as the placement test, ACT Mathematics Usage Test, ACT Composite and grade point average in college algebra.

The subjects were 161 students enrolled in six sections of college algebra during the fall semester, 1972 at Mississippi State University. The criterion variable was the grade point average received in college algebra. Pearson product moment method was used to compute the correlation coefficients between all pairs of the four variables.

Table 3 shows Cooperative Mathematics Test has the highest correlation coefficient with college algebra GPA ($r = 0.53$) while ACT Mathematics was second with $r = 0.52$. The small difference between the two coefficients indicated the Cooperative Mathematics Test was a moderately reliable test for placement purposes.

[5]Emmett T. Kohler, "The Relationship Between the Cooperative Mathematics Test, Algebra III, ACT Mathematics Usage Test, ACT Composite, and Grade Point Average in College Algebra", <u>Educational and Psychological Measurement</u>, 1973, Vol. 33, pp. 929-931.

Table 3

Intercorrelation Analyses

Test	1	2	3	4
1. Cooperative Mathematics Test				
2. ACT Mathematics	.63 (158)			
3. ACT Composite	.53 (158)	.74 (161)		
4. Algebra GPA	.53 (158)	.52 (161)	.40 (161)	----

Finding the best predictor variable or combination of variables for introductory mathematics courses has been the interest of many researchers.

The study by Dykes[6] was concerned with the prediction of success in college algebra at Copiah-Lincoln Junior College. The sample of the study comprised of 188 freshmen enrolled in college algebra as their first college mathematics course during the fall semesters of 1976-77, 1977-78, and 1978-79. The predictor variables were ACT Mathematics scores, ACT composite scores, GPA's in high school mathematics, cumulative GPA's in high school, and scores on the Cooperative Mathematics Tests, Algebra II section. The criterion variable was the GPA in college algebra.

Pearson product-moment correlation coefficients were calculated between each of the predictor variables and the GPA in college algebra. All correlation coefficients were found to be significant at the 0.05 level. GPA in high school mathematics has the highest correlation coefficient with $r = 0.631$ and ACT Mathematics was third with $r = 0.535$.

The stepwise regression technique was used to find a predictive equation for predicting success in college algebra. The best equation for predicting the GPA in college algebra was as follows:

[6]Dykes, Isaac Jerald, "Prediction of Success in College Algebra at Copiah-Lincoln Junior College", Doctoral Dissertation, The University of Mississippi, 1980.

$$Y = .47179X_1 + .06198X_2 + -.5611X_3 + .58308X_4 - 3.26773.$$

Where

Y = GPA in college algebra.

X_1 = GPA in high school mathematics.

X_2 = Cooperative Mathematics Tests Score.

X_3 = ACT Math Score.

X_4 = Cumulative GPA in High School.

It was concluded that the use of several variables tends to improve the regression equation. The study showed GPA in high school mathematics courses was the best single predictor of success in college algebra.

In the study by O'Neal[7], five measurable characteristics of the students enrolled in Calculus 1 course at the Oxford campus of the University of Mississippi and the three campuses of Mississippi Gulf Coast Junior College were examined. The predictor variables were the ACT composite score, the ACT Mathematics score, the number of units of high school mathematics, the high school GPA, and the age in months beyond the seventeenth birthday. The criterion variable for the university and junior college was the final grade received in Calculus 1 course.

[7]O'Neal, Larry Dean, "A Comparison of the Predictors of Success of University and Junior College Students in the Initial Calculus Course", Doctoral Dissertation, The University of Mississippi, 1980.

Stepwise multiple regression analyses was done to find the best equation for predicting the grade in Calculus 1 at the university and the junior college. The best equation for the university was:

$$Iu = .153\ D + 1.39G + .580E - .930F - 5.93$$

The best equation for the junior college was:

$$Ij = .064D + .295G + .283.$$

Where

Iu = grade in Calculus 1 at the university

Ij = grade in Calculus 1 at the junior college

D = ACT Mathematics score

G = High school mathematics GPA

E = Number of units of high school mathematics

F = High school GPA.

II. General Studies of Mathematics Placement Examination as Predictor of Academic Success in Introductory Mathematics Courses.

Mathematics placement tests have been used in many studies to predict success in beginning mathematics courses.

Wick[8] investigated the factors associated with success in first-year college mathematics. The study was conducted during the 1962-63 school year in six Minnesota and Wisconsin colleges and universities. In all, 1692 students were involved in one or more phases of the study. The criterion variables were first term college grades in college algebra, college algebra and trigonometry, and calculus and analytic geometry.

Table 4 shows the median correlations for predicting grades in the three mathematics courses. Mathematics placement tests have a median correlation of .37 with college algebra and was ranked sixth among the eight variables used. This indicates that mathematics placement tests have a low correlation with success in college algebra.

The objectives of the study by Sims[9] were:
(1) to determine if there is a significant correlation at the .05 level between success in college algebra and prior

[8]Marshall E. Wick, "A Study of the Factors Associated with Success in First-Year College Mathematics", The Mathematics Teacher, November 1965, pp. 642-648.

[9]Sims, Georgia Lee, "Prediction of Success in College Algebra at Richland College in Dallas, Texas", Doctoral Dissertation, The Florida State University, 1979.

Table 4

Median Correlations

VARIABLE	COLLEGE ALGEBRA		COLLEGE ALGEBRA AND TRIGONOMETRY		CALCULUS AND ANALYTIC GEOMETRY	
	Correlation	Rank	Correlation	Rank	Correlation	Rank
Math Av., Grade 10-12	.59	1	.44	1	.39	4
Math Av., Grade 11-12	.57	2	.39	4	.40	3
Math Av., Grade 12	.51	4	.41	3	.46	1
Ratio of A's, Grades 10-12	.55	3	.38	5	.39	4
High School Rank	.51	4	.32	7	.31	6
Scholastic Aptitude Tests	.34	8	.26	8	.29	7
Mathematics Aptitude Tests	.36	7	.43	2	.43	2
Mathematics Placement Tests	.37	6	.36	6	.24	8

mathematics achievement as measured by the Mathematical Association of American Placement Test BA/1.

(2) to determine if there is a significant correlation at the .05 level between a student's attitude towards mathematics as measured by Aiken's Revised Attitude toward Mathematics Scale and the student's probability for success in college algebra.

(3) to determine the predictive ability of certain cognitive, affective and demographic factors.

The predictor variables were the mathematics achievement test score, two mathematics attitude scores, age, sex, whether or not the student had taken the prerequisite two years of high school algebra, whether or not the student had taken the highest level of developmental mathematics offered by the institution, whether the student was a full time or part time student, whether the student worked full time, part time or not at all, and the student's sureness of his/her major.

The study found a significant correlation at the .05 level between the placement test scores and college algebra grades for all students. This suggests that the placement test can be used as a predictor of success in college algebra.

Another study by Neal[10] seems to agree with the above finding. One of the purposes of the study was to determine

[10]Neal, Linda Marie Dullnig, "Predicting Success in College Algebra at Tarleton State University", Doctoral Dissertation, Texas A&M University, 1974.

the best single predictor, or set of predictors of success, in College Algebra Course at Tarleton State University. The predictors were placement test, high school Algebra 1 grades, SAT combined scores, SAT Verbal scores, and SAT Math scores.

The hypotheses of the research were:

(1) A sixty-minute placement test can be developed such that its results indicate that a student who makes a grade greater than or equal to a determined raw score can successfully complete the College Algebra Course.

(2) The placement test, together with one or more additional predictors, will correlate significantly with a student's College Algebra grade.

The study concluded that a mathematics placement test could be developed to predict success in College Algebra.

The objectives of the study conducted by Sprankel[11] were to evaluate the validity of placement tests and other predictor variables with respect to success in beginning mathematics courses at Southern Illinois University at Carbondale and to determine which combinations of the predictor variables were most effective in predicting first quarter mathematics grades.

The predictor variables were mathematics placement test score, high school class rank, high school mathematics grade,

[11]Sprankel, Charlene Mildred, "The Validity of Placement Tests and Other Predictor Variables in the Placement of Students in Beginning Mathematics Courses at Southern Illinois University at Carbondale", Doctoral Dissertation, Southern Illinois University, 1976.

and the ACT English, Mathematics, Natural Science, and Composite scores. The criterion variables were grades received in beginning mathematics courses for credit. The subjects were 214 students who took the Mathematics 106 Placement Test, 132 students who took the Mathematics 107 Placement Test, and 317 students who took the Advanced Placement Test during the 1969-70 and 1970-71 school years.

The study used stepwise regression technique to develop regression equations for each beginning mathematics course in every beginning sequence. The results of the study revealed that the mathematics placement test score appeared in first or second place five times in the six major regression equations. It was concluded that the mathematic placement test score was the best single predictor of success in beginning mathematics courses.

In the study conducted by Clark[12] at Kings River Community College, certain characteristics of students were examined for prediction of success in Math Analysis 1 course.

The subjects consist of all students enrolled in Math Analysis 1 in fall 1979 or fall 1980. The predictor variables were year of high school graduation, high school attended, placement test taken and math score, high school grade point average, high school math courses and grades,

[12]Clark, Robert M., "Math Courses Survey: Math 5A--Math Analysis 1.", Research Report (143), Statistical Material (110), RIE, Kings River Community College, Reedley, California, May 1982.

college units taken prior to Math Analysis 1, GPA of college courses before Math Analysis 1, and other college math courses and grades. The criterion variable was a C grade or better in Math Analysis 1.

The study found that students had a less than 50% chance of success in the course if they:

(1) scored less than the 94th percentile on a Math achievement test.

(2) had less than a 3.0 GPA in high school.

(3) received less than a B in any high school math class.

(4) received a grade of less than B in any other math course taken at college.

(5) had less than a 3.0 college GPA.

III. General Studies Related to the Prediction of Success in Intermediate Algebra.

There were few studies involving prediction of success in Intermediate Algebra course.

The purpose of the study by Wilbur[13] was to use existing statistical techniques to form linear multiple and joint multiple regression equations to see if the equations would predict success in a course in intermediate algebra.

The predictor variables were the student's sex, grade level in high school when the course was taken, grade in geometry, grade in elementary algebra, grade point average in junior high school mathematics prior to enrollment in elementary algebra, overall grade point average prior to taking intermediate algebra, scores on the Differential Aptitude Tests, and the occupation of one of the parents. Student's grade in intermediate algebra was the criterion variable. The data was collected from student's permanent records in three large high schools in Kansas.

The study revealed that the best predictors of intermediate algebra grades were the grades received in plane geometry course and overall grade-point average. It was concluded that linear multiple and joint multiple regression equations can be developed to predict success in intermediate algebra.

[13] Wilbur, Raymond Harvey, "Prediction of Academic Success in Intermediate Algebra", Doctoral Dissertation, University of Kansas, 1973.

One of the objectives of the study conducted by Nourallah[14] was to determine the significance of predictor variables in predicting Intermediate Algebra grade point average, College Algebra grade point average, and first semester grade point average.

The subjects were 546 freshmen students enrolled in Intermediate Algebra during the fall of 1980 at Kansas State University. The predictor variables were sex, number of mathematics units taken in high school (NMATH), high school grade-point average (HGPA), ACT mathematics (ACT-M), ACT composite (ACT-C), high school rank (HRANK), and high school size (HSIZE). The grade point average in Intermediate Algebra was also used as a predictor variable to predict the College Algebra grade-point average.

The study (of table 5) revealed that high school grade point average (HGPA) had the highest correlation coefficient ($r = 0.40$) with Intermediate Algebra grade point average (INALG). ACT mathematics (ACT-M) was second with $r = 0.36$. Column 3 indicated that the best predictor of College Algebra grade point average (COALG) was the grade point average in Intermediate Algebra with $r = 0.54$. The following table from Nejadsacheghi's study shows the various observed correlations.

[14]Nourallah Nejadsadeghi, "A Study of the Predictive Relationship Between Certain Pre-Enrollment Data and Certain Success Factors Obtained From a Sample of 1980 Freshmen at KSU", Doctoral Dissertation, Kansas State University, 1985.

Table 5

Pearson Correlation Coefficient Between
Independent Variables and Dependent Variables

	NMJPS	INALG	COALG	SGPA
SEX	0.13*	0.18*	0.08	0.21**
NMATH	0.04	0.20*	0.14	0.16*
HGPA	-0.11	0.40***	0.30**	0.45***
ACTM	0.007	0.36***	0.28**	0.16*
ACTC	-0.06	0.34***	0.23**	0.33***
HRANK	-0.13*	0.28***	0.14	0.35***
HSIZE	0.09	0.01	0.08	-0.02
INALG	-0.21*	1.00	0.54**	0.60***
COALG	-0.18*	0.54***	1.00	0.48***
SGPA	-0.30***	0.60***	0.48***	1.00

*P < 0.05

**P < 0.001

***P < 0.0001

Another study by Zakaria[15] also indicated that ACT Mathematics scores had high correlation with final grades in Intermediate Algebra. The goals of the study were (1) to determine whether there is a significant correlation at the 0.01 level between success in Intermediate Algebra, College Algebra, and Calculus 1 and scores earned in Mathematical Association of American Mathematics Placement Examination and ACT Mathematics Usage Test, (2) to find the best predictor variable for each of the mathematics courses.

The predictor variables were the scores in the placement test and ACT Mathematics. The criterion variable was the final course grade. The Pearson product moment technique was used to compute the correlation coefficients between each pair of predictor variables and between each predictor variable and the criterion variable.

The results showed that ACT Mathematics has the highest correlation ($r = 0.163$, $p = 0.015$) with the final grades in Intermediate Algebra. The best predictor variable for College Algebra was the mathematics placement test with $r = 0.497$ ($p = 0.0001$).

At Kings River Community College, Clark[16] conducted a research to determine the variables which were significantly related to success in Mathematics A (Elementary Algebra), Mathematics B (Plane Geometry), Mathematics C (Trigonometry),

[15] Sakirah Zakaria, "A Comparison Between Mathematics Placement Examination and ACT Mathematics On Certain Classes of Students at Kansas State University", Master Report, 1986.

and Mathematics D (Intermediate Algebra).

The subjects were 69 students in Mathematics A, 24 in Mathematics B, 15 in Mathematics C, and 64 in Mathematics D. The predictor variables were placement test scores, high school grade point average (GPA), prior college units taken, prior college GPA, high school mathematics grades, and prior college mathematics grades.

The study discovered that students had less than a 50% chance of success in Mathematics D (Intermediate Algebra) if they scored below the 56 percentile on placement tests, had less than a 3.0 high school or 2.9 college GPA, and had taken less than 35 college units.

Summary of Studies

Review of related studies shows that several variables have been used to predict success in introductory mathematics courses at post secondary institutions. Many of the studies revealed that ACT Mathematics Usage Test and Mathematics Placement Test were the best predictor variables to predict student's success in College Algebra Course. It was also found that the score in ACT Mathematics Usage Test has a high correlation with the final grade in Intermediate Algebra.

[16]Clark, Robert M., "Summary Analysis of Students and Grades: Mathematics A, Elementary Algebra; Mathematics B, Plane Geometry; Mathematics C, Trigonometry; and Mathematics D, Intermediate Algebra", Research Report (143), Statistical Material (110), RIE, Kings River Community College, Reedley, California, September 1982.

Chapter 3

Design of the Study

The primary purpose of this investigation was to determine the predictor variables that were significantly correlated at the 0.01 level with the course grade in College Algebra. The second purpose was to find the predictor variable that best predicts the grade point average in College Algebra.

Correlation coefficients will be calculated between the predictor variables and the final grade in College Algebra.

The Variables Used in This Study.

The variables used in this study were those which Kansas State University had on file for the subjects under study. These variables are Kansas State University identity numbers of the subjects, ACT Mathematics Usage Test scores for each subject, Mathematics Placement Examination scores for each subject, Intermediate Algebra final grades for each subjects and College Algebra final grades for each subject. For the purpose of this study, the final grades in Intermediate Algebra and College Algebra were converted to the numerical four point system, i.e. A = 4, B = 3, C = 2, D = 1, F = 0.

Subjects of this Study.

The subjects of this study include 134 students who had taken the Intermediate Algebra course during the Fall semester of 1985 and completed the College Algebra course the following spring semester.

Data

A request was made in the Mathematics Department for the information required for this study. The first set of data obtained was the computer print out listing certain information on each student who enrolled in Intermediate Algebra during the Fall 1985. The information were student identity number, letter grade received in Intermediate Algebra, numerical grade earned in Intermediate Algebra, Mathematics Placement Examination score, and ACT Mathematics Usage Test score. However, not all the students had a complete set of data. The second set of information received were the grade rosters of students enrolled in College Algebra during Spring semester of 1986.

A computer program was written to search those students who had taken Intermediate Algebra in Fall 1986 and College Algebra the following semester.

From the information listed for each subject, only the following pieces of information were used:

1. The ACT Mathematics Usage Test score for each subject. A minimum score of 0 and a maximum score of 36.
2. The Mathematics Placement Examination score for each subject. A minimum score of 0 and a maximum score of 32.
3. The numerical equivalent of the grade in Intermediate Algebra for each subject.
4. The numerical equivalent of the grade in College Algebra for each subject.

Table 6

Summary and Abbreviation for the Variables Used In This Study

Abbreviation	Description
INALG	Intermediate Algebra numerical grade received by each subject.
COALG	College Algebra numerical grade received by each subject.
PLACEMENT	The Mathematics Placement Exam score for each subject.
ACT-M	The ACT Mathematics score for each subject.

Statistical Method for Processing the Data

All correlation coefficients in this study were calculated using Pearson Product Moment Correlation technique.

Pearson Product-Moment Correlation Coefficient and Related Hypothesis

Pearson correlation coefficient is an index of relationships between two variables. In this study, correlation coefficients between the final course grade in College Algebra and the three predictor variables were calculated. The predictor variables were Intermediate Algebra final grade, ACT Mathematics score and Mathematics Placement Examination score.

Since not all subjects have complete data, the number of pairs of measurement were not the same for the three correlations. There were 134 pairs of measurements for the correlation between Intermediate Algebra final grade and College Algebra final grade. Also, there were 98 pairs of measurements for the correlation between Placement Exam score and College Algebra final grade. For the correlation between ACT Mathematics score and College Algebra final grade, there were 94 pairs.

Listed below are the three hypothesis which pertain to the relationship between independent variables and the criterion variable, the final course grade in College Algebra.

Hypothesis COALG 1

The correlation coefficient between Intermediate Algebra final grade and criterion variable will not be different from zero.

Hypothesis COALG 2.

The correlation coefficient between Mathematics Placement Exam score and criterion variable will not be different from zero.

Hypothesis COALG 3.

The correlation coefficient between ACT Mathematics Usage Test score and criterion variable will not be different from zero.

Chapter 4

Analysis of Data

Correlation Analysis

Pearson product-moment correlation coefficient were calculated between the predictor variables and the criterion variable, final course grade in College Algebra.

Tables 7, 8, and 9 show the statistics found in the computations of the three correlation coefficients.

Table 10 shows the correlation coefficients between the predictor variables and College Algebra final course grade.

Table 7

Statistics for the Correlation Between Intermediate Algebra Final Course Grade and College Algebra Final Course Grade

N	134
ΣX	356
ΣX^2	1106
ΣY	209
ΣY^2	519
ΣXY	634

Table 8

Statistics For the Correlation Between Mathematics Placement Exam Score and College Algebra Final Course Grade

N	98
ΣX	884
ΣX^2	10,018
ΣY	166
ΣY^2	428
ΣXY	1,586

Table 9

Statistics For the Correlation Between ACT Mathematics Usage Test Score and College Algebra Final Course Grade

N	94
ΣX	1,364
ΣX^2	22,468
ΣY	145
ΣY^2	355
ΣXY	2,323

Table 10

Pearson Correlation Coefficients Between Predictor Variables and College Algebra Final Course Grade.

Predictor	Correlation Coefficient with College Algebra final grade
INALG	0.4478*
PLACEMENT	0.1618
ACT-M	0.3694*

* Significant at 0.01 level

3 hypothesis concerning the correlation coefficients between the variables were tested and the results were as follows:

Hypothesis COALG 1

The null hypothesis was rejected, final course grade in Intermediate Algebra and final course grade in College Algebra had a correlation coefficient of 0.4478 which is significant at 0.01 level.

Hypothesis COALG 2

The null hypothesis was retained, Mathematics Placement Exam score does not correlate significantly with the final course grade in College Algebra at 0.01 level.

Hypothesis COALG 3

The null hypothesis was rejected, ACT Mathematics Usage Test score and final course grade in College Algebra had a correlation coefficient of 0.3694 which is significant at 0.01 level.

CHAPTER 5

Findings, Conclusions and Recommendations

Findings

Two predictor variables were found to be significantly correlated with the final course grade in College Algebra at the 0.01 level. The variables were final course grade in Intermediate Algebra and ACT Mathematics Usage Test score.

The final course grade in Intermediate Algebra has the highest correlation with the final course grade in College Algebra ($r = 0.4478$). ACT Mathematics Usage Test score was second with $r = 0.3694$. This variable was followed by Mathematical Association of America Mathematics Placement Examination Form A/4A (1981) score with $r = 0.1618$.

Conclusion

The following were concluded from the results of the present study at Kansas State University:

1. This study concluded that final course grade in Intermediate Algebra and ACT Mathematics Usage Test score correlate significantly (at 0.01 level) with the final course grade in College Algebra.
2. This investigation found that Mathematics Placement Examination does not correlate significantly (at 0.01 level) with the final course grade in College Algebra. A possible explanation for this was that the subjects were limited only to those who had taken both Intermediate Algebra and College Algebra courses, excluding those

students who took College Algebra as their first mathematics course.

3. This study revealed that final course grade in Intermediate Algebra was the single best predictor of academic success in College Algebra.
4. It was found that only 39.53% of all Intermediate Algebra students who received letter grades in the course during Fall semester 1985 completed College Algebra with letter grades the following Spring semester.

Recommendation

The following recommendations can be made as a result of this study:

1. The study should be replicated at Kansas State University to confirm the findings.
2. Faculty advisors, counselors, and administrators at Kansas State University should give consideration to the findings of this study when advising students in the selection of first mathematics course.

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APPENDICES

Table A

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
1	D	1	3	•	C	2
2	F	0	9	•	F	0
3	B	3	11	16	C	2
4	A	4	3	•	B	3
5	D	1	10	10	F	0
6	D	1	5	13	D	1
7	C	2	12	16	A	4
8	C	2	8	12	C	2
9	C	2	4	11	F	0
10	C	2	7	10	F	0
11	B	3	3	•	C	2
12	C	2	6	•	B	3
13	A	4	10	•	B	3
14	C	2	4	22	C	2
15	C	2	13	18	D	1
16	C	2	6	21	C	2
17	A	4	12	25	A	4
18	B	3	1	16	C	2
19	C	2	4	1	C	2
20	C	2	13	8	C	2
21	C	2	7	•	B	3
22	B	3	9	•	B	3
23	C	2	12	8	C	2

Table A continued.

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
24	C	2	12	18	B	3
25	C	2	23	15	D	1
26	D	1	3	•	F	0
27	A	4	7	17	C	2
28	D	1	10	•	F	0
29	C	2	4	8	B	3
30	C	2	8	12	D	1
31	B	3	5	•	D	1
32	B	3	8	19	B	3
33	C	2	0	•	F	0
34	C	2	3	•	F	0
35	A	4	11	13	B	3
36	C	2	10	7	C	2
37	B	3	6	25	B	3
38	C	2	10	13	C	2
39	A	4	11	28	A	4
40	A	4	7	19	A	4
41	C	2	10	12	C	2
42	B	3	19	25	D	1
43	A	4	4	19	A	4
44	C	2	3	12	F	0
45	C	2	2	7	F	0
46	D	1	6	18	F	0
47	D	1	3	6	C	2

Table A continued.

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
48	B	3	12	8	D	1
49	C	2	•	16	F	0
50	B	3	9	•	C	2
51	B	3	12	9	C	2
52	C	2	9	•	C	2
53	B	3	13	16	D	1
54	C	2	•	12	F	0
55	A	4	21	20	A	4
56	A	4	10	•	B	3
57	C	2	12	15	D	1
58	F	0	13	20	F	0
59	B	3	•	6	D	1
60	A	4	•	16	C	2
61	A	4	•	•	D	1
62	C	2	•	13	D	1
63	D	1	•	•	D	1
64	B	3	6	•	D	1
65	C	2	•	7	F	0
66	C	2	10	19	C	2
67	A	4	•	•	D	1
68	A	4	8	6	D	1
69	B	3	•	•	C	2
70	F	0	•	13	F	0
71	A	4	9	•	B	3

Table A continued.

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
72	F	0	11	•	F	0
73	D	1	9	22	D	1
74	B	3	•	15	C	2
75	A	4	•	8	D	1
76	A	4	•	•	F	0
77	B	3	•	10	D	1
78	A	4	•	•	A	4
79	A	4	14	22	C	2
80	F	0	•	•	F	0
81	B	3	9	16	B	3
82	B	3	7	15	F	0
83	C	2	•	12	F	0
84	A	4	5	•	F	0
85	C	2	•	18	F	0
86	B	3	•	•	B	3
87	C	2	•	16	C	2
88	D	1	•	•	F	0
89	C	2	•	9	D	1
90	B	3	7	17	F	0
91	A	4	11	15	A	4
92	C	2	15	•	F	0
93	C	2	12	11	F	0
94	B	3	8	20	D	1
95	A	4	11	6	F	0

Table A continued.

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
96	A	4	14	13	C	2
97	A	4	18	20	A	4
98	C	2	8	12	C	2
99	A	4	3	10	D	1
100	A	4	13	14	F	0
101	B	3	19	13	D	1
102	B	3	3	.	C	2
103	B	3	7	.	D	1
104	A	4	16	8	C	2
105	A	4	15	.	C	2
106	A	4	6	.	B	3
107	A	4	6	18	D	1
108	A	4	15	.	B	3
109	A	4	9	14	D	1
110	C	2	10	.	B	3
111	C	2	10	21	B	3
112	B	3	.	16	C	2
113	C	2	.	14	F	0
114	C	2	10	23	F	0
115	B	3	16	20	D	1
116	C	2	5	20	C	2
117	A	4	.	10	D	1
118	B	3	.	14	C	2
119	B	3	.	.	D	1

Table A continued.

Subject	INALG L GRADE	INALG N GRADE	PLACEMENT SCORE	ACT-M SCORE	COALG L GRADE	COALG N GRADE
120	A	4	•	•	C	2
121	D	1	•	5	F	0
122	C	2	•	7	D	1
123	B	3	•	11	D	1
124	C	2	4	•	D	1
125	C	2	•	23	B	3
126	A	4	•	•	B	3
127	C	2	•	16	C	2
128	A	4	•	16	C	2
129	A	4	10	13	C	2
130	A	4	6	12	C	2
131	C	2	7	15	D	1
132	A	4	20	23	B	3
133	C	2	9	16	C	2
134	B	3	5	19	D	1

A STUDY OF THE RELATIONSHIPS
BETWEEN SOME PLACEMENT EXAMINATIONS
AND ALGEBRA GRADES FOR CERTAIN
STUDENTS AT K.S.U.

by

RAJA SULAIMAN

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AN ABSTRACT OF A MASTER'S REPORT

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The objectives of this study were 1) to determine the predictor variables which are significantly correlated at the 0.01 level to the success in College Algebra, 2) to determine the predictor variable which has the highest correlation with the course grade in College Algebra.

The predictor variables were Intermediate Algebra final course grades, ACT Mathematics Usage Test scores, and Mathematical Association of America Mathematics Placement Examination scores, and the criterion variable was the final course grades received.

The subjects included 134 students enrolled in Intermediate Algebra during the Fall semester 1985 and completed College Algebra the following Spring semester.

Pearson Product-Moment Correlations were calculated between each predictor variable and the criterion variable.

A significant correlation at the 0.01 level was found between Intermediate Algebra final course grades and College Algebra course grades, and between ACT Mathematics Usage Test scores and College Algebra course grades.

Intermediate Algebra final course grades has the highest correlation with the final grades in College Algebra ($r = 0.4478$). This was followed by ACT Mathematics Usage Test scores ($r = 0.3694$) and Mathematics Placement Examination scores ($r = 0.1618$).