# A COMPARISON OF THE SUCCESS RATE OF COLLEGE ALGEBRA STUDENTS HAVING A SINGLE MINIMUM ACT MATHEMATICS SCORE WITH COLLEGE ALGEBRA STUDENTS HAVING ATTAINED THE REQUIRED ACT MATHEMATICS SCORE IN MULTIPLE ATTEMPTS

NANCY FRIMEL MATTHEWS

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# A COMPARISON OF THE SUCCESS RATE OF COLLEGE ALGEBRA STUDENTS HAVING A SINGLE MINIMUM ACT MATHEMATICS SCORE WITH COLLEGE ALGEBRA STUDENTS HAVING ATTAINED THE REQUIRED ACT MATHEMATICS SCORE IN MULTIPLE ATTEMPTS

A Field Study

Presented to the

Graduate Research Council

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Education Specialist

by

Nancy Frimel Matthews

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# ABSTRACT

This research was conducted to determine if there was a significant relationship between success rates of College Algebra students who received an ACT Mathematics Test score of 19 in one attempt, and those who received less than 19 on the first attempt and at least 19 on a later attempt. Data was collected from the records of College Algebra students of Austin Peay State University during the Fall and Spring terms of 1997 and 1998. The study used a causal-comparative design. Data was analyzed using the $\chi^2$ method, with a significance level of .05. Students who achieved the required score to be placed in College Algebra after multiple ACT attempts had very close success and nonsuccess rates. Students who were placed in College Algebra after making a minimum score in a single attempt had a significantly lower success rate than expected. Students do not need to be discouraged from taking the ACT multiple times in an attempt to improve placement in college mathematics courses. The difference in success rate may indicate that students who are willing to make the effort to improve their ACT Assessment Mathematics Test scores are students who are more motivated to be successful in College Algebra.

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# CHAPTER 1

## Introduction

Placement of college students into the proper classes for successful achievement is a difficult task. Since 1985, the Tennessee Board of Regents has required that a first-time college student under the age of 21 have an ACT Assessment Mathematics Test score of at least 19 to be placed directly into college level mathematics. Students with a score of less than 19 on the ACT Assessment Mathematics Test are required to take the Academic Assessment and Placement Program (AAPP) test to determine if Developmental Studies Programs mathematics classes will be required (Tennessee Board of Regents, 1999).

The task of placing students into appropriate classes for successful achievement is further complicated when students take multiple ACT Assessments in an attempt to change their placement if their scores are not high enough to be placed in regular freshman level courses. Some may consider placement in the Developmental Studies Program classes to be too expensive in both time and money since credit received does not apply towards minimum requirements for graduation, Honors, or Dean's List. Other students are embarrassed by their underprepared status. ACT Mathematics Test scores are used to place entering students in College Algebra or in remedial and developmental mathematics classes. When high school students make below the required score to be placed in college

level mathematics, they may take multiple ACT Assessments in an attempt to improve their scores so that they will be placed in College Algebra. In the long run, multiple ACT Assessments may or may not be in the best interest of the student.

## Statement of the Problem

The problem to be investigated in this study is the success rate of two particular groups of College Algebra students. The success rate of students who took the ACT Assessment once with a Mathematics Test score of 19 is to be compared with the success rate of students who took the ACT Assessment more than once with the first Mathematics Test score less than 19 and a later Mathematics Test score of greater than or equal to 19. How much difference, if any, may be of assistance to students, parents, and educators in determining the value of multiple ACT Assessments.

## Hypothesis

There will be no significant difference between the success rates of students in College Algebra with a single ACT Mathematics Test score equal to 19 and students in College Algebra with a first ACT Mathematics Test score less than 19 and a later score greater than or equal to 19.

## Definition of Terms

ACT--A nationwide college-entrance testing program that is often used for admissions and placement decisions.

Developmental Studies Program--A Tennessee Board of Regents mandated program designed to help underprepared students improve skills necessary for success in college level course work. Credit is given for Developmental Studies courses; however, the credit does not apply towards minimum requirements for graduation, Honors, or Dean's List.

Multiple ACT Assessments--Taking two or more ACT Assessments in an attempt to improve test scores.

Nonsuccess--Achieving a grade of D, F, FA (failure due to lack of attendance), FN (failure due to never attending), or W (withdrawal) in College Algebra on the first attempt.

Student Information System (SIS)--Computerized record management system used by institutions of higher education in the Tennessee Board of Regents system.

Success--Achieving a grade of A, B, or C in College Algebra on the first attempt.

Success rate--The percentage of students in a category who have achieved a College Algebra grade of A, B, or C on the first attempt.

## Importance of the Study

The study is important to parents, students, and educators. When high school students receive their ACT Assessment scores, they need to begin a process of

decision-making with the advice of parents and counselors. Frequently, a decision will be made to retake the ACT Assessment in an attempt to improve scores. Books, computer software, and tutoring programs are available to help the student try to improve their scores. Students and parents need to know if it is in the students' best interest to attempt to improve ACT Assessment scores. Educators need to know if college placement policies are appropriate for students taking one or multiple ACT Assessments.

## Limitations of the Study

The data of this study will be limited to students of Austin Peay State University for the Fall 1998, Spring 1998, Fall 1997, and Spring 1997 terms. Four terms may not be enough to make definite conclusions or to be consistent with results from other terms or other universities. The amount of course work taken after the final ACT Assessment and before college may have an impact on the success of a student in college level mathematics courses. Also, the variation in the amount of time lapsed between taking the ACT Assessment and taking College Algebra may have some effect on the results.

# CHAPTER 2

## Review of Literature

Standardized test scores have been used by colleges and universities in America for many years. In the early years, they were used in making admissions decisions to select the most talented applicants for college. Later, as an open door admissions policy became more prevalent, the standardized tests were used more for placement than admissions decisions. Much research, with varying results, has been conducted to determine the reliability of the use of standardized tests as a predictor of grade point average and retention. Even though the emphasis has changed from acceptance in admissions to placement in particular courses, standardized test scores have remained a part of the admissions process in many colleges and universities.

Before World War II, almost all students in the United States who could afford the tuition and had completed high school were admitted to the college or university of their choice (Hudson, 1990). Later, when an increasing number of students wanted to continue their education past high school, colleges and universities had the option of being more selective in their admissions process (The History of ACT, 1999). As a result, they began using standardized test scores in an attempt to select the most talented students to be admitted.

ACT was founded as the American College Testing Program in 1959. Before then, the only nationwide college-entrance testing program, the Scholastic Aptitude Test by Education Testing Service, focused on identifying the most talented students for admission to elite American universities. During the late 1950s, large numbers of students were approaching college age, and more students wanted to attend college. ACT's founders in Iowa intended to assist students in making better decisions about their postsecondary education and to provide colleges with more information about the students (The History of ACT, 1999).

During the 1960s and 1970s two opposing admissions philosophies emerged. Some postsecondary educators preferred open access to all students while others insisted on a selective process for maintaining quality and standards. As a result, high school graduation standards were raised, and the use of standardized tests as admissions standards increased. Admissions policies were developed that were dependent upon the use of standardized test scores obtained from the American College Test and the Scholastic Aptitude Test (Hudson, 1990).

During the 1970s, many began to view the use of standardized tests for admissions decisions as a barrier to educational access for some individuals (Woods, 1985). The use of standardized tests for admissions often denied access to a college education to minorities, females, and the poor, who historically scored lower than white middle-class males (Hudson, 1990).

By the early 1980s, students applying for admission were required to take either the American College Test or the Scholastic Aptitude Test by most of the four-year colleges and universities in the United States. College entrance exams became very important, and lack of preparation prior to taking the exams could result in not being able to attend the college of first choice. The president of the Colorado Council on High School/College Relations, Dwight Grotewald, and the Director of Admissions at the University of Colorado in Boulder, Millard Storey, suggested that students interested in college admissions take standardized tests early in their junior year. The scores on these tests could then be examined, deficiencies could be identified, and courses could be chosen to correct any academic deficiencies before taking the standardized tests again (Hulsart, 1983). The University of Alabama required a composite score of 16 or better on the ACT, but allowed the student to take it as many times as necessary before admission to achieve the minimum score of 16 (Watkins and Stanford, 1983). As retesting became more common in an attempt to increase college admissions test scores, coaching students before the test became more frequent and research on how such scores could be increased and how much coaching was necessary for a significant increase in scores also increased (Hulsart, 1983).

From the middle 1980s through the 1990s emphasis has shifted to a more open admissions policy with standardized tests being used more for placement. Instead of students being denied access to many colleges and universities, they were being placed into remedial and developmental classes. This gave many underprepared students the

opportunity to correct academic deficiencies in basic areas such as mathematics, English, and reading before attempting college level work. Remedial mathematics is required of all students entering a college or university in Arkansas with a score below 19 on the ACT mathematics test (Better Preparation, Less Remediation, 1998). According to Ansley Abraham, writer of remedial education for the Southern Region Education Board, many problems result from the fact that each school in Alabama sets its own standard for what is to be considered college level work. Senior colleges in Alabama give various tests or none to determine placement, while their two-year schools all give a standardized diagnostic test but use different cutoff scores to determine placement into remedial or college level courses. Many states such as Tennessee have a standardized test with the same cutoff score for every college in their system (High School or College? Many Toil to Catch Up, 1998).

Late in 1996, the American College Testing Program changed its name to ACT and increased its services to include more than just testing for college admissions purposes. ACT now sees its expanded role as providing services throughout the world, to all levels of education, to business and industry, to develop and administer tests, and to provide a broad range of supplementary materials and programs (The History of ACT, 1999).

During 1996 and 1997, 1.7 million ACT Assessments were administered. The purpose of these assessments was to provide a comprehensive transition service for

students and educators and to assist with recruitment, enrollment, scholarship, and course placement (ACT: Products and Services, 1999).

The assumption of fairness of the use of standardized tests for college admissions is being challenged (Toch and Walthall, 1997). More than 280 American four-year colleges and universities are now making the ACT and SAT tests optional for admissions (FairTest: SAT/ACT Optional Schools, 1999). Controversy over the use of standardized test scores for admissions and placement often includes a discussion on the relationship between test scores and retention. Research by Hodum and Martin (1994) found that the higher students' ACT composite test scores are, the less likely they are to withdraw from the university. Research by Snyder and Elmore (1983) showed that the ACT composite score is the best predictor of cumulative grade point average. Other research by Fletcher (1989) showed no relationship between standardized test scores and grade point average, while House and Keeley (1997) found that in some instances there is a significant correlation between admissions test scores and grades. Research does not consistently support the opinion that standardized test scores are significantly related to grade point averages.

Success in first-year college courses tends to be an indicator of success in higher-level courses and overall success in college. Students experiencing nonsuccess in their first-year courses may be placed on academic probation or may choose to drop out of college. Research in a midwestern state has shown that students with an ACT Composite score of 19 have about a 17 percent chance of achieving a 3.0 or higher grade point

average or about a 58 percent chance of achieving a 2.0 or higher grade point average in college. Due to the many differences in high schools' curriculum, instruction, and grading practices, using high school grades as a measure of a student's academic preparation may not be reliable. Using a combination of ACT Composite scores and high school grades might provide more accurate placement of students. Using ACT Composite scores or high school grades alone might prevent students who could be successful from being admitted to college or provide improper placement in courses (Making Good Admissions Decisions Using ACT Test Scores and High School Grades, 1997).

According to ACT President Richard L. Ferguson, data from ACT Assessments indicate that most American high school graduates are not prepared to achieve higher than a C in their first college math course. He further stated that ACT Assessment scores are directly related to preparation for college with higher scores predictive of college success. He describes the ACT Assessment as a transitions assessment that indicates accurately what students are ready to study in college (ACT Endorses Call for Tougher High School Courses, 1998). The purpose of the ACT Assessment is to assist high school counselors in helping students prepare for college and to assist colleges in making reliable admissions and course-placement decisions (ACT Assessment Data as It Relates to the TIMSS 12$^{th}$ Grade Report: Questions and Answers, 1998).

Using a predetermined cutoff score on the ACT Mathematics Test score provides a simple method of placing students into College Algebra or remedial and developmental mathematics courses. However, the policies of universities and the results of research are

not in agreement as to the reliability of the ACT Mathematics Test scores used alone to place students appropriately. A university in Arkansas recommends that students with an ACT Mathematics Test score less than 22 should not enroll in College Algebra since most students with ACT Mathematics Test scores of 19 to 21 fail College Algebra if they do not take Intermediate Algebra first (Selecting an Algebra Course, 1998). Research at the University of Louisville found that course placement by use of ACT Assessment scores and placement test scores indicated whether students were prepared or not for particular types and levels of courses (Hudson, 1989). However, the research also indicated that if students were allowed to perform, their academic performance did not necessarily reflect their ACT Assessment and placement scores. A correlational study at Southern West Virginia Community College found no significant relationship between ACT Assessment scores and academic performance (Nolan, 1977).

Even though research often indicates that ACT Mathematics Test scores are not reliable predictors, many universities continue to use them for placement decisions of students into College Algebra. Since many universities use the ACT Assessment scores for placement, students often try to improve their scores by taking multiple ACT Assessments. Research by Lanier (1994) considers the many students who choose to take the ACT Assessment multiple times. Data was analyzed on students who tested twice between 1989 and 1992. Composite scores of these students increased an average of .8 scale score units on a scale score range of one to 36. He also found that about one-third of the students increased their scores by at least two units while one-fifth of the students

decreased on the Composite score. More gain was achieved by students testing late in their junior year and retesting early in their senior year than by student testing the first time after October of their senior year. In his study of other variables concerning retest scores, he found that high school course work and rank were statistically significant predictors of improvement.

Some students choose to take part in tutoring programs in the form of books, computer software, or classes in an attempt to improve ACT Assessment scores. Some of these tutoring programs even guarantee higher scores on the ACT Assessment (College Prep, 1998 Style, 1998). McCormick (1987) states that about one-third of students who take the ACT Assessment pay up to $600 for tutoring courses that promise to improve test scores. However, he also states that test-makers have not been convinced by these tutoring services that they can make a significant difference in the score of typical students.

While conflicting views exist on the reliability of using ACT Mathematics Test scores for placement into College Algebra or remedial and developmental mathematics classes, the use of these scores is the quickest and simplest method of placement. Since proper placement in first-year college courses improves success rate in these courses, and success in the first year is an indicator of retention and success in higher level courses, proper placement is important to the students and to the university. Students often take multiple ACT Assessments in an attempt to improve their Mathematics Test scores and change their placement from remedial and developmental mathematics to College Algebra.

Taking multiple ACT Assessments in an attempt to change placement may or may not be in the students' best interest.

# CHAPTER 3

## Methodology

The research was conducted to determine if there was a significant relationship between success rates of College Algebra students who received an ACT Mathematics Test score of 19 in one attempt, and those who received less than 19 on the first attempt and at least 19 on a later attempt. Success was determined by achieving a grade of A, B, or C. Nonsuccess was determined by achieving a grade of D, F, FA, FN, or W. The grade of D was included with grades of nonsuccess since it indicated less than adequate preparation for the next higher course, often does not transfer as credit to another university, and has the potential to decrease the grade point average to an unacceptable level. The grades of AU (audit) and I (incomplete) were not included in the data. The data was collected from records on the Student Information System (SIS) of College Algebra students at Austin Peay State University during the Fall 1998, Spring 1998, Fall 1997, and Spring 1997 terms. A causal-comparative study was done using the $\chi^2$ method of data analysis. The study addressed the concern involving multiple ACT Assessments being used to place students in College Algebra when the first score is below the normal cutoff score of 19 on the ACT Mathematics Test score.

## Null Hypothesis

There will be no significant difference between the success rates of students in College Algebra with a single ACT Mathematics Test score equal to 19 and students in College Algebra with a first ACT Mathematics Test score less than 19 and a later score greater than or equal to 19 when compared to the expected success rates in each category.

## Description of the Research Subjects

The research subjects were College Algebra students at Austin Peay State University during Fall 1998, Spring 1998, Fall 1997, and Spring 1997 terms. Transfer students, students repeating the course, students auditing the class, students with a grade of incomplete, students having taken Developmental Studies Program mathematics classes, students without ACT Assessment scores, and students with ACT Assessment scores more than five years old were not included. One group included students having taken the ACT Assessment only once with a Mathematics Test score of 19. The second group included students having taken the ACT Assessment two or more times with a Mathematics Test score of less than 19 on the first attempt and greater than or equal to 19 on a later attempt.

## Research Design

The study used a causal-comparative, or an ex post facto, design. From the list of possible subjects, two groups (students with single ACT Mathematics Test score of 19

and students with multiple ACT Assessments to increase Mathematics Test score to at least 19) were selected for comparison of their success rates in College Algebra. The data was analyzed using the $\chi^2$ method, with a significance level of .05.

## Procedure

Approval for research on human subjects was obtained from the Office of Grants and Sponsored Research. Data was collected from the Student Information System (SIS). Permission to use SIS to acquire research data was obtained from the Office of the Registrar and the Vice President of Academic Affairs. The collection and analysis of data did not use any record of student names or identification numbers. Complete anonymity and confidentiality of student records was maintained. Data was reported as aggregate statistics. From College Algebra class rolls, the students were tracked through SIS to determine ACT Assessment Mathematics Test scores from the past five years, transfer status, remedial or developmental mathematics work, and the grade achieved in College Algebra. The grade achieved was considered a success if it was A, B, or C. The grade of D, F, FA (failure due to lack of attendance), FN (failure due to never attending), or W (withdrawal) was considered nonsuccess. Grades of AU (audit) or I (incomplete) were not considered in the data.

The data was organized into the categories of success in College Algebra and single ACT Mathematics Test score of 19, nonsuccess in College Algebra and a single ACT Mathematics Test score of 19, success in College Algebra and at least a score of 19

on the ACT Mathematics Test after multiple attempts, and nonsuccess in College Algebra and at least a score of 19 on the ACT Mathematics Test after multiple attempts. The data observed in each category was compared with the expected results of each category as stated in the null hypothesis. The $\chi^2$ test was performed to determine if there is a significant difference between the expected and observed success rates in both categories.

For the data to be collected, the $\chi^2$ method was the appropriate method of analysis since there was one nominal dichotomous independent variable, ACT Mathematics Test score of 19 in a single attempt or ACT Mathematics Test score of at least 19 in multiple attempts, and one nominal dichotomous dependent variable, success or nonsuccess in College Algebra. The null hypothesis assumed that there is no significant difference in the success rate of students placed in College Algebra with a single ACT Assessment Mathematics Test score equal to 19 and students placed in College Algebra with a first ACT Assessment Mathematics Test score less than 19 and a later score of at least 19.

The $\chi^2$ method was used to analyze the data of both categories within the hypothesis. Using the $\chi^2$ method, the square of the total expected minus the total observed in each category was calculated. Since the data could be expressed in a 2 x 2 table with one degree of freedom, a special $\chi^2$ formula could be used. Table 3.1 illustrates the information placed into the $\chi^2$ formula.

$$\chi^2(1) = \frac{n(ad - bc)^2}{(a + b)(c + d)(a + c)(b + d)}$$

$$n = a + b + c + d$$

Yates' correction of the $\chi^2$ was also calculated. This formula lowers the value of the obtained statistic, reducing the risk of making a Type I error, rejecting the null hypothesis when it should be accepted. Table 3.1 illustrates the information placed into Yates' correction of the $\chi^2$ formula.

$$\chi^2(1) = \frac{n(|ad - bc| - .5)^2}{(a + b)(c + d)(a + c)(b + d)}$$

$$n = a + b + c + d$$

Table 3.1

$\chi^2$ Sample 2 x 2 Table

| Category | Independent Response 1 | Independent Response 2 |
|---|---|---|
| Dependent Response 1 | a | b |
| Dependent Response 2 | c | d |

Each analysis consisted of two variables which determined a degree of freedom of one. Using this formula at a level of significance ($p$) of $< .05$, the $\chi^2$ had to be less than or equal to 3.841 to accept the null hypothesis.

# CHAPTER 4

## Results

Of the 108 students considered in this study, 38% made a 19 on the ACT Assessment Mathematics Test in one attempt while 62% of these students made less than 19 on the ACT Assessment Test on the first attempt and then made at least 19 on a later attempt. Of the same 108 students, 40% achieved success in College Algebra while 60% did not achieve success in College Algebra.

Table 4.1 illustrates the number of students each term who made 19 on the ACT Assessment Mathematics Test in a single attempt and achieved success or nonsuccess in College Algebra. Of the 41 students who made a 19 on the ACT Assessment Mathematics Test in one attempt, 27% achieved success and 73% did not achieve success.

Table 4.1

Summary of Success with One ACT Assessment Attempt

| Category | Fall 1998 | Spring 1998 | Fall 1997 | Spring 1997 | Total |
|---|---|---|---|---|---|
| Success | 5 | 3 | 2 | 1 | 11 |
| Nonsuccess | 14 | 3 | 8 | 5 | 30 |

Table 4.2 illustrates the number of students each term who made less than 19 on the ACT Assessment Mathematics Test in the first attempt and at least 19 in a later attempt and achieved success and nonsuccess in College Algebra. Of the 67 students who made less than 19 on the ACT Assessment Mathematics Test in the first attempt and at least 19 in a later attempt, 48% achieved success and 52% did not achieve success.

Table 4.2

Summary of Success with Multiple ACT Assessment Attempts

| Category | Fall 1998 | Spring 1998 | Fall 1997 | Spring 1997 | Total |
|---|---|---|---|---|---|
| Success | 14 | 3 | 10 | 5 | 32 |
| Nonsuccess | 18 | 8 | 7 | 2 | 35 |

The expected frequencies as defined by the null hypothesis have equal rates. Some variation between observed frequencies and expected frequencies occurred. The observed frequencies for each cell of the 2 x 2 table are given in Table 4.3.

Table 4.3

Observed Values

| Category | ACT Math = 19 in Single Attempt | ACT Math ≥ 19 in Multiple Attempts |
|---|---|---|
| Success | 11 | 32 |
| Nonsuccess | 30 | 35 |

A graphical comparison of observed frequency percentages is illustrated in Figure 1. The frequency of students who made 19 on the ACT Assessment Mathematics Test in a single attempt and achieved success is far less than those who did not achieve success. The frequency of students who made less than 19 on the first attempt of the ACT Assessment Mathematics Test but later made at least 19 and achieved success was close to equal to the frequency of those who did not achieve success.

The data was analyzed using the $\chi^2$ formula for a 2 x 2 frequency table with one degree of freedom. The value of $\chi^2$ was 4.651. The $\chi^2$ value at the .05 level of significance with one degree of freedom is greater than 3.841. The calculated value of 4.651 was greater than 3.841, resulting in the rejection of the null hypothesis. The data was also analyzed using Yates' correction formula which reduced the value of the obtained statistic thus reducing the risk of the Type I error of rejecting the null hypothesis when it is true. The value of Yates' correction was 4.643 which was still greater than the .05 significance level of 3.841, indicating that a Type I error was not made. Examination of Table 4.3 and Figure 1 indicated that the greatest difference between expected and observed frequencies occurred in success and nonsuccess in College Algebra of students making a score of 19 on the ACT Assessment Mathematics Test in one attempt. While students who achieved the required score to be placed in College Algebra after multiple ACT attempts had very close success and nonsuccess rates, those who were placed in College Algebra after making a minimum score in a single attempt had a significantly lower success rate than expected.

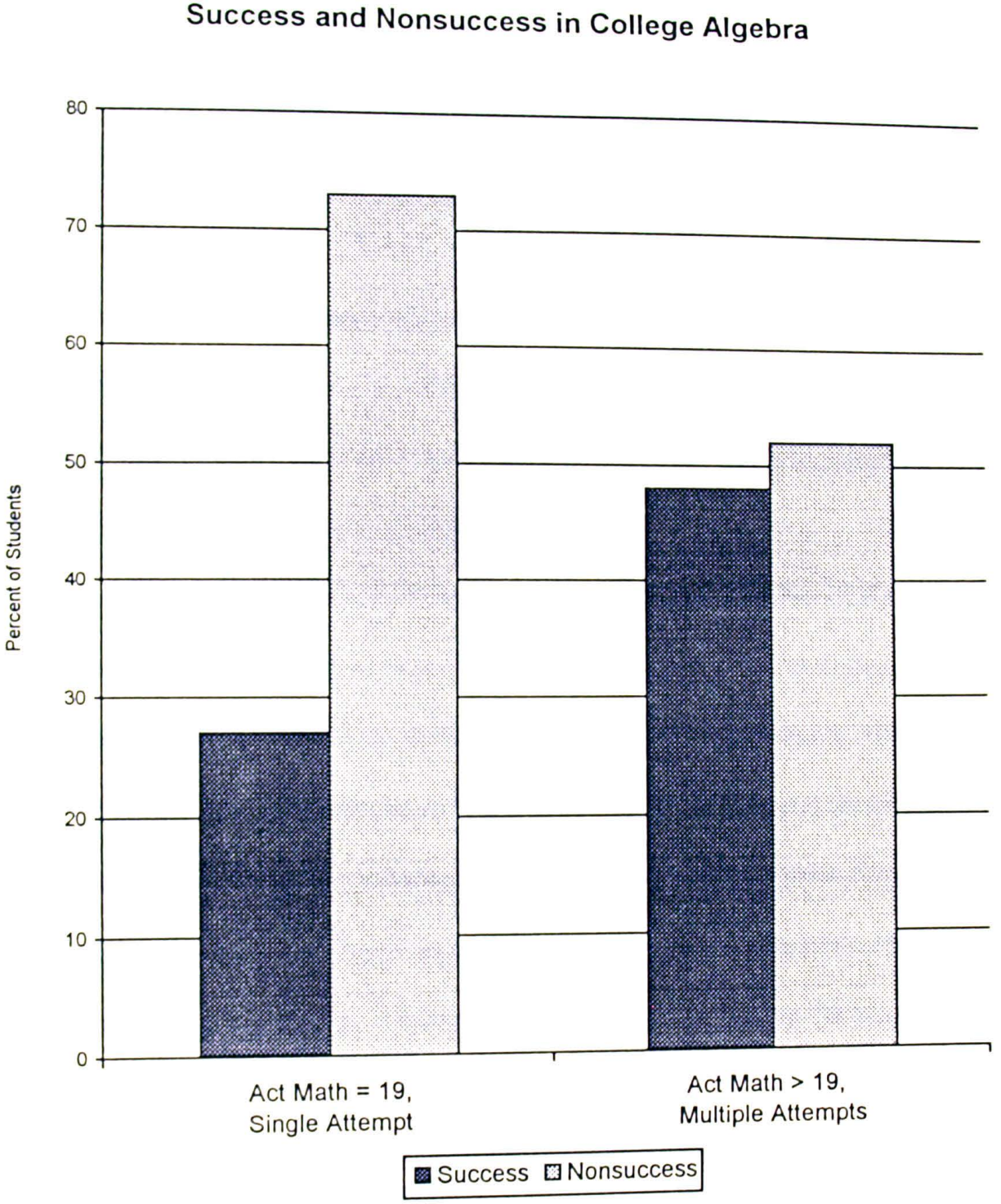


Figure 1: Success and Nonsuccess for Single and Multiple ACT

# CHAPTER 5

## Summary, Conclusions, and Recommendations

### Summary

Placement into the proper mathematics classes in college is an important but difficult task. Students who experience success during their freshman level courses are more likely to experience success in later higher level courses. Also, success in the first year of college is one of the best indicators of retention.

Tennessee Board of Regents institutions use an ACT Assessment Mathematics Test score of 19 as the minimum score for placement of freshmen into College Algebra. Many students take the ACT Assessment more than once in an attempt to raise scores and change their mathematics placement so that they will not have to spend the time and money to take remedial or developmental classes. Students, parents, and educators need to know if this practice of taking multiple ACT Assessments translates into approximately the same success rate in College Algebra as those students who score the minimum in a single ACT Assessment.

Data was collected from the Student Information System (SIS) of Austin Peay State University for Spring and Fall terms of 1997 and 1998. Students who were placed directly into College Algebra as a result of a single ACT Assessment Mathematics Test score of 19 or as a result of a first ACT Assessment Mathematics Test score of less than

19 and a later score of at least 19 were classified as achieving success or nonsuccess during their first College Algebra attempt.

Analysis of the data using $\chi^2$ method indicated that the two groups did not achieve an equal amount of success. The students in this study who received College Algebra placement after multiple attempts on the ACT Assessment were more successful than those who received College Algebra placement in a single ACT Assessment with the minimum score.

## Conclusions

Students do not need to be discouraged from taking the ACT multiple times to improve placement in college mathematics courses. Parents should not consider the retaking of the ACT multiple times by students a waste of time and money. Educators should not worry that multiple ACT Assessments will cause the students to be incorrectly placed in college level classes. Previous research has found that students often achieve when allowed the opportunity as a result of their determination. The students who are willing to spend the time and effort to study and improve their ACT Assessment Mathematics Test scores may very well be the students who will spend extra time and effort studying with peers or tutors or in the Math Lab. The students who score the minimum ACT Assessment Mathematics Test score in a single attempt may include students trying to pass with minimum effort. The difference in success rate may indicate the difference in self motivation.

## Recommendations

The analysis of data suggested that students taking the ACT Assessment Mathematics Test multiple times for changing placement from remedial and developmental mathematics to College Algebra achieve a higher success rate than those who are placed in College Algebra with a single minimum ACT Assessment Mathematics Test score. As a result of this study the following recommendations are presented.

1. This study be replicated at Austin Peay State University using more terms.
2. This study be replicated in all Tennessee Board of Regents institutions.
3. A study be conducted using a survey designed to measure motivation in combination with ACT Assessments as an indicator of success in College Algebra.
4. A similar study be conducted to investigate the effect of varying amounts of time lapse between the last ACT Assessment and first enrollment in College Algebra.
5. A similar study be conducted to investigate the effect on student success resulting from the amount of mathematics coursework taken in high school after the ACT Assessment.

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# VITA

Nancy Frimel Matthews was born in Salem, Illinois on January 20, 1951. She attended elementary school in the Odin Public School District and graduated from Odin High School in May, 1969. The following June she entered Kaskaskia College and in May 1971 received the degree of Associate in Science. She entered Austin Peay State University in March, 1971 and in May, 1972 received the degree of Bachelor of Science in Secondary Mathematics Education. She reentered Austin Peay State University in September, 1973 and in May, 1975 received a Master of Arts in Education degree in Curriculum and Instruction. In August, 1996 she reentered Austin Peay State University to work towards an Education Specialist degree in Curriculum and Instruction.

She is presently employed by Austin Peay State University as mathematics instructor in the Developmental Studies Program.