A COMPARISON OF THE ACADEMIC SUCCESS RATES OF COLLEGE ALGEBRA STUDENTS HAVING MINIMUM ACT MATHEMATICS SUB-SCORES, WITH COLLEGE ALGEBRA STUDENTS HAVING ACT MATHEMATICS SUB-SCORES BELOW THE MINIMUM, BUT WHO ATTAINED COMPASS SCORES SUFFICIENT TO BE PLACED INTO COLLEGE LEVEL MATHEMATICS

KAY DILLARD HARALSON

To the Graduate Council:

I am submitting herewith a field study written by Kay Dillard Haralson entitled "A Comparison of the Academic Success Rates of College Algebra Students Having Minimum ACT Mathematics Sub-scores, with College Algebra Students Having ACT Mathematics Sub-Scores Below the Minimum, but Who Attained COMPASS Scores Sufficient to be Placed into College Level Mathematics." I have examined the final copy of this field study for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Education Specialist, with a major in Education.

Dr. J. Ronald Gupton, Major Professor

We have read this field study
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Date August 15, 2002

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A Field Study

Presented for the

Education Specialist

Degree

Austin Peay State University

Kay Dillard Haralson

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ABSTRACT

This research was conducted to determine if there was a statistically significant difference in academic success rates of College Algebra students whose placement was based on an ACT mathematics sub-score of 19, and those whose placement was based on an ACT mathematics sub-score less than 19 but a COMPASS algebra placement score of 50-99. Data was collected from the records of College Algebra students of Austin Peay State University using the Student Information System (SIS), at both the main campus and Ft. Campbell campus, for terms between Spring 2000 and Spring I 2002, inclusive. This study utilized an ex post facto, comparative design using the χ^2 statistic, with a significance level of .05. The academic success rates of both groups of students were very similar. The results of the χ^2 statistical analysis, χ^2 (1, N = 289) = 0.475, p = .49, supported a failure to reject the null hypothesis.

The study found no statistically significant difference in the academic success rates of students placing into College Algebra based on an ACT mathematics sub-score of 19 and students placing into College Algebra based on a COMPASS algebra score of 50-99. Thus, use of COMPASS as a secondary placement test appears useful in insuring uniform placement of students with similar abilities. However, the overall academic success rate of all students in the study was very low. Low achievement in core level courses should be of concern, and could suggest inadequate placement policies at Tennessee Board of Regents institutions.

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CHAPTER 1

INTRODUCTION

Placement of college freshmen into appropriate core level classes is critical for a successful first year college experience. Correct placement in the area of mathematics is especially important. According to a 1989 report from the National Research Council, *Everybody Counts* (as cited in Shoenfeld, 2002), "Mathematics is the worst curricular villain in driving students to failure in school. When mathematics acts as a filter, it not only filters students out of careers, but frequently out of school itself" (p. 14).

Currently, students admitted to Tennessee Board of Regents institutions with an American College Test (ACT) mathematics sub-score of 19 or greater are placed into college level mathematics. Students with an ACT mathematics sub-score less than 19 are required to complete the Computerized Adaptive Placement Assessment and Support System (COMPASS) algebra placement test to determine if Developmental Studies Program mathematics courses are needed before enrolling in core mathematics courses. If students score 50-99 on the COMPASS placement test in algebra, Developmental Studies Program mathematics courses are not required and students are allowed to enroll in college level mathematics courses. This COMPASS score was selected by the Tennessee Board of Regents as the cutoff score for placement into College Algebra (Tennessee Board of Regents, 2001). The COMPASS test was developed by ACT, whose cutoff score guide for placement in first-year college courses indicates that with a COMPASS algebra score of 48 or higher, students have only a 50% chance of earning a grade of

C or higher in College Algebra. To have a 50% chance of earning a grade of B or higher in College Algebra, a student would have to score 71 or higher on the COMPASS algebra test (ACT, Inc., 2001b).

Funding for Developmental Studies Programs is being scrutinized by the Tennessee Board of Regents and Tennessee State Legislators. Using ACT sub-scores to determine placement and eliminating the COMPASS placement test is one alternative being considered to reduce costs of Developmental Studies Programs in the state. If a score of 50-99 on the COMPASS algebra placement test is not a better predictor of academic success in college algebra than an ACT mathematics sub-score of 19, then the need for a secondary placement test would be questionable.

Statement of the Problem

Determining the appropriate mathematics course placement for first-year students can be a difficult task. Students' scores on different standardized tests can produce conflicting information regarding their academic skills. In the TBR system, a score below 19 on the ACT Mathematics Test indicates a student does not have the necessary mathematical skills to be successful in college level mathematics courses. If a secondary placement test, such as COMPASS, is then administered and the student shows proficiency in mathematics, based on a score set by the institution, inappropriate placement into core level mathematics could occur.

The problem to be investigated in this study is the academic success rates of two particular groups of College Algebra students. One group of students will be composed of

those who had an ACT mathematics sub-score of 19, the minimum score needed to be placed into college level mathematics at Tennessee Board of Regents institutions. The second group will contain students who had an ACT mathematics sub-score below the minimum of 19, but placed into college level mathematics based on a score of 50-99 on the COMPASS placement test in algebra. These two groups of students will be compared to determine if there is a statistically significant difference in their academic success rates in College Algebra.

Importance of the Study

This study is important to students, parents, educators, and post-secondary institutions. Correct placement into college level courses affects the self-esteem, persistence, and retention rates of students. Mathematics requirements, in particular, seem to be a critical factor in many students' choice of major and their success in attaining a degree. Insuring that students are adequately prepared to succeed in their college level mathematics courses should be of great concern to each parent, student, teacher, and institution. This study will be useful in determining if the current Tennessee Board of Regents COMPASS cutoff scores are appropriately placing students in college level mathematics.

Research Question

The following research question will be explored in this study:

How do the academic success rates of students in College Algebra who had an

ACT mathematics sub-score of 19 and students in College Algebra who had an ACT mathematics sub-score less than 19, but scored 50-99 on the COMPASS algebra placement test differ?

Hypothesis

The following null hypothesis will be tested:

There will be no statistically significant difference in the academic success rates of students in College Algebra who had an ACT mathematics sub-score of 19 and students in College Algebra who had an ACT mathematics sub-score below 19, but scored 50-99 on the COMPASS algebra placement test when compared to the expected academic success rates in each category.

Definition of Terms

The following definitions are provided for clarification of terms that will be used in this study:

1. Academic 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.
2. Academic Success--Achieving a grade of A, B, or C in College Algebra on the first attempt.
3. American College Test (ACT)--A nationwide college-entrance testing program that is often used for admissions and placement decisions.

4. Computerized Adaptive Placement Assessment and Support System (COMPASS)--A comprehensive computerized adaptive testing system that helps place students into appropriate courses and maximizes the information post secondary schools need to insure student success.

5. Developmental Studies Program (DSP)–A Tennessee Board of Regents mandated program designed to help underprepared students improve skills necessary for success in college level course work. Courses are offered at the remedial/basic level and the developmental level. Courses are referred to as remedial in some references and developmental in others.

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

Limitations of the Study

The data of this study will be limited to students of Austin Peay State University enrolled in College Algebra for terms between Spring 2000 and Spring I 2002, inclusive, at the Clarksville and Ft. Campbell campuses. The beginning term of Spring 2000 was the first term the COMPASS placement test was used at APSU. Therefore, data for this study cannot be used from the Student Information System (SIS) prior to that term. Data of students who completed the written ASSET placement test rather than the computerized COMPASS placement test will be omitted from the study. Any additional mathematics course work taken after the ACT test was administered and before the

COMPASS test was administered may have an impact on the academic success of a student in College Algebra. Also, variations in the amount of time between taking the COMPASS test and enrolling in College Algebra may have some effect on the results of the study.

CHAPTER 2

REVIEW OF LITERATURE

History of ACT

During the 1950's, attitudes in the United States regarding higher education went through major changes. Until this time, nationwide college-entrance tests were used only by the most prestigious universities in their selection of students for admission. In 1959, as the number of students attending college increased, the American College Testing Program was established. The goals of the program were to aid students and colleges in making appropriate decisions concerning educational choices, curricula planning, and course placement. The name of the program was changed to ACT in 1996. ACT currently provides services worldwide, not only in the area of post-secondary education, but also in K-12 education, and business. From a single college testing program, ACT has expanded to more than 100 programs serving millions of customers (ACT, Inc., 2001e).

The ACT Assessment has been used in all 50 of the United States since 1960. During 2000-2001, more than 1.9 million ACT Assessments were administered (ACT, Inc., 2001d). While not designed to determine if students have been successful in their secondary education, the ACT Assessment is useful to students preparing for college and to colleges making admissions decisions and determining appropriate course placement (ACT, Inc., 1998a). Compared to other college entrance exams, the ACT Assessment "is more closely linked to curriculum and, therefore, is a more manageable test for concrete

thinkers" (Schoenfeld, 1999, p. 20). Skills in four academic areas are measured–English, reading, mathematics and science reasoning. The ACT is based on a scale of one to 36, with separate sub-scores given for each area, as well as a composite score. The 2001 national average composite score for all students taking the ACT was 21. Students completing the core courses in high school–four years of English, three years of mathematics, algebra and above, three years of social science, and three years of natural science, had a national average composite score of 21.9 in 2001 (ACT, Inc., 2002b).

ACT and Success in College

Researchers have shown that students' success during their first year of college is related to their ACT scores. In a study of 198,329 ACT-tested students enrolled at 246 colleges, 40% of students having composite scores less than or equal to 19 were low achievers, with a first-year college GPA of 2.0 or lower, while only 9% were high achievers, with a first year college GPA of 3.2 or higher. By comparison, only 10% of students with composites scores 24-27 were low achievers, while 40% were high achievers (ACT, Inc., 2001i). As one would assume, as ACT composite scores increased, the percentage of students achieving higher first-year college GPA's also increased. In a national press release, ACT President Richard L. Ferguson stated, "there remains a significant number of graduating seniors who want to go to college but simply aren't prepared" (ACT, Inc., 2001a, p. 3).

Because the ACT Assessment is curriculum-based, many colleges using ACT for admission also use ACT scores to place students into courses appropriate for their

academic skill level. In a study on course placement, Ang and Noble (1993) found that even though high school subject area GPA, overall high school GPA, and ACT subject area scores were all effective in making accurate decisions on placement, the ACT score was the most effective. Based on the scope of the ACT Mathematics Test, deficiencies in various areas can be identified. "The ACT Mathematics Test is a 60-question, 60 minute test designed to assess the mathematical skills students have typically acquired in courses taken up to the beginning of grade 12" (ACT, Inc., 2002a, p. 1). The content covered includes Pre-algebra (23%), Elementary Algebra (17%), Intermediate Algebra (15%), Coordinate Geometry (15%), Plane Geometry (23%), and Trigonometry (7%). The ACT Mathematics Test reports four scores, a total score based on all 60 questions, a Pre-algebra/Elementary Algebra sub-score based on 24 questions, an Intermediate Algebra/Coordinate Geometry sub-score based on 18 questions, and a Plane Geometry/Trigonometry sub-score based on 18 questions (ACT, Inc., 2002a).

Under-preparedness of Students in Mathematics

While the 2001 national ACT Assessment composite score for students having completed core courses was 21.9, the average ACT Mathematics score for students who had completed Algebra I, Algebra II, and Geometry in high school was only 19.6. ACT President Ferguson concluded, "Two years of algebra and one year of geometry alone are simply not sufficient preparation for many college programs" (ACT, Inc., 2001a, p. 6). Although reported high school GPA's have increased over the past several years, this increase has not been reflected in ACT scores, which have held steady for five years. This

points to possible grade inflation or a lack of objective, standardized methods of measuring academic achievement at the high school level. One of the primary reasons college students leave school after their first year is that they were not prepared for college level courses (ACT, Inc., 2001a). Lack of preparation is also seen as a barrier to college enrollment of underrepresented minority students (Jones, Yonezawa, Ballesteros & Mehan, 2002).

Based on an ACT Mathematics cut score of 23, the median score used by colleges and universities across the country for placement into college algebra, only 35% of students who took the ACT in 1998 were adequately prepared for college algebra (Hoyt & Sorensen, 2001). According to ACT President Ferguson, "ACT data reveal clearly that a large majority of U.S. high school graduates are not prepared to earn a grade higher than C in their first college math and science courses" (ACT, Inc., 1998b). One southern university recommends that students with a mathematics ACT score less than 22 not enroll in college algebra, since most students scoring 19-21 on the mathematics ACT will fail college algebra if they do not take a developmental course first (Arkansas State University-Beebe, 1998). Research further suggests that the rigor of high school mathematics courses is substantially different from the college curriculum. To learn difficult mathematical concepts, many students need repeated exposure to the material (Hoyt & Sorensen, 2001).

Need for Remediation

When students choose not to enroll in a mathematics course during their senior year, they may not recall needed information for standardized tests or first-year college mathematics courses. By choosing not to take mathematics their senior year, students may also, unknowingly, be choosing remediation in college. According to data provided by the Southern Regional Education Board (SREB), approximately 33% of all college students need at least one remedial course in mathematics, writing, or reading. Because SREB institutions determine placement into remedial courses in various ways, the percent of students taking a remedial mathematics course ranges from 4-43% at four-year universities. Universities which have lower admission policies and an established assessment and placement procedure have a higher percentage of students taking remedial courses (Southern Regional Education Board, 1998). In a 1996 study by the National Center for Education Statistics (as cited in Carriuolo, Rodgers & Stout, 2001), 43% of community college students and 29% of university students take at least one developmental course. Students needing remedial courses in college come from two groups of students, adults who have been out of school for one or more years, and recent high school graduates who did not complete college preparatory courses, made low grades in college preparatory courses, or did not take mathematics during their senior year (Southern Regional Education Board, 1998).

Dr. Yolanda T. Moses, President of the American Association for Higher Education (AAHE) feels, like President Bush, that no child should be left behind. She states, "The real issue is not opening the door to students, but creating opportunities for

them to be successful after they enroll" (Carriuolo et al., 2001, p. 22). Dr. Moses sees effective developmental education as a program vital to the success of underprepared students. Wes Habley, director of the ACT Office for the Enhancement of Educational Practices, emphasizes that students enrolling in higher education institutions without the necessary skills for success "can quickly find themselves in over their heads" unless they are provided appropriate course placement and "participate in developmental courses and other support services" (ACT, Inc., 2001h, p. 2).

History of Developmental Studies Programs

Programs designed to assist underprepared students have been a part of post-secondary education since the mid-1800s. Originally classified as college preparatory programs, these programs are now referred to as academic development, learning assistance, or developmental studies (Tomlinson, 1989). Tomlinson defines post-secondary developmental education in the following way:

> Developmental programs at institutions of higher education encompass a variety of courses and services that are conducted to provide assistance to individuals who have been denied regular admission to the institution because of failure to meet specified admission and placement requirements or because of predicted risk in meeting the requirements of college-level courses. (p. 1)

The need for assistance for underprepared students is widespread. Some type of developmental service is provided at approximately 90% of all higher education institutions, with 33% of institutions having a separate department or program to provide

these services (Tomlinson, 1989).

Concerns exist in the educational community and political community with regard to maintaining the academic integrity of higher education, while providing admission to and help for underprepared students. The "White Paper on Remedial and Developmental Studies" (Tennessee Board of Regents, 1984), a position paper developed by the Tennessee Board of Regents (TBR) in 1984, addresses this issue by stating, "underpreparedness does not equate with being incapable or ineducable" (p. 2). At the time the TBR position paper was written, an estimated "40% of all freshman entering TBR institutions were underprepared for college level work" (Bader & Hardin, 2002, p. 36). Tomlinson (1989) observed that, "Postsecondary developmental programs have helped to fulfill the mission of providing equal educational opportunity in a democratic society. These programs have provided a 'last chance' for many individuals to obtain worthwhile experiences in higher education . . ." (p. 2). Results from a study by Stage and Kloosterman (1995) suggested that students entering college with a weak background in high school could overcome their deficiencies by taking remedial college-level mathematics courses.

Correct Placement

Correct placement of students into first-year courses, based on their academic skills, affects student retention as well as student success (ACT, Inc., 2001g). "Appropriate course placement is vital to student success, persistence, and satisfaction. Incorrect placement can have adverse long-term effects on these important outcomes"

CHAPTER 3

METHODOLOGY

Research was conducted to determine if there existed a statistically significant difference in academic success rates of students in College Algebra who had an ACT mathematics sub-score of 19 and those who had an ACT mathematics sub-score below 19, but scored 50-99 on the COMPASS algebra placement test. Academic success in College Algebra was defined as receiving a grade of A, B, or C. Academic nonsuccess was defined as receiving a grade of D, F, FA, FN, or W. Grades of AU (audit) and I (incomplete) was excluded from the data. The Student Information System (SIS) at Austin Peay State University was used to collect data from records of College Algebra students on both the Clarksville and Ft. Campbell campuses for terms between Spring 2000 and Spring I 2002, inclusive. An ex post facto comparative study was conducted utilizing the χ^2 method of data analysis. The study addressed concerns involving appropriate placement of students into college level mathematics courses. The procedures and methods are described in this chapter under the following topics: (1) null hypothesis; (2) description of the research subjects; (3) research design; and (4) procedure.

Null Hypothesis

There is no statistically significant difference in the academic success rates of students in College Algebra who had an ACT mathematics sub-score of 19 and students

in College Algebra who had an ACT mathematics sub-score below 19, but scored 50-99 on the COMPASS algebra placement test when compared to the expected academic success rates in each category.

Description of the Research Subjects

The research subjects were students enrolled in College Algebra at the Clarksville and Ft. Campbell campuses of Austin Peay State University for terms between Spring 2000 and Spring I 2002, inclusive. Students repeating the course, students auditing the class, students with a grade of incomplete, students having taken Developmental Studies Program mathematics courses, students without ACT assessment scores, and students with an ACT mathematics sub-score greater than 19 were not included. One group of students was composed of those who had an ACT mathematics sub-score of 19. The second group contained students who had an ACT mathematics sub-score below 19, but placed into college level mathematics based on a score of 50-99 on the COMPASS placement test in algebra.

Research Design

This study utilized an ex post facto, comparative design. From the possible subjects, two groups, students with ACT mathematics sub-scores of 19 and students with ACT mathematics sub-scores less than 19 and COMPASS algebra scores of 50-99, were selected for comparison of their academic success rates in College Algebra. The χ^2 method of data analysis was used, with a significance level of .05.

Procedure

Approval for research on human subjects was obtained from the Austin Peay State University Institutional Review Board. The quantitative information was gathered from the Student Information System (SIS) database employing FOCUS programming language. Permission to use SIS as a source for research data was obtained from the Office of the Registrar and the Vice-President of Academic Affairs. Student names or social security numbers were not used in the collection and analysis of data. The study maintained complete confidentiality and anonymity of student records. Data were reported as aggregate statistics only. From College Algebra enrollment records, students were tracked through SIS to determine their ACT mathematics sub-score, completion of remedial or developmental courses, and the grade achieved in College Algebra on their first attempt. A grade of A, B, or C was considered an academic success. Academic nonsuccess included grades of D, F, FA, FN, or W. Grades of AU (audit) or I (incomplete) were excluded from the data.

Data were organized into the categories of academic success in College Algebra and an ACT mathematics sub-score of 19, academic nonsuccess in College Algebra and an ACT mathematics sub-score of 19, academic success in College Algebra and an ACT mathematics sub-score less than 19 and a COMPASS algebra score of 50-99, and academic nonsuccess in College Algebra and an ACT mathematics sub-score less than 19 and a COMPASS algebra score of 50-99. A 2×2 contingency table of observed data was created as illustrated in Table 3-1. The category Yes refers to the members of the sample that have the desired characteristic and the category No refers to those that do not.

Table 3-1

Observed Table

Category	Sample 1	Sample 2
Yes	X_1	X_2
No	$n_1 - X_1$	$n_2 - X_2$

A 2 × 2 contingency table of expected data was created as illustrated in Table 3-2.

Table 3-2

Expected Table

Category	Sample 1	Sample 2
Yes	$n_1 \bar{p}$	$n_2 \bar{p}$
No	$n_1(1 - \bar{p})$	$n_2(1 - \bar{p})$

In Table 3.2, the pooled proportion, $\bar{p}$, represents the proportion of the members in the total sample having the desired characteristic. The data observed in each category was compared with the expected results of each category. The χ^2 statistic, was used to determine if there was a statistically significant difference in the expected and observed academic success rates in the two categories.

The χ^2 method of data analysis was the appropriate analysis for the type of data collected since there was one nominal dichotomous independent variable, ACT mathematics sub-score of 19 or ACT mathematics sub-score less than 19 and a

COMPASS algebra score of 50-99, and one nominal dichotomous dependent variable, academic success or academic nonsuccess in College Algebra. The null hypothesis assumed that there is no statistically significant difference in the academic success rates of students placed in College Algebra with an ACT mathematics sub-score of 19 and students placed in College Algebra with an ACT mathematics sub-score less than 19 and a COMPASS algebra score of 50-99.

The χ^2 statistic was used to analyze the data of both categories within the hypothesis. There was a degree of freedom of one since each analysis consisted of two variables. Using the χ^2 method of analysis at a level of significance of $p < .05$, the value of χ^2 needed to be equal to or greater than 3.841 to reject the null hypothesis. Data analysis was done computationally by hand and confirmed using the statistical programs available on the TI-83+ graphing calculator.

CHAPTER 4

RESULTS

This chapter contains a summary of the data and provides a presentation of the significance of the hypothesis tested. Of the 289 students considered in this study, 206 students, representing 71%, had an ACT mathematics sub-score of 19, while 83 students, representing 29%, had an ACT mathematics sub-score less than 19, but were not required to complete DSP mathematics courses based on COMPASS algebra placement scores. Each of these students subsequently enrolled in College Algebra during one of the terms from Spring 2000 through Spring I 2002. From these 289 students, 117 students achieved academic success in College Algebra, while 172 students did not achieve academic success, determining an overall academic success rate of 40% for students in this study.

Of the 206 students enrolled in College Algebra from Spring 2000 through Spring I 2002 who had an ACT mathematics sub-score of 19, 86 students, or 42%, achieved academic success and 120 students, or 58%, did not achieve academic success. Of the 83 students enrolled in College Algebra from Spring 2000 through Spring I 2002 who had ACT mathematics sub-scores below 19, but placed into college level mathematics based on a score of 50-99 on the COMPASS placement test in algebra, 31 students, or 37%, achieved academic success and 52 students, or 63%, did not achieve academic success.

The observed frequencies for each cell of the 2×2 contingency table are given in Table 4-1.

Table 4.1

Observed Values

Category	ACT math sub-score = 19 $n_1 = 206$	ACT math sub-score < 19, COMPASS math score 50-99 $n_2 = 83$
Academic Success	86	31
Academic Nonsuccess	120	52

The expected frequencies for each cell of the 2 × 2 contingency table are given in Table 4-2. As described in Chapter 3, the pooled proportion was calculated as follows:

$$\bar{p} = \frac{\text{total \# successes}}{\text{total \# students}} = \frac{117}{289} \approx .405$$

The expected number of academic successes in the first group was found by multiplying the total number of students in the group times $\bar{p}$: (206)(.405) = 83.43. Similarly, the expected number of academic successes in the second group was found by multiplying the total number of students in the group times $\bar{p}$: (83)(.405) = 33.615. The expected number of academic nonsuccesses in the first group was found by multiplying the total number of students in the group times 1 - $\bar{p}$: (206)(.595) = 122.57. Similarly, the expected number of academic nonsuccesses in the second group was found by multiplying the total number of students in the group times 1 - $\bar{p}$: (83)(.595) = 49.385.

Table 4-2

Expected Values

Category	ACT math sub-score = 19 $n_1 = 206$	ACT math sub-score < 19, COMPASS math score 50-99 $n_2 = 83$
Academic Success	83.43	33.615
Academic Nonsuccess	122.57	49.385

This study was conducted to compare the academic success rates of students placing into College Algebra based on an ACT mathematics sub-score of 19 and students placing into College Algebra based on an ACT mathematics sub-score less than 19, but a COMPASS algebra score of 50-99. The data was analyzed for the purpose of determining the existence of dependent relationships between students' method of mathematics course placement and students' academic performance.

The data was analyzed using the χ^2 statistic for a 2×2 frequency table with one degree of freedom:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$= \frac{(86 - 83.43)^2}{83.43} + \frac{(31 - 33.615)^2}{33.615} + \frac{(120 - 122.57)^2}{122.57} + \frac{(52 - 49.385)^2}{49.385}$$

$$= \frac{(2.57)^2}{83.43} + \frac{(-2.615)^2}{33.615} + \frac{(-2.57)^2}{122.57} + \frac{(2.615)^2}{49.385} \approx 0.475$$

With a level of significance $p < .05$ and one degree of freedom, the value of χ^2 had to be equal to or greater than 3.841 to reject the null hypothesis. The results of the χ^2 statistical analysis, χ^2 (1, N = 289) = 0.475, $p = .49$, suggested a failure to reject the null hypothesis, indicating that the academic success rates of students in the two groups are independent of the students' method of course placement. Thus, the findings of this study indicated there was no statistically significant difference in the academic success rates of students in College Algebra who had an ACT mathematics sub-score of 19 and students in College Algebra who had an ACT mathematics sub-score below 19, but scored 50-99 on the COMPASS algebra placement test.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Placement of college freshmen into appropriate core level courses is important for a successful first-year college experience. Mathematics requirements, in particular, seem to be a critical factor in many students' choice of major and their persistence toward attaining a degree. Once students are admitted to an institution of higher learning, that institution should make every effort to place students in courses for which they have the necessary skills and background.

At Tennessee Board of Regents institutions, an ACT mathematics sub-score of 19 or greater is required for placement into core level mathematics courses. Students scoring less than 19 are required to complete the COMPASS placement test in algebra to determine if DSP mathematics courses are needed before enrolling in core mathematics courses. It is important to students, parents, educators, and post-secondary institutions to know if placement into college level mathematics courses based on a COMPASS algebra score of 50-99 translates into approximately the same academic success rate in College Algebra as those students who placed into College Algebra based on the state minimum ACT mathematics sub-score of 19.

Data was collected from the Student Information System (SIS) of Austin Peay State University for all semesters between Spring 2000 and Spring I 2002, inclusive, at

the Clarksville and Ft. Campbell campuses. Students who were placed directly into College Algebra based on an ACT mathematics sub-score of 19 or as a result of an ACT mathematics sub-score less than 19 but a COMPASS algebra score of 50-99 were classified as achieving academic success or academic nonsuccess during their first College Algebra attempt.

Analysis of the data using the χ^2 statistic indicated no statistically significant difference in the academic success rates of these two groups of students. Students placing into College Algebra based on a COMPASS algebra score of 50-99 had academic success rates slightly lower than students placing into College Algebra based on an ACT mathematics sub-score of 19, but the difference was not statistically significant.

Conclusions

Since the data analysis did not show a statistically significant difference in the academic success rates of students placing into College Algebra based on an ACT mathematics sub-score of 19 and students placing into College Algebra based on an ACT mathematics sub-score less than 19 but a COMPASS algebra score of 50-99, using COMPASS as a secondary placement test appears useful in insuring uniform placement of students with similar abilities. However, while no statistically significant difference was shown in the academic success rates of these two groups of students, the overall academic success rate of all students in the study was only 40%. Tennessee Board of Regents institutions should be concerned with this low level of academic success in a core course for which students should be prepared, based on admission standards and

placement policies.

This research confirms previous ACT research that showed students scoring 48 or higher on the COMPASS algebra test have only a 50% chance of earning a grade of C or higher in College Algebra (ACT, Inc., 2001b). Since the 2001 national average ACT mathematics score for students who had completed Algebra I, Algebra II, and Geometry in high school was only 19.6, this research also provides further evidence that a large majority of U. S. high school graduates are not prepared to succeed in first year college mathematics courses (ACT, Inc., 2001a).

The median ACT mathematics sub-score used by colleges and universities across the country for placement into college algebra is 23. Setting the minimum score at 19 for Tennessee Board of Regents institutions may be placing a significant number of students into a level of mathematics above that at which they can be successful. Since first year success is linked to student satisfaction and retention, all public institutions should make every effort to insure their admission and placement policies are meeting the needs of all students.

Recommendations

The analysis of data in this study suggests that students who achieve College Algebra placement by means of the COMPASS algebra placement test rather than by meeting the minimum ACT mathematics cut-score of 19 have approximately equal academic success rates. However, the study also reveals that the academic nonsuccess rate of both groups was extremely high. As a result of this study the following

recommendations are presented.

1. This study be expanded to include a group of students scoring between 19 and 23 on the ACT Mathematics Test.

2. This study be revised to compare students at the main campus and students at the Ft. Campbell campus separately.

3. The study be replicated in all Tennessee Board of Regents institutions.

4. A study be conducted to compare academic success rates of college algebra students at two-year versus four-year Tennessee Board of Regents institutions.

5. A study be conducted to determine the retention rate of students not succeeding in core level mathematics during their freshmen year.

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