

COMPARING AND CONTRASTING COLLEGE ALGEBRA SUCCESS RATES
IN TRADITIONAL VERSUS EIGHT-WEEK COURSES AT
A SPECIFIC COMMUNITY COLLEGE: A SINGLE
INSTITUTION CASE STUDY

Czarina S. Reyes, B.A., M.L.A.

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APPROVED:

Patsy Fulton-Calkins, Major Professor
Ronald W. Newsom, Committee Member
Herlinda M. Glasscock, Committee Member
Kathleen Whitson, Program Coordinator for
Higher Education
Jan Holden, Chair of the Department of
Counseling and Higher Education
Jerry R. Thomas, Dean of the College of Education
Sandra L. Terrell, Dean of the Robert B. Toulouse
School of Graduate Studies

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There is a need to understand the relationship between, the traditional 16-week versus an 8-week, and college-level mathematics success rates. This study applied chi-square (χ^2) and analysis of variance to compare and contrast which course length of time, 8-weeks or 16-weeks, for college algebra resulted in a higher proportion of students successfully completing the course. In addition, success rates among ethnicities, gender, and age groups were also examined. The population sample for this study was 231 students enrolled in college algebra from fall 2004 through fall 2007. Data was analyzed on four sections of the traditional 16-week courses and four sections of 8-week courses. Success was defined as earning a grade of A, B, or C in the course.

The study found that overall there was no significant difference in success rates for the 8-week and 16-week college algebra courses. However, significant differences were found in success rates among Asian, Pacific Islander students enrolled in the 8-week and 16-week courses. No significant differences in success rates were found for White, Non-Hispanic; African-American, and Hispanic, Mexican American students. There was a significant difference in the number of A's, B's, C's, D's and F's among White, Non-Hispanic students, but there was no difference in A's, B's, C's, D's or F's for African-American; Hispanic, Mexican American and Asian, Pacific Islander.

When considering success rates among genders, no difference was found in

success rates for males or females who were enrolled in the 8-week and 16-week college algebra courses. There were a significant greater number of students in the age group (23-30) who were successful in the 16-week college algebra course than in the 8-week college algebra course. However, no differences in success rates were found in the age groups (18-22) and (31-40).

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CHAPTER 1

INTRODUCTION

Introduction to the Problem

Offering different course lengths of time in higher education institutions is rapidly gaining popularity. Grimes and Niss (1989) studied whether the same learning of economic concepts could be accomplished at an equivalent level in a shortened time frame, such as 8-weeks. Few studies relating to the positive and negative benefits of shortened course length of time have been conducted. Shafer (1995) studied adult, non-traditional, and traditional college age students and their perceptions of compressed versus traditional course length of time. Simon (2007) writes as an authority on course length of time. However, many of the studies found in the literature on both the traditional 16-weeks and 8-weeks course length of time focused on courses such as business, English, theater, biology, accounting, and psychology, to name a few. None of the studies specifically discussed and identified college algebra courses. There was no literature that directly stated whether 8-week or 16-week college algebra courses had higher success rates. This study addressed that void by providing research on different course lengths of time for college algebra course offerings and student success rates.

The State of Texas has an education initiative titled “Closing the Gaps.” This initiative is to ensure that by 2015, the State of Texas will expand its educated population and workforce. Two of the main objectives of this initiative are to increase the enrollment of students’ by 500,000 and to increase by 50 percent the number of degrees and certificates (Texas Higher Education Coordinating Board, 2008). Therefore, as more

students are pursuing a college education, college algebra, which is a gatekeeper course, is needed for graduation or entrance into a technical program. A gatekeeper course is defined in this study as a required course in a given curriculum that historically has low passing rates and thus serves as a barrier to continued progress toward a major or specific certification or degree (Hagedorn, 2004). This study examined the literature on attrition rates in college algebra. Small (2002a, "Attitudes") addressed the 40 to 60 percent attrition rate in college algebra by stating "Because of college algebra's gateway position in undergraduate programs, traditional college algebra courses block the academic opportunities and plans of approximately 200,000 students per semester. As educators, we cannot accept this cost." Although previous research has been conducted on college algebra, after searching the databases of ERIC via EBSCOhost, Digital Dissertations, ProQuest, and ERIC via FirstSearch, the researcher found only one study which focused specifically on online college algebra courses taught in both ten and fifteen weeks.

Concern is growing in community colleges about the increasing number of students enrolling in college algebra and the success and retention rates of students in this particular course. The two-year college enrolls a broad group of students from diverse backgrounds such as: low income students, students of color, first-generation college students, part-time students, returning adults, and students who graduated with lower academic success in high school. The literature presented studies which suggest that there are differences in terms of ethnicities, gender, and age among students' mathematics achievement rates in higher education. Therefore, ethnicities, gender, and age are significant issues in the discussion on different course lengths of time for college

algebra courses. Since the 1960's, with the expansion of community colleges, considerations of access to higher education have been imperative, but more recently educators, policy-makers, researchers and foundations have increasingly turned their attention to the actual experience of students enrolled in these institutions (Bailey & Alfonso, 2005). Community colleges are acknowledged for creating equal access to higher education and allowing more Americans to gain social mobility. Carnevale & Fry (2000); Knox, Lindsay, & Kolb, (1993) indicate that social mobility and status attainment are a function, not simply of family social status and individual ability but also of intervening experiences, including educational experiences and attainment.

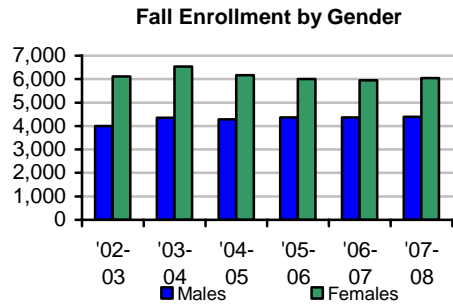
There were more than 1,150 two-year colleges serving 10.1 million students, with 6.6 million enrolled in credit classes in the year 2005 (Blair, 2006). In the academic year 2001-2002, 53 percent of all undergraduate students in the United States were enrolled at two-year colleges (Phillippe & Sullivan, 2005). According to Phillippe & Sullivan (2005) in the academic year 2001-2002, two-year college students had these characteristics:

- the average student age was 29; 36 percent were 18-21 years old; 15 percent were 40 years or older
- 58 percent were women and 33 percent were minority students (African-American, native American, Asian/Pacific Islander, Hispanic)
- 61 percent of all students took a part-time course load
- 80 percent were employed with 41 percent employed full-time

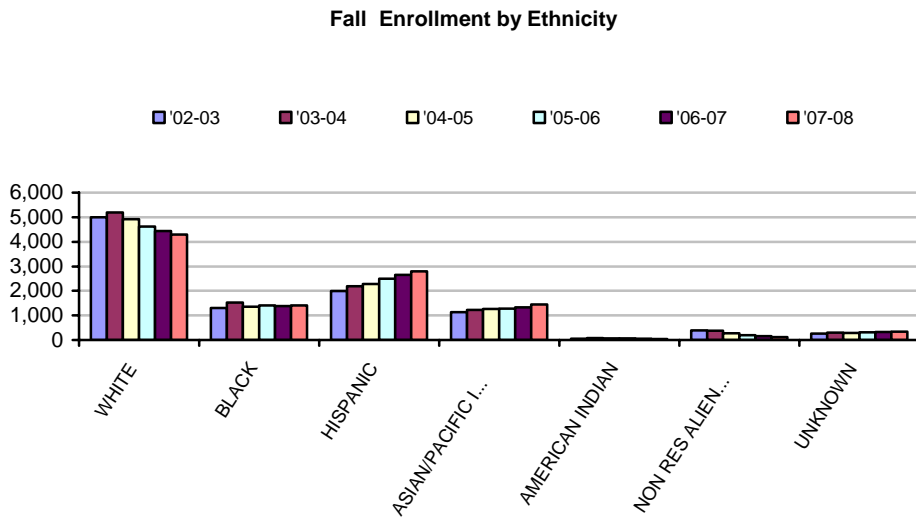
- many two-year college students had not attended school in several years, were involved in a career change, and were commuters.

Brookhaven College (BHC) is a public two-year institution, which is part of the Dallas County Community College District, located in the Dallas metropolitan area. During fall 2007, the student enrollment was 10,437, of which 77 percent of the students were part-time, which means enrolled in 11 hours or less, 47 percent were classified as first generation college students, 50 percent attended during the day, 24 percent took night classes with the remaining students enrolled in day, night, and online classes. Fifty-eight percent were under the age of 25, and 6 percent were over 50 years of age. The average age is 29. Approximately 80 percent of all enrollments are in academic courses and the remaining 20 percent of enrollments are in technical/occupational courses (BHC, 2007). Brookhaven has been continuously changing in the demographics of the students it serves. Additionally, the institution has constantly been changing in enrollment by gender, enrollment by ethnicity, and enrollment by age. Figures 1 and 2 present this (BHC, 2007). Brookhaven serves a wide and diverse group of student populations with varying levels of academic ability. At the same time, Brookhaven offers a wide variety of credit, non-credit, technical, and life learning experiences for senior adults across a large number of different curriculums and disciplines. In order to fulfill the College's stated mission, Brookhaven has an obligation to be concerned with how students experience college, how they progress toward their educational goals, and whether or not they are achieving the intended educational outcomes after completion of college algebra.

Figure 1. Brookhaven Data Trends: Fall 2007.

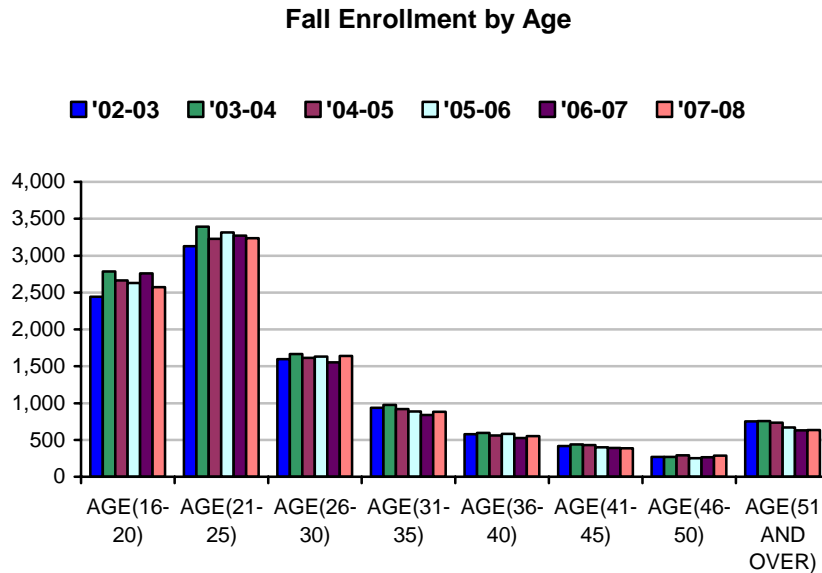


Source: (BHC, 2007).



Source: (BHC, 2007).

Figure 2. Brookhaven Data Trends: Fall 2007.



Source: (BHC, 2007).

Forty-nine percent of African-American students and 57 percent of Hispanic students are first-generation students, while only 37 percent of White non-Hispanic students are first-generation (BHC, 2007). In addition to the well-known barriers to success for first-generation students, African-American and Hispanic students are far more likely to be low income (BHC, 2007). African-American and Hispanic students typically have more external commitments (defined as one or more dependents and jobs of 21 hours or more weekly). These ratios exceed those of White students (BHC, 2007). Hispanic students tend to be younger than the general student population. According to Oesterreich (2000), socioeconomic status is the greatest determinant of enrollment and persistence in college for all students. Demographic trends in the college service area indicate an increasingly greater percentage of under prepared, economically disadvantaged students of color will

be enrolling at Brookhaven College, in the next five to ten years.

A consistent goal of community colleges is for all students to achieve their educational goals. During the spring semester 2005, Sandy Shugart, President of Valencia College in Orlando Florida, was a special guest at Brookhaven College. Shugart said, "Every student can learn under the right conditions." There is not a formula for these conditions, because they differ for each and every student. According to Blair (2006) teaching and learning of college algebra and assessing what is successful learning presents ongoing challenges to students, faculty, departments, and institutions. The teaching and learning environment in college algebra continues to change. Students who complete college algebra will have more opportunities such as: 2-year or 4-year degree attainment.

For this dissertation study, the researcher directed attention to the large number of students who must take college algebra (a gatekeeper course) for degree attainment, the moderate to low completion rates (earned A, B, or C), and the contributing factors in the successful completion of college algebra in defined lengths of time (8 or 16-weeks). Grade distributions by ethnicities were provided and were examined to determine whether differences exist in grades among ethnicities for different course lengths. Grade distributions by gender were provided and were examined to determine whether differences exist in grades among genders for different course lengths. Grade distributions by age were provided and were examined to determine whether differences exist in grades among age groups for different course lengths. The researcher compared and contrasted which course length of time, 8-weeks or 16-weeks, for college algebra,

resulted in a higher proportion of students successfully completing each semester from fall 2004 through fall 2007. The 8-week courses taught had one variable difference, which was course length of time. This examination resulted in which course, the traditional 16-week or the 8-week, had better success and completion rates.

Statement of the Problem

This study compared and contrasted which course length of time, 8-weeks or 16-weeks, for college algebra, resulted in a higher proportion of students successfully completing. Grade distributions by ethnicities, gender, and age were provided. Each of these were examined separately to determine whether differences do exist in grades among ethnicities, gender, and age groups for students enrolled in these specific college algebra courses.

Purpose of the Study

The study determined: (1) which course length of time 8-weeks or 16-weeks resulted in a higher proportion of students completing college algebra, (2) whether differences existed within grades among ethnicities of students enrolled in the 8-week and 16-week college algebra courses, (3) whether differences existed within grades among genders of students enrolled in the 8-week and 16-week college algebra courses, and (4) whether differences existed within grades among age groups of students enrolled in the 8-week and 16-week college algebra courses.

Hypotheses

This study considered the problem and the purpose by testing five sets of hypotheses.

Hypothesis 1

A statistically significant greater number of students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of, A, B, C, than students who are enrolled in the traditional 16-week college algebra course.

Hypothesis 2

There are statistically significant differences in grades among ethnicities in students enrolled in the 8-week college algebra course at Brookhaven College than in those same ethnicities enrolled in the traditional 16-week course at Brookhaven.

- A. A statistically significant greater number of White, Non-Hispanic students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than White, Non-Hispanic students who are enrolled in the traditional 16-week college algebra course.
- B. A statistically significant greater number of African-American students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than African-American students who are enrolled in the traditional 16-week college algebra course.
- C. A statistically significant greater number of Hispanic, Mexican American students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than Hispanic, Mexican American students who are

enrolled in the traditional 16-week college algebra course.

- D. A statistically significant greater number of Asian, Pacific Islander students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than Asian, Pacific Islander students who are enrolled in the traditional 16-week college algebra course.

Hypothesis 3

- A. There are statistically significant differences in the number of A's, B's, C's, D's, and F's among White, Non-Hispanic students in the 8-week college algebra course at Brookhaven College than, White, Non-Hispanic students who are enrolled in the traditional 16-week college algebra course.
- B. There are statistically significant differences in the number of A's, B's, C's, D's, and F's among African-American students in the 8-week college algebra course at Brookhaven College than, African-American students who are enrolled in the traditional 16-week college algebra course.
- C. There are statistically significant differences in the number of A's, B's, C's, D's, and F's among Hispanic, Mexican American students in the 8-week college algebra course at Brookhaven College than, Hispanic, Mexican American students who are enrolled in the traditional 16-week college algebra course.
- D. There are statistically significant differences in the number of A's, B's, C's, D's, and F's among Asian, Pacific Islander students in the 8-week college algebra course at Brookhaven College than, Asian, Pacific Islander students who are enrolled in the traditional 16-week college algebra course.

Hypothesis 4

There are statistically significant differences in grades among genders of students enrolled in the 8-week college algebra course at Brookhaven College than in those same genders enrolled in the traditional 16-week course at Brookhaven College.

- A. A statistically significant greater number of males in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than males who are enrolled in the traditional 16-week college algebra course.
- B. A statistically significant greater number of females in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than females who are enrolled in the traditional 16-week college algebra course.

Hypothesis 5

There are statistically significant differences in grades among age groups of students enrolled in the 8-week college algebra course at Brookhaven College than in those same age groups enrolled in the traditional 16-week course at Brookhaven College.

- A. A statistically significant greater number of students in the age group (18-22), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (18-22), who are enrolled in the traditional 16-week college algebra course.
- B. A statistically significant greater number of students in the age group (23-30), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (23-30), who are enrolled in the traditional 16-week college algebra course.

- C. A statistically significant greater number of students in the age group (31-40+), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (31-40+), who are enrolled in the traditional 16-week college algebra course.

Significance of the Study

Community colleges have responded to the democratization of education by having open access and serving the community by accommodating the various learning styles, academic levels, and requests of students without turning anyone away. This study was important for various reasons. There was a lack of research that considered shortened course length of time, such as 8-weeks, for college algebra courses. This study provided the mathematics department at Brookhaven College and other two-year institutions with evidence that there was no difference in successful completion rates for 8-week or 16-week courses for college algebra. Therefore, the data suggested that the 8-week course was just as productive as the 16-week course. Variations in students' mathematics achievement have long been associated with the demographic issues of socioeconomic status and race/ethnicity (Blair, 2006). Since Brookhaven has a large enrollment of first-generation, immigrant, and international students, these students may have difficulty adjusting to a new educational environment (Blair, 2006). Community colleges have always admitted everyone, but then guide students to programs that fit their aspirations (Cohen & Brawer, 2003). One way to address the open access enrollment policy and new educational learning environment is to encourage students to take responsibility for their own learning. In return, faculty and institutions have an obligation to create a

responsive mathematics learning environment which will respond to the needs and characteristics of its students (Blair, 2006).

Deleting college algebra from the degree requirement is not an option for most majors offered at two and four-institutions. Becoming an efficient, independent problem solver should be the goal of every college algebra student (Blair, 2006). Therefore, one possible way two-year and four-year institutions can be responsive to student needs and characteristics is to adjust course lengths for college algebra courses. Using this model, instead of attending class two days per week, students would attend class four days per week. Four-year colleges and universities may possibly benefit from this study by using the information to develop college algebra courses that would result or might result in increased completion rates in college algebra. This may also lower the number of times students repeat the course. For many students, college algebra is viewed as a “string of procedures to be memorized, where right answers count more than right thinking” (National Research Council, 1989, p. 10). According to Kloosterman and Stage (1992) actual problem solving does not necessarily involve memorizing procedures and usually involves students having motivation to solve the problems. According to Lester (1983):

Good problem-solving behavior usually is not fostered by having students imitate how teachers solve problems. Because teachers typically demonstrate only correct moves, students often come to view problem solving as that of delving into a mysterious bag of tricks to which only a select few are privy (p. 229).

Developing problem solving skills is only one of the many benefits of having college algebra as a required course for all majors. When students complete college algebra, the goal is for students to be able to think conceptually as well as quantitatively. Students,

for example, should be able to understand and calculate statistics in the daily newspaper, balance budgets, and analyze human and non-human resources. Meeting the needs of students' learning styles, which is defined as "the preferences, tendencies, and strategies that individuals exhibit while learning," is one method of improving completion rates in college algebra (Thomson & Mascazine, 1997, p. 1). Focusing only on Brookhaven and the length of time that college algebra courses can be completed was important for students trying to earn a college degree.

Improving the completion and retention rates in college algebra is not a simple task. Since the eight week course meets four days a week, it was possible students were more likely to develop a sense of community with each other. This environment promoted interaction and intellectual discussion which resulted in collaborative learning.

According to Barr, Desler, & Associates, (2000), this form of classroom organization encourages students to work together in some form of collaborative group and to become active, and responsible, for the learning of both group and classroom peers (p. 438).

After teaching college algebra for six years, the researcher observed that in both the 8-weeks and 16-weeks college algebra courses, three things occurred when learning takes place. First, was shared knowledge which meant that students were sharing a common curricular experience. Students began to develop higher levels of cognitive awareness in the particular courses being taken. Second, shared knowing meant students got to know one another faster and sometimes on a more intimate level. Students connected socially and intellectually which increased their cognitive development. In return, students received academic benefits for their own learning by listening to their classmates which

enforced their learning experiences. Third was shared responsibility. Students became responsible for each others learning and wanted to be a part of the success and lift each other up in times of failure (Barr, Desler, & Associates, 2000). Students reported not only greater involvement and enhanced learning, but also claimed that they learned better together in addition to persisting at rates that were substantially higher than those for similar students in two-day a week courses (Tinto, Goodsell, & Russo, 1994). If students who are in college algebra courses were determined to get a higher education, then they took advantage of every service the community college offers. Community colleges are constantly trying to meet the needs of all students and these institutions facilitate students to take ownership of their education. By the end of the college algebra course the mathematics department at Brookhaven expects to see a substantial and positive change in the rate at which students completed college algebra and enrolled in higher level mathematics courses such as trigonometry and calculus.

According to Schoenfeld (1987) attitudes toward mathematics can be either a feeling of confidence or anxiety which may have a positive or negative effect on mathematical behavior. It is essential for faculty, staff, and administrators to be cognizant of these feelings of anxiety. By offering different course length options for college algebra this might reduce significantly the number of students who withdraw. Fiore (1999) stated that factors such as age or maturational level, relationship between student and teacher, and the nature of the learning environment, including instructional methods used and learning resources available, influence mathematical anxiety. One of many goals of Brookhaven College is to help students diminish their anxiety level about

college algebra. Students will then find their way to discover their dreams of fulfilling their higher education ambitions. According to Lamkin (2004), “That dream benefits us all. Let’s make it our dream, and let’s make it come true” (p. 15).

Definition of Terms

College Algebra – This course is a study of relations and functions including polynomial, rational, exponential, logarithmic, and special functions. Other topics include complex numbers, systems of equations and inequalities, theory of equations, progressions, the binomial theorem, matrices and determinants, proofs, and applications.

Eight-week course – A course that provides 64 hours of instruction in 8-weeks.

Grades – The grades earned by students are defined as:

A: 90% - 100% (carries 4 grade points)

B: 80% - 89% (carries 3 grade points)

C: 70% - 79% (carries 2 grade points)

D: 60% - 69% (carries 1 grade point)

F: below 60% (carries 0 grade points)

W: Withdraw from the course

The grade of “W” carries 0 grade points and is not computed in a student’s grade point average.

Sixteen-week course – A course that provides 64 hours of instruction in 16-weeks.

Successful course completion – Remaining enrolled in a course until completion and earning the grade of “A”, “B”, or “C.”

Unsuccessful course completion – Remaining enrolled in a course until completion and

earning the grade of “D” or “F.”

Withdraw – The student voluntarily removes himself or herself from the class before the class is over, which results in the student earning a “W” grade.

Limitations

Shortened course length of time is a new approach for teaching college algebra; traditionally the course is taught in a 16-week semester. College algebra is a gatekeeper course that must be completed for most majors graduating from two or four-year institutions. Course descriptions and stated learning outcomes are similar across the state of Texas as well as colleges and universities in the Dallas-Fort Worth area. A limitation of this study was the lack of research available in the area of course length of time for students in college algebra.

Delimitations

Brookhaven College, examined in this study, is one college that uses the 8-week course length of time and the 16-week course length of time for college algebra. The data collected was limited to this one source. Additionally, no college algebra sections offered online were included in this data set since these sections used a different modality for instruction.

Assumptions

Several assumptions were made in order to advance this study:

- (1) Students enrolled in the specific course length of time based on their own judgment or advice given to them by an academic advisor.
- (2) Students either placed into college algebra based on assessment scores, or passed

prerequisite courses.

- (3) Students may not have recently taken a mathematics course prior to enrolling in college algebra. The time spans between courses were assumed to have a minimal effect on successful completion.

CHAPTER 2

LITERATURE REVIEW

Introduction

In the higher education market today, students are viewed as the consumers, and their degree is the product. Four-year and two-year institutions are continuously seeking ways to improve their current services, programs, retention and completion rates and products for the consumers. As a provider of improvements in current services, programs, retention and completion rates, faculty play a significant role in the success of community college students. Faculty members interact with students on a day-to-day basis, and have the opportunity to make a positive difference in students' lives.

In general, only 5 percent of research is conducted on community colleges (Pascarella & Terenzini, 1991). In addition, there is a lack of research on community colleges specifically relating to gatekeeper course completion such as college algebra. Pascarella and Terenzini (1991) published an 800-page volume reviewing 3,000 studies on *How College Affects Students*, including studies on completion and retention that only superficially addressed community colleges. According to Bailey and Alfonso (2005) most of the research is about four-year colleges. Additionally, national and multi-college databases do not include sufficient measures of institutional practices designed to promote retention and completion. Methodological techniques used in research processes have flaws that often impact efforts to properly assess institutional practices, and the dissemination and discussion of research reports on community colleges are inadequate (Bailey & Alfonso, 2005).

Pascarella and Terenzini (1991) affirmed that their work was “based almost exclusively on samples of traditional college students 18 to 22 years of age, attend four-year institutions full-time and live on campus” (p. 632). Since the inception of community colleges in 1901 (with the opening of Joliet in Illinois) there has been a growing interest in community colleges due to the impact they have made and continue to make in education in the United States. However, articles published in five higher education journals in the years between 1990 and 2003 reveal that only 8 percent of the 2,321 articles written in major four-year education publications (*The Journal of Higher Education, Research in Higher Education, The Review of Higher Education, Journal of College Student Development, and the NASPA Journal*) mention community colleges (Townsend, Donaldson & Wilson, 2004). The *Journal of Higher Education* had the largest community college portion with 13 percent (Townsend, et. al., 2004). For research on community colleges, the field relies basically on journals that have arisen as a result of the needs of community college constituencies for research and information concerning community college education. Several journals, such as the *Community College Journal of Research and Practice, Community College Review, Journal of Applied Research in the Community College, and New Directions for Community Colleges*, address this need. However, since a significant number of community college students are now transferring to four-year institutions, it is important that both community college faculty and four-year university faculty understand the unique issues and needs that impact community college transfer students. According to the University of North Texas Fall 2007 Fact Book, 3,697 students were new undergraduate transfers.

Undergraduate total enrollments for fall 2007 were 27,242 students (UNT Fact Book, 2007), which means that of this undergraduate total 14 percent were transfer students. Successful transfer from a community college to a four-year institution is often the only opportunity these community college transfer students have to achieve a bachelor's degree, particularly in the case of low-income students (Education Commission of the States, 2001, p. 1).

This chapter provided a review of the literature and set the conceptual framework that pertained to the impact of course length of time in college algebra and students' success. The review of literature was categorized as follows: (a) theoretical models, (b) course length of time, (c) relevant studies, (d) attrition rates in college algebra, and (e) ethnicity, gender, and age differences.

Theoretical Models

Student Integration Model

Tinto (1993) developed a model called the student integration model, which captures and frames students' persistence, retention, and graduation rates at community colleges. For this study, the researcher took the concept of student integration and applied it to social integration in the classroom. This model remains the foundation for two-year institutions. The student integration model helps community colleges understand why students leave at the rate that they do. By using this model, higher education institutions can become more cognizant in their planning efforts that ultimately will prepare students for the rigorous academic and culture challenges that face them when they arrive on campus. Increased persistence and retention rates will result in

academic classes. Tinto proclaimed that students' departures from an institution "reflect the character of the individual's social and intellectual experiences within the institution. Specifically, they mirror the degree to which those experiences serve to integrate individuals into the social and intellectual life of the institution" (1993, p. 51). Tinto believed that institutions should have both social integration and academic integration. The Tinto (1975) model introduced the terms, "social integration" and "academic integration" which are frequently used in community colleges today. Social integration in this study was defined as students connecting to the institution both with their peers and employees of the college. Academic integration in this study was defined as students engaging in the academic community within the institution. Faculty and student involvement in academic classes, such as college algebra, does not always result in higher grades and student success. Pascarella and Terenzini (1991) reported the results of one study and found that "educational aspirations are more likely to influence contact with faculty, than contact with faculty is to influence educational aspirations" (p. 395).

In the last four years, Braxton, Hirschy, and McClendon (2004) have extended Tinto's model to "commuter universities and colleges." Unlike residential colleges, the authors say, "commuter colleges and universities lack well-defined and structured communities for students to establish membership" (p. 35). The authors noted a prominent recommendation based on their study. Students' interaction with each other on a more frequent basis such as an 8-week college algebra course, which meets four days a week, learn better together. Students who have someone with whom to learn build supportive networks with each other. Braxton, et al. (2004) contend that institutions

make pragmatic decisions such as offering classes at convenient times, offering day care, and even providing on campus employment. Ultimately, if students' needs are considered and taken care of, then students will persist at higher levels in gatekeeper courses such as college algebra.

Braxton, et al. (2004) found that Tinto's student integration model is most effective at four-year residential institutions. On the other hand, for commuter institutions, they found "modest" support for the role of social and academic integration in promoting "commitment to the institution" if not persistence itself (p. 16-17). Tinto's model is used most extensively and acknowledged in community colleges for students' persistence and retention. While academic integration continues to be important for all who enroll in higher education institutions, access to faculty outside of class (Lau, 2003; Pascarella & Terenzini, 1991; Tinto, 1993) and informal social contact also matter to commuter students. Braxton, et al. (2004) stated that "given this configuration of support, the pattern of empirical data that they found in their review, the explanatory power of Tinto's theory to account for student departure in two-year colleges remains undetermined and open to empirical treatment" (p. 17-18). The classroom at a community college is the single most influential place for students' learning to take place. Students' have an internal need for learning new knowledge in challenging courses such as college algebra. Tinto wrote, "Institutional studies should help educators discern what attributes, behaviors, and situations distinguish between successful and unsuccessful outcomes" (1993, p. 221).

Other researchers have used Tinto's model to explore and advance their own

viewpoints on student's persistence and retention. King (1993) illustrated his views by saying "populations such as first-generation college students, racial minorities, students needing remediation, and commuting students each possess characteristics that have been linked to higher college attrition" (p. 21-22). Therefore, they need more academic support. Pascarella and Terenzini (1991) interpret social and academic integration as meaning that "grade performance is a critical predictor of persistence and educational attainment" (p. 618). Surette (1997) reported evidence suggesting that community colleges "play an important role as intermediaries between the completion of high school and attendance at a four-year college" (p. 3). Surette (1997) found that "one cannot reject the hypothesis that a year of community college credits and a year of four-year credits raise equally the probability of subsequently attending a four-year college" (p. 18). In addition, Astin (1993c) correlated social and academic integration by claiming that even when controlling for an array of students' personal, family, and academic background characteristics, college experiences, and the characteristics of the institutions they attend, it was found that "student-faculty interaction has significant positive correlations with every academic attainment outcome: college GPA, degree attainment (beta = .16), graduating with honors (beta = .12), and enrollment in graduate or professional school (beta = .11)" (p. 383).

Course Length of Time Literature

As the discussion of academic and social integration enter the realm of course length of time, social and academic constructs are acknowledged in the following ways. Brookhaven, the institution being studied, does offer 8-weeks and 16-weeks college

algebra courses; the sections being studied have only one variable difference which is course length of time. The faculty member who taught the courses remains constant and has the same degree of expectations in content, social, and academic involvement from all students.

According to Simon (2007), who writes as an authority on different course lengths of time, the traditional course length of time of 16-weeks in higher education institutions was developed as a reasonable time frame for an agrarian society that served the harvest times and Christian holidays (p. 1). Simon (2007) also suggested that for today's students who attend college, work, and have children in daycare, 16-weeks can be considered too long. William J. Husson, vice president for professional studies and strategic alliance at Regis University in Denver, points out that for years "older adults were excluded from higher education unless they wanted to cram into desks that did not fit or take time off from work" (Simon, 2007, p. 1). Brookhaven College is just one example of how higher education institutions are competing to meet student's needs by shortening college algebra course length of time to 8-weeks, in which students meet four days a week. This is also called a compressed or intensive course.

Dorothy Durkin, associate dean of the School of Continuing and Professional Studies at New York University, describes these shortened courses as "pain relievers" (Simon, 2007, p. 1). Shorter course length of time is quickly being built into course selection schedules by a number of educators. Instead of in 14-weeks, Valencia Community College, offered in spring 2008, Pre-Algebra, Beginning Algebra, and Math for the Liberal Arts courses in a condensed 7-week format that met four days a week

(Valencia, 2008). However, not all educators believe shortened course length of time is beneficial for college students. Simon (2007) stated that educators maintain that replacing a semester's worth of curriculum with more achievable chunks compromises learning, and additionally states that an eight-week course is too fast and too intense (p. 1). On the other hand, educators also claim that shortened course length of time will increase the chance for students to pass gatekeeper courses such as college algebra.

College algebra at Brookhaven College is not the only course offered as an 8-week course. Higher education institutions across the country are doing similar experimentations with their course offerings. Oakton Community College, in the Chicago suburbs, combines an English class with a library science or a theater course with psychology, and clusters them into 16-week or 8-week sessions (Simon, 2007, p. 2). New York University offers for-credit courses that last one week in subjects like languages, digital arts and finance (Simon, 2007, p. 2). Simon (2007) mentioned how students taking classes at Northeastern's school of education can get up to a full semester's class time in only five days (p. 2). The research relating to the positive benefits of shortened course length of time set the grounds for the researchers experiment and was illustrated by the Johnson, Johnson and Smith's (1998a) discussion of the results of their meta-analysis of more than 300 studies indicated that meeting four days a week increased time on task and promoted both academic and social engagement within the classroom. In contrast, classes that meet two or three times a week do not provide as tight an academic community as a class that meets four days a week. If a traditional 16-week college algebra course meets on Monday and Wednesday, then by the last class

meeting for the week which is a Wednesday, the class will not meet again for five days which can result in non-academic and social interaction. Whereas, an 8-week college algebra course that meets four days a week has the loss of non-academic and social interaction of only three days.

Meeting four days a week, based on Johnson, Johnson, and Smith (1998a), fostered the development of peer networks, increased student involvement in the classroom, increased social networks, perceptions of greater academic development, and increased integration of student's academic and nonacademic lives. The research also provided evidence which suggested that 8-week college algebra courses foster a sense of "educational citizenship," a sense of responsibility for the learning of others as well as one's own (Tinto, 1997; Tinto & Goodsell, 1993; Tinto, Goodsell, & Russo, 1993; Tinto & Russo, 1994).

Relevant Studies Literature

Limited research existed in the published literature that reports and analyzes traditional and shortened course length of time in higher education institutions. This resulted in a gap regarding understanding how different course length of times in college algebra benefits students success rates. This study addressed this gap by adding to the limited number of published dissertations and studies focusing on shortened course length of time in college algebra.

While a small number of studies exist on course length of time, many of the studies focused on courses such as business, philosophy, speech, and accounting, but not specifically on college algebra. Grimes and Niss (1989) conducted a study that compared

whether students enrolled in a 15-weeks economics course can learn at the same level and accomplish the same results as students enrolled in a modified mastery class of 8-weeks or 10-weeks. Student performance in the two classes was measured using standardized techniques such as the revised Test of Understanding College Economics (TUCE) (Grimes & Niss, 1989, p. 135). Grimes and Niss (1989) used *t tests* for independent group means to test for statistical differences between the performance scores of the control group, which was 15-weeks, and the modified mastery group (p. 135). According to Grimes and Niss (1989) this study found no significant differences between the control group and either of the modified mastery groups (eight-week and ten-week courses) (p. 136).

Throughout these studies one question remains constant and that is, “do students really learn the material?” According to Simon (2007) research on the effectiveness of various course formats is not readily available (p. 2). However, Grimes and Niss in their study (1989) conclude that students in the shortened course lengths of time appeared to have learned as much as the students in the traditional semester and this means that the learning/time ratio is greater for the modified mastery students, implying that the students used their time more efficiently (p. 136). Wlodkowski, former director of the Center for the Study of Accelerated Learning at Regis, conducted two studies and found that students in accelerated courses learned as well as or better than students in traditional-length courses (Simon, 2007, p. 2). The Regis studies demonstrated, according to the faculty members who taught in the study, that 80 percent of the content and methodology of the accelerated classes overlapped with traditional classes and some class discussion,

repetitive activities, and practice time were eliminated (Simon, 2007, p. 2). “It brings us back to a fundamental question,” Wlodkowski said. “What does it take for people to learn something? There is no study in the world that says you learn more after doing, say, two papers on a subject instead of one” (Simon, 2007, p. 2).

In opposition, Slavkin, professor at the University of Southern Indiana and an educational psychology researcher, disagreed that accelerated coursework is beneficial (Simon, 2007, p. 3). “The brain is flexible, but it is not a super computer,” Slavkin said. “People need time to think through information. We are already talking about students who are living in a rushed and hurried society. Frantically trying to get through assignments makes it more difficult for it to be a powerful learning experience” (Simon, 2007, p. 3). As a result, it is up to individual institutions to decide what they will offer in terms of course selection. The current literature in higher education did not have evidence of studies that confirm which subjects work best when it comes to shortened course length of time. Simon (2007) concluded that courses such as mathematics, more specifically college algebra, require drill and practice and this means that there will be a large demand of time on the student’s part in a shortened time frame (p. 3).

Bedard – Voorhees (2006) conducted a two-phase, post-hoc, quantitative study, using Pearson Product-Moment Correlation Coefficient and multiple regression. The population for this study consisted of 534 subjects that were enrolled in either a ten-week online college algebra course or a fifteen-week online college algebra course. The study was conducted over three semesters from the community college virtual consortia. This study was a good predictor of how course length of time impacts grades in college

algebra, even though the students were completely online instead of in the traditional classroom setting. According to Bedard – Voorhees (2006) this study found that students' in the ten-week course had a higher percentage of passing grades, a lower percentage of failing grades and fewer drops than those students who were taking courses that were fifteen weeks in length (p. iii).

Shafer (1995) conducted a qualitative study of adult and traditional college age students' perceptions of both compressed and traditional length college courses. A compressed course used in this study was defined as a five-week course meeting four days a week. A traditional length course was defined in this study as a 14-week course meeting two evenings a week. The instruments used in this study were the Kolb Learning Style (KLS) and a survey developed by the researcher, Shafer. Fifty-seven students completed the surveys and thirteen interviewees were selected based on age groups, course format, and learning style as identified by the LSI (Shafer, 1995, p. vii). The traditional age group was identified as students ranging in the ages between 18 and 23. On the other hand, nontraditional students were identified as being 25 years and older. According to Shafer (1995) this study found a relationship between students' perceptions and students' learning styles by the Kolb LSI (p. viii). Shafer found that students who are likely to procrastinate had positive perceptions of the compressed format because these students felt that this course length of time prevented procrastination and provided structure (p. viii).

Attrition Rates in College Algebra

College algebra serves both the general education and the trigonometry and

calculus students in higher education institutions. On average, less than ten percent take a higher level mathematics course such as calculus, and “the pragmatic reason most students take college algebra is to fulfill a college or state requirement” (Small, 2002a, p.1). Mathematicians are always trying to find ways to improve and understand why college algebra has such high attrition rates. Herriott’s (2001) analysis of why students do not persist in college algebra courses has common themes such as lack of high school preparation, wrong placement, content, poor attitude, pace of course, and out of school commitments. Students taking college algebra courses react excessively and withdraw cognitively if they do not comprehend the content rapidly. Gaps in prior knowledge make it increasingly difficult for students to catch up. According to one faculty member, “Math is not like history where you can break into the timeline and learn from one event forward” (Farrell, 2006, p. A42). The attrition rates in fall 2006 and spring, summer and fall 2007 for college algebra at Brookhaven College were:

2006 Fall-Successful Completion: 58 percent; In-Course Attrition: 29 percent

2007 Spring-Successful Completion: 60 percent; In-Course Attrition: 27 percent

2007 Summer I-Successful Completion: 80 percent; In-Course Attrition: 14 percent

2007 Summer II-Successful Completion: 67 percent; In-Course Attrition: 23 percent

2007 Fall-Successful Completion: 56 percent; In-Course Attrition: 29 percent (BHC, 2008).

The successful completion was the percentage of students who received an A, B,

or C divided by the total number of grades. When examining attrition, Brookhaven College considers students who leave from one semester to the next rather than within a semester. The in-course attrition was the percentage of W's divided by the total number of grades multiplied by 100. The percent of the students enrolled in the course who received a "W" in the course are students who voluntarily removed themselves from the course before the drop date.

The American Mathematics Society has conducted studies in terms of drop, withdraw, and F rates for college algebra and as an average it was approximately 40 percent to 60 percent (Herriott, 2001). College algebra has the largest enrollment of any college credit-bearing mathematics course. In fall 2000, there was approximately 400,000 student's enrolled nation wide (Small, 2002b). In the large urban community college system that Small (2002b) studied he found that the college algebra withdrawal rate was 50 percent. Small, West Point Mathematics faculty and Algebra textbook author, also claimed that students' reading abilities as it relates to the development of mathematical concepts and communication of quantitative literacy are severely lagging (Small, 2002b).

In fall 2002, Owens (2003), who is a mathematics faculty member at a community college in Texas, conducted his own study on college algebra course length of time and attrition rates. He found an overall attrition rate, percentages of withdraws and F's, that averaged 41 percent, ranging from 13 percent to 81 percent per section. In an attempt to decrease attrition rates in 16-week college algebra classes, the faculty – researcher implemented two procedures: (1) enforcing the prerequisite and (2) dropping

students who were failing after 4 weeks of class (Owens, 2003). Owens (2003) made a clear distinction between having the appropriate prerequisites and having the appropriate prerequisite skills. Institutions define the necessary prerequisite score and define all the prerequisite courses that are adequate for students to place into college algebra. The American Math Association (Lutzer, Maxwell, & Rodi, 2002) surveyed 1053 community colleges and found that 98 percent of them had students take a placement exam before enrolling in college algebra. Owens' institution used the COMPASS math placement test, but the real issue was whether the placement score was enforced, or were students able to take college algebra without meeting the requirements. If students were not initially placed into a mathematics class appropriately, then students were at an immediate disadvantage before other factors had the opportunity to influence success (Shaw, 1997, p. 6).

Nevertheless, there was a distinction between having a particular score and having the necessary pre-requisite skills. Garland (1993) asserted that time between learning of the new skill or pre-requisite knowledge and using the skill can impact the current skill level of students entering a course. In Owens (2003) study, the first homework assignment served as an algebra assessment test to determine the level of the student's algebra skills. Course length of time is also mentioned as a factor in the Owens (2003) study. Bartels (1982) and Garland (1993) assert that course length of time can not only affect the pace of the course but also the student's persistence or dropout rate. Generally, there were benefits and limitations found in the methodology that Owens (2003) used. One limitation was that this method did not include students who did not have the

prerequisite, but who may have the prerequisite skills (Owens, 2003). Benefits included: (1) lectures and discussions progressed without having to stop every minute to answer questions on elementary algebra concepts, (2) classroom atmosphere was optimistic, and (3) students were responsive, attended regularly, and were on time (Owens, 2003).

Ethnicity, Gender and Age Differences

According to *The Chronicle of Higher Education, Almanac 2007-2008*, the total enrollment at public 2-year institutions, in the State of Texas, was 543,491 (p. 89). A proportion of this total enrollment was of minority students who made up 46.6 percent (p. 89). Community colleges continuously attempt to create positive learning environments for all students regardless of their gender, race, ethnicity, disability, or class. At Brookhaven College, the gender breakdown is 58 percent for females and 42 percent for males (BHC, 2007). The average mean age is 29, the median age is 25, and the mode age is 19, with the total age range being 14 to 89 (BHC, 2007). Furthermore, community colleges are known for embracing individuals from minority groups, and students with various academic levels. On an average, community colleges tend to attract under-represented groups to higher education, but retaining minorities to graduate with degrees or certificates at the rate at which they are enrolling is low. Of all first-time college students who entered community colleges in 1995, only 36 percent earned a certificate, an associate degree or a bachelor's degree within six years (Bailey & Alfonso, 2005). At Brookhaven College, the highest enrollment increase with regard to ethnicity came from the Asian/Pacific Islander students at 7.8 percent followed by Hispanic students with a 5.5 percent increase (BHC, 2007). Enrollment by nonresident aliens was down in 2007

by 25.2 percent (from 151 in fall 2006 to 113 in fall 2007) (BHC, 2007).

There was not one study that particularly addressed the completion rate in college algebra among ethnicities, gender, and age. However, studies did reveal mathematics achievement rates while in high school and college. Pascarella and Terenzini (1991) conclude there was evidence that students from different racial or ethnic groups have different quantitative gains in college than their White counterparts. A 1997 study by Fimmen, Witthuhn, Riggins and Carson found that Hispanics have the lowest rate of educational attainment, have a larger number of high school dropouts, and have the second highest percentage of children living in poverty of any group in the nation. In 1995, statistics show nationwide that 82 percent of adults 25 years or older had completed high school and 23 percent had earned a bachelor's degree or higher (Fimmen et al., 1997). Of Hispanics 25 years and older, 53.4 percent had completed high school as compared with 73.8 percent of the African-Americans and 83 percent of the Whites. In addition, 27.1 percent of Hispanics, 37.5 percent of African-Americans, and 49 percent of Whites had completed some college. Only 9.3 percent of the Hispanic population had earned a bachelor's degree, as opposed to 13.2 percent of African-Americans and 24 percent of Whites (Fimmen et al., 1997). With the diverse enrollment growth at community colleges, these institutions have a huge challenge in the next five to ten years to meet the "Closing the Gaps" initiative. Once students enroll in college algebra courses, it is imperative that each individual institution adopt sound pedagogy to assist students in successfully completing their college algebra courses.

The issue of gender differences in mathematics learning is complex. As recently

as 2004, the gender gap in higher level mathematics courses such as precalculus and calculus has closed, meaning that females will take these courses at the same rate as males (Bae et al., 2000; Freeman, 2004; Xie & Shauman, 2003). In addition, prior research on mathematics courses revealed that there are ethnic disparities between African-American, Hispanic and White students (Jones et al., 1992; Ladson-Billings, 1997; Lucas, 1999; National Center for Education Statistics, 2001; Oakes, 1990). White students tend to take advanced mathematics courses in high school, which resulted in these students placing directly into college algebra once they enter college. On the other hand, African-American and Hispanic students take fewer higher level mathematics courses in high school; therefore they may or may not have direct placement into college algebra upon college entry. According to Adelman (1999 & 2003) and Schneider (2003) students who do not begin their sophomore year by taking geometry or Algebra II, will not be able to take advanced mathematics courses in high school such as trigonometry and calculus. These two courses determine which mathematics courses the students are placed in during college attendance.

Earlier research provided some distinct gender differences in educational achievement among minority students. Evidence suggested that Hispanic and African-American females do better in mathematics courses than their male peers (Clewell & Anderson, 1991; Mickelson, 1989; Roderick, 2003). One example given revealed that Hispanic females drop out of high school at a lower rate than Hispanic males, and both Hispanic and African-American females will complete a bachelor's degree at a higher rate than their male peers of the same ethnicity (Bae et. al., 2000; Freeman, 2004).

Minority females showed greater persistence levels, positive attitudes, and higher confidence levels, than their White peers (Catsambis, 1994; Mau & Domnick, 1995).

Riegle-Crumb (2006) did a study that examined the high school math course-taking trajectories of high school students of different racial-ethnic groups and genders using nationally representative data from the 1990's (p. 116). Riegle-Crumb (2006) found that race-ethnicity did not clearly identify that male and female students take the same level of mathematics courses. According to Riegle-Crumb (2006) the disadvantaged position of African-American and Hispanic males in a core high school subject, such as algebra must be carefully considered (p. 116). Riegle-Crumb (2006) stated "More work is needed to determine the critical factors in the public educational system, as well as the broader society, that function to place African-American and Hispanic males in a position of educational disadvantage" (p. 118).

Flowers's (2000) analyses of two multi-institutional data sets found that African-American students made significantly smaller gains during college than did similar White students. While measuring the variable of successful completers, one disadvantage for African-American students relative to White students was in first-year mathematics = .19 of a standard deviation, or 8 percentile points (Flowers, 2000). Secada (1992) examined the mathematics achievement of diverse groups on such factors as ethnicity. His focus examined whether the achievement gap between White and minority students has been shrinking. Secada (1992) stated that the mathematics achievement gap appears to be getting narrower for African-American students only and the difference was in basic mathematical skills. Secada (1992) said "basic computational skills are not deemed

sufficient for true knowledge and mastery of mathematics” (p. 630).

Students’ mathematics grades prior to taking college algebra have a positive correlation in traditional 16-week courses and 8-week courses (Owens, 2003). Better mathematical grades before college algebra continue to be improved in 16-week courses and 8-week courses. Swigart and Ethington (1998) did an additional analysis of a national sample of community college students and found significant differences between African-Americans, Asians, Hispanics, and White students in gains during college mathematics. Community colleges have the responsibility to help students from ethnic and minority groups complete and fulfill their educational goals. Students who have greater learning benefits from attending community colleges are students of color, older students and less affluent students (Pascarella & Terenzini, 1991).

McDonnell (2007) conducted a study that examined faculty-student interactions in the college algebra classroom for gender bias. The study used three measuring instruments to answer five research questions. The participants in the study were made up of four mathematics faculty members, 54 female students and 45 male students (p. 15). According to McDonnell (2007) male and female students responded unanimously, students with male instructors were silent in class, and male students received more positive responses from female instructors and females received more negative responses from male instructors (p. 15).

Summary

This literature review examined the relationship among Tinto’s student integration model, the impact of course length of time, relevant studies that pertain to

course length of time, attrition rates, and ethnicity, gender, and age differences in college algebra and how these factors contributed to whether there was a difference between 8-week courses and 16-week courses in terms of completion and success rates. The literature did not present solid research showing that 8-week courses had greater success rates than 16-week courses. In most cases, studies involving different course lengths of time have been conducted on small groups of students, but not on college algebra courses. This presented a gap in the research. Whether students successfully complete college algebra is a more practical determination of the effects of different course lengths of time.

The studies on integration used in this review infer that learning in college algebra classes will be maximized if students are academically and socially engaged in the institution. In return, this would result in higher success rates. What is known about attrition in college algebra is that it is high, but few methods to improve the attrition rates were not found in the research literature. This caused concern because college algebra is a gatekeeper course required for most two- or four-year degrees. Eight-week and 16-week course length of time used in this study may provide evidence that can lead to improving the success rates in college algebra with the goal of improving course completion, decreasing attrition, and overall improved success rates.

CHAPTER 3

METHODOLOGY

Introduction

This study examined which college algebra course, the traditional 16-week or the 8-week, had superior success rates. In addition, this study examined the grade distributions, in both the 8-week and 16-week courses among ethnicities, gender, and age groups and discovered whether differences existed. Each was analyzed separately.

The five purposes of this chapter were to: (1) describe the research design, (2) describe the data collection, (3) describe the population, (4) describe the research procedures, and (5) describe the testing of hypotheses.

Research Design

A comparative quantitative research design was used for this study. This is an ex post facto study. “Ex post facto research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables” (Kerlinger, 1973, p. 379). According to Gall, Gall, & Borg (2003) this methodology is an inquiry that is grounded in the assumption that features of the social environment constitute an objective reality that is relatively constant across time and settings (p. 634). The researcher compared the percentage of students earning an A, B, C, D, or F in different course lengths of time, either 8-weeks or 16-weeks, for college algebra. Withdraws (W) were not included in the

design. This study covered four sections of college algebra taught in 8-weeks and four sections of college algebra taught in 16-weeks, from fall 2004 through fall 2007 and included the same instructor who taught all eight sections. Hence, the variable of instructor did not change.

The number of students in each course and the number of students, who successfully and unsuccessfully completed each course, were gathered from a centralized data source that is maintained by Brookhaven College and the Dallas County Community College District. These hypotheses address strictly the successful students. The unsuccessful students are the complement of that. The percentage of unsuccessful students were found by taking 100 percent-(percent successful) since the two subsets are mutually exclusive and their union is the entire population of completers. The data was gathered by the Office of Institutional Research at Brookhaven College and placed on a USB disk.

Data Collection

Data was gathered using a case study of a single institution, Brookhaven College which is one of seven colleges in the Dallas County Community College District and is located in a suburban area of Dallas, Texas. It offers two-year transfer degree courses and certificate programs in technical fields. It is the second largest of the colleges in the District, enrolling approximately 10,400 students each semester. At Brookhaven College, approximately 415 students enroll in college algebra each semester. Permission was obtained from the President of Brookhaven College and the Institutional Review Board at the University of North Texas to use the archival data from Brookhaven College for this

study. Final course grades, ethnicities, gender, and age of students were collected from the archival data in order to classify them as earning a grade of A, B, C, D, F, or W (Withdrawing).

The Population

The population for this study consisted of the set of students enrolled in either one of the four sections of 8-weeks or 16-weeks college algebra courses from fall 2004 through fall 2007 at Brookhaven College. Eight sections of college algebra courses were identified by the researcher, four sections were the 8-week courses and four sections were the 16-week courses. All students enrolled in the eight college algebra sections were taught by the same faculty member. The sample size for this study was $N = 231$. According to Gall, Gall, & Borg (2003) a sample can be obtained and considered convenient for a variety of reasons: the sample is located at the researchers place of employment, the researcher is familiar with the setting, and might even work in it; and some of the data that the researcher needs already have been collected (p. 175). Gall, Gall, & Borg (2003) stated the fact, that many research studies that appear in journals involve college students because the researcher is a professor and these students provide a convenient sample (p. 175). Gall, Gall, & Borg (2003) also agreed that a convenience sample is an appropriate methodology if the readers of the report can infer a population to which the results might generalize (p. 175).

Research Procedures

The data analysis consisted of examining the grade distributions in the 8-week and 16-week college algebra courses and the grade distributions by ethnicity, gender, and age. One statistical test that was used is nonparametric. Nonparametric statistics are tests of statistical significance that do not rely on any assumptions about the shape or variance of population scores (Gall, Gall, & Borg, 2003, p. 313). To determine whether there was statistical significance between the 8-week and 16-week college algebra courses, grades were analyzed by using the non-parametric test based on Chi-Square (χ^2). According to Gall, Gall, & Borg (2003) the Chi-Square (χ^2) test can be used to determine whether research data in the form of frequency counts are distributed differently for different samples (p. 313). To determine whether differences exist among ethnicities, grades were analyzed by using the non-parametric test based on Chi-Square (χ^2). To determine whether differences exist among gender, grades were analyzed using a one-way analysis of variance. Analysis of variance (ANOVA) is a statistical procedure that compares the amount of between-groups variance in individuals' scores with the amount of within-group variance (Gall, Gall, & Borg, 2003, p. 307). The same procedures were used to determine whether differences exist within age groups. The two tests were analyzed by using the statistical software program *SPSS*, Statistical Package for the Social Sciences. All of the hypotheses were stated in the null form for testing.

Testing of Hypotheses

To test hypothesis 1, a 2×7 Chi-Square (χ^2) contingency table was used. The results of this test suggested if success rates are independent of course length of time. The dependent variable was the number of students who fell in each category. Table 1 was designed as shown in the following illustration.

Table 1

Number of Students Completing College Algebra According to Course Length of Time

Time	A	B	C	D	F	W	N
8-weeks	*						
16-weeks							
Total							

*denotes number of students

To test hypothesis 2, parts A, B, C, D, a 4×2 Chi-Square (χ^2) contingency table was used. The results of this test suggested if success rates are independent of course length of time. The dependent variable was the number of students based on a particular ethnicity who fell into each category. Tables 2 and 3 were designed as illustrated here.

Table 2

Number of Students Based on Ethnicity Completing College Algebra in 8-weeks

8-weeks	Successful A, B, C grades	Unsuccessful D, F grades	Total
White, Non-Hispanic	*		
African-American			
Hispanic, Mexican American			
Asian, Pacific Islander			
Total			

*denotes number of students

Table 3

Number of Students Based on Ethnicity Completing College Algebra in 16-weeks

16-weeks	Successful A, B, C grades	Unsuccessful D, F grades	Total
White, Non-Hispanic	*		
African-American			
Hispanic, Mexican American			
Asian, Pacific Islander			
Total			

*denotes number of students

To test hypothesis 3A, B, C, and D, a 2×5 Chi-Square (χ^2) contingency table was used. The results of this test suggested if A's, B's, C's, D's, and F's are independent of course length of time. The dependent variable was the number of students who fell into each category. The design of tables 4 & 5 is shown in the following illustrations.

Table 4

Grade Distributions of Students Based on Ethnicity in 8-weeks

8-weeks	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
White, Non-Hispanic	*					
African-American						
Hispanic, Mexican American						
Asian, Pacific Islander						
Total						

* denotes number of students

Table 5

Grade Distributions of Students Based on Ethnicity in 16-weeks

16-weeks	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
White, Non- Hispanic	*					
African- American						
Hispanic, Mexican American						
Asian, Pacific Islander						
Total						

* denotes number of students

To test hypothesis 4 parts A & B, a one-way analysis of variance was used and presented in a 2×5 Chi-Square (χ^2) contingency table. The analysis of variance allowed for the testing of differences in the means of grades between and within course length of time by using the Post Hoc multiple comparison tests. The independent variables were course length of time, either the 8-weeks or 16-weeks and the grades received by each gender completing college algebra. The dependent variable was the number of students based on a particular gender who fell into each category. Tables 6 and 7 were designed as illustrated here.

Table 6

Number of Males Completing College Algebra According to Course Length of Time

Time	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
8-weeks	*					
16-weeks						

* denotes number of students

Table 7

Number of Females Completing College Algebra According to Course Length of Time

Time	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
8-weeks	*					
16-weeks						

* denotes number of students

To test hypothesis 5 parts A, B, and C, a one-way analysis of variance was used and presented in a 3×5 Chi-Square (χ^2) contingency table. The independent variables were course length of time, either the 8-weeks or 16-weeks and the grades received by students completing college algebra. The dependent variable was the number of students based on a particular age group who fell into each category. Tables 8 and 9 present the data.

Table 8

Number of Students Based on Age Completing College Algebra in 8-weeks

8-weeks	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
Ages (18-22)	*					
Ages (23-30)						
Ages (31-40+)						

*denotes number of students

Table 9

Number of Students Based on Age Completing College Algebra in 16-weeks

16-weeks	Number of A grades	Number of B grades	Number of C grades	Number of D grades	Number of F grades	Total
Ages (18-22)	*					
Ages (23-30)						
Ages (31-40+)						

*denotes number of students

CHAPTER 4

DATA COLLECTION AND ANALYSIS

Introduction

There were four purposes of this study. The first was to determine which course length of time, 8-weeks or 16-weeks would result in a higher proportion of students successfully completing college algebra. The second purpose was to determine whether differences existed in grades among the same ethnicities in the 8-week and 16-week courses. The third purpose was to determine whether differences existed in grades among the same genders in the 8-week and 16-week courses. The fourth purpose of this study was to determine whether differences existed in grades among the same age groups in the 8-week or 16-week courses.

This study utilized archival data from Brookhaven College, one of the seven colleges in the Dallas County Community College District. All of the students who were enrolled in the eight sections in the study were enrolled on the twelfth class day. According to Gherardi & Turner (1987) researchers can speak of “data transformation” as information that is condensed, clustered, sorted, and linked over time. Miles and Huberman (1994) conclude that there is no clear or clean boundary between describing and explaining; the researcher typically moves through a series of analysis episodes that condense more and more data into a coherent understanding of what, how, and why (p. 91). This study provided a total sample of $N=231$, from the fall semester 2004 through fall 2007. This included students who repeated college algebra. Seventy-five of the 231 students that received grades in the eight sections of college algebra used in this study

were repeaters. This means that 32 percent were repeating college algebra. Further information revealed that: 47 students had taken college algebra two times, 20 percent; 19 students had taken college algebra three times, 8.2 percent; 4 students had taken college algebra four times, 1.7 percent; 3 students had taken college algebra five times, 1.3 percent; and 2 students had taken college algebra six times, .9 percent. Only the students who took these courses in the traditional classroom setting were included in the study. The students who were enrolled in online college algebra sections were excluded since a different modality of instruction was employed.

Course Length of Time Data

Students' records were separated into two course lengths of time, semesters of 8-weeks or 16-weeks; Table 10 contains this information. There were 32 students who were enrolled in the 8-week college algebra course during the fall 2004 semester. There were 44 students who were enrolled in the 16-week college algebra course during this same time period. The course sections were chosen not randomly, but based on the fact that the same instructor taught all of them. Sixteen students were enrolled in the 8-week college algebra course, during the fall 2006 semester, with 36 students enrolled in the 16-week college algebra course during this same time period. No 8-week courses were offered in spring 2007, but there were two 16-week sections taught by the same instructor who taught all the other courses used in this study. Seventy-two students were enrolled in these two sections. In summer 2007 there were 16 students enrolled in the 8-week course and 16-week courses were offered during this time, but no sections were used because they were not taught by the same instructor who taught all of the other courses

used in this study. In fall 2007, 15 students enrolled in the 8-week course; no 16-week course was taught by the same instructor who taught all of the other courses used in this study.

Table 10

Number of Students Enrolled in 8-weeks and 16-weeks Semesters

College Algebra	8-week	16-week	Total
Fall 2004	32	44	76
Fall 2006	16	36	52
Spring 2007	0	72	72
Summer 2007	16	0	16
Fall 2007	15	0	15
Total	79	152	231

In the college algebra classes, each lecture section had a maximum of thirty-six students, with the exception of the 16-week section in fall 2004 which had 44 students.

Successful Students Data

Of the 79 students who took college algebra in 8-weeks, 54 were successful and 13 were unsuccessful, where success was defined to be completion with the grade of A, B, or C. Unsuccessful completion included grades of D and F. Withdrawals were not included in the data analysis, with withdrawals being those students who voluntarily removed themselves from the class before the semester had finished. However, the

number of withdrawals in each course length of time is reported. In the 8-week college algebra courses there were 12 withdraws.

In the 16-week college algebra courses 119 students were successful and 13 were unsuccessful. There were 16 withdraws. In the 16-week courses, four grades of N were given. An N meant that students failed the course due to non-participation in class, i.e., non-attendance after the institutions official drop date, not turning in assignments or taking tests. The N grade is shown as an F on the transcript. Grades of N were not included in the data analysis. Table 11 presents the data.

Table 11

Successful and Unsuccessful Grades in 8-weeks and 16-weeks

Time	A	B	C	D	F	W	N
8-weeks	27	17	10	3	10	12	0
16-weeks	37	50	32	9	4	16	4
Total	64	67	42	12	14	28	4

College algebra is the first course in mathematics at the college level and enrolls a larger number of students than other college level mathematics courses. Student enrollment in college algebra is dependent upon the following: the completion of a developmental mathematics program, assessment scores that meet the requirements and completion of Algebra I and Algebra II in high school, assessed into trigonometry or another higher-level mathematics course, but chose to enroll in college algebra, or placed

into an advanced mathematics course and did not pass so the student took college algebra for a review of mathematical concepts. As the assumptions stated in Chapter 1, these students enrolled in the specific course length of time, based on their own judgment or advice given to them by an academic advisor (Assumption #1, p. 17).

Analysis of the Data

Five sets of hypotheses were tested to carry out the four purposes of this study. This section presents an analysis of the data and findings found in the testing of these hypotheses. For the purpose of analysis, a null form was stated. A α level of .05 was used.

Archival data were acquired from the Office of Institutional Research at Brookhaven College listing all the students, from the eight college algebra sections selected, who had taken college algebra at Brookhaven College during the semesters, fall 2004 through fall 2007. These data were divided into course length of time: 8-weeks and 16-weeks.

Purpose 1

The first purpose was to determine which course length of time, 8-weeks or 16 weeks would result in a higher proportion of students completing college algebra. To examine this purpose, the following hypothesis was tested.

Hypothesis 1: A statistically significant greater number of students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students who are enrolled in the traditional 16-week college algebra course.

To test this hypothesis, the following null hypothesis was used: There is no difference in the success rates between the 8-week and 16-week college algebra courses.

A Chi-Square (χ^2) test indicated, $\chi^2 (1, N = 199) = 3.57$, with a p-value of .059.

Therefore, there was no difference in the success rates between the 8-week and 16-week course lengths of time. There was no evidence to suggest that Hypothesis 1 was true; the data did not allow the researcher to make this conclusion. That is failing to reject the null did not indicate its truth. Table 12 presents the data.

Table 12

Successful and Unsuccessful Grade Distributions for 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	Successful A, B, C	Unsuccessful D, F	Total
8-weeks	54 27.1 80.6 31.2	13 6.5 19.4 50.0	67 33.7
16-weeks	119 59.8 90.2 68.8	13 6.5 9.8 50.0	132 66.3
Total	173 86.9	26 13.1	199 100.0

df = 1, Critical Value for $\chi^2 = 3.57$ ($\alpha = .05$).

Summary of Purpose 1

Purpose 1 was completed by testing one hypothesis. The purpose was to establish which course length of time, 8-weeks or 16-weeks, allowed the highest proportion of students to be successful in college algebra. It was hypothesized that for college algebra, the 8-weeks course length of time would allow a statistically significant number of students to be successful. There was no evidence to suggest this was true.

Purpose 2

The second purpose was stated: To determine whether differences exist within grades among ethnicities of students enrolled in the 8-week and 16-week college algebra courses. To examine this second purpose of the study, one hypothesis was tested with parts A, B, C, and D. Ethnicities were categorized by White, Non-Hispanic; African-American; Hispanic, Mexican-American; Asian, Pacific Islander, and other. The category classified as other was not analyzed in this study. All of the ethnicities were divided by course length of time, 8-weeks or 16-weeks. All ethnicities were analyzed separately. The hypothesis was stated in null form in order to be analyzed statistically.

Hypothesis 2: There are statistically significant differences in grades among ethnicities of students enrolled in the 8-week college algebra course at Brookhaven College than in those same ethnicities enrolled in the traditional 16-week course at Brookhaven.

Hypothesis 2A: A statistically significant greater number of White, Non-Hispanic students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than White, Non-Hispanic students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in the success rates among White, Non-Hispanic students enrolled in the 8-week and 16-week college algebra courses.

The first ethnicity analyzed were the students classified as White, Non-Hispanic. There were 26 White students in the 8-week and 60 students in the 16-week college algebra courses. The numbers of students in each course length of time for college algebra is shown in Table 13. A Chi-Square (χ^2) test indicated, $\chi^2(1, N = 86) = 1.20$, with a p-value of .273. The data did not indicate a significant difference in success rates for White students between the 8-week and 16-week college algebra courses. There was not data to indicate that Hypothesis 2A was true.

Table 13

Successful and Unsuccessful for White, Non-Hispanic Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	Successful A, B, C	Unsuccessful D, F	Total
8-weeks	19 22.1 73.1 27.5	7 8.1 26.9 41.2	26 30.2
16-weeks	50 58.1 83.3 72.5	10 11.6 16.7 58.8	60 69.8
Total	69 80.2	17 19.8	86 100.0

df = 1, Critical Value for $\chi^2 = 1.20$ ($\alpha = .05$).

Hypothesis 2B: A statistically significant greater number of African-American students in the 8-week college algebra at Brookhaven College will be successful, earn grades of A, B, C, than African-Americans students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in the success rates among African-American students enrolled in the 8-week and 16-week college algebra courses.

The second ethnicity analyzed were the students classified as African-American. There were eight African-American students in the 8-week course and 14 students in the 16-week college algebra courses. The numbers of students in each course length of time for college algebra is shown in Table 14.

A Chi-Square (χ^2) test indicated, $\chi^2(1, N = 22) = .177$, with a p-value of .674.

The data did not indicate a significant difference in success rates for African-American students between the 8-week and 16-week college algebra courses. There was not data to indicate that Hypothesis 2B was true.

Table 14

Successful and Unsuccessful for African-American Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	Successful A, B, C	Unsuccessful D, F	Total
8-weeks	7 31.8 87.5 35.0	1 4.5 12.5 50.0	8 36.4
16-weeks	13 59.1 92.9 65.0	1 4.5 7.1 50.0	14 63.6
Total	20 90.9	2 9.1	22 100.0

df = 1, Critical Value for $\chi^2 = .177$ ($\alpha = .05$).

Hypothesis 2C: A statistically significant greater number of Hispanic, Mexican American students in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than Hispanic, Mexican American students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in the success rates among Hispanic, Mexican American students enrolled in the 8-week and 16-week college algebra courses.

The third ethnicity examined were the students classified as Hispanic, Mexican American. There were 16 students in the 8-week course and 31 students in the 16-week

college algebra courses. The numbers of students in each course length of time for college algebra is shown in Table 15.

A Chi-Square (χ^2) test indicated, $\chi^2(1, N = 47) = .237$, with a p-value of .626. In both the 8-weeks and 16-weeks no grades of D were received. Hence, the data did not indicate a significant difference in success rates for Hispanic, Mexican American students between the 8-week and 16-week college algebra courses. There was not data to indicate that Hypothesis 2C was true.

Table 15

Successful and Unsuccessful for Hispanic, Mexican-American Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	Successful A, B, C	Unsuccessful D, F	Total
8-weeks	15 31.9 93.8 33.3	1 2.1 6.3 50.0	16 34.0
16-weeks	30 63.8 96.8 66.7	1 2.1 3.2 50.0	31 66.0
Total	45 95.7	2 4.3	47 100.0

df = 1, Critical Value for $\chi^2 = .237$ ($\alpha = .05$).

Hypothesis 2D: A statistically significant greater number of Asian, Pacific Islander students in the 8-week college algebra course at Brookhaven College will be successful,

earn grades of A, B, C, than Asian, Pacific Islander students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in the success rates among Asian, Pacific Islander students enrolled in the 8-week and 16-week college algebra courses.

The fourth ethnicity examined were the students classified as Asian, Pacific Islander. There were 11 students in the 8-week course and 23 students in the 16-week college algebra courses. The numbers of students in each course length of time for college algebra is shown in Table 16.

The null hypothesis was rejected since the χ^2 value was significant for Asian, Pacific Islander students at the $\alpha = .05$ level. Chi-Square (χ^2) was significant, $\chi^2(1, N = 34) = 6.08$, with a p-value of .014. Hence, there was a difference in success rates for Asian, Pacific Islander students between the 8-week and 16-week college algebra courses. Data indicates Hypothesis 2D to be true.

Table 16

Successful and Unsuccessful for Asian, Pacific Islander students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	Successful A, B, C	Unsuccessful D, F	Total
8-weeks	7 20.6 63.6 24.1	4 11.8 36.4 80.0	11 32.4
16-weeks	22 64.7 95.7 75.9	1 2.9 4.3 20.0	23 67.6
Total	29 85.3	5 14.7	34 100.0

df = 1, Critical Value for $\chi^2 = 6.08$ ($\alpha = .05$).

Hypothesis 3A: There are statistically significant differences in the number of A's, B's, C's, D's and F's among White, Non-Hispanic students in the 8-week college algebra course at Brookhaven College than, White, Non-Hispanic students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in A's, B's, C's, D's and F's among White, Non-Hispanics students enrolled in the 8-week and 16-week college algebra courses.

The numbers of students in each course length of time for college algebra in shown in Table 17. The null hypothesis was rejected, since the χ^2 critical value was significant at the $\alpha = .05$ level. Chi-Square (χ^2) was significant, $\chi^2(4, N = 86) = 9.58$,

with a p-value of .048. Thus, there was a significant difference in A's, B's, C's, D's and F's for White, Non-Hispanic students between the 8-week and 16-week college algebra courses. The data indicated Hypothesis 3A to be true.

Table 17

Grade Distributions for White, Non-Hispanic Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	A	B	C	D	F	Total
8-weeks	9 10.5 34.6 39.1	7 8.1 26.9 28.0	3 3.5 11.5 14.3	2 2.3 7.7 20.0	5 5.8 19.2 71.4	26 30.2
16-weeks	14 16.3 23.3 60.9	18 20.9 30.0 72.0	18 20.9 30.0 85.7	8 9.3 13.3 80.0	2 2.3 3.3 28.6	60 69.8
Total	23 26.7	25 29.1	21 24.4	10 11.6	7 8.1	86 100.0

df = 4, Critical Value for $\chi^2 = 9.58$ ($\alpha = .05$).

Hypothesis 3B: There are statistically significant differences in the number of A's, B's, C's, D's and F's among African-American students in the 8-week college algebra course at Brookhaven College than, African-American students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in A's, B's, C's, D's and F's among African-American students enrolled in the 8-week and 16-week college algebra courses.

The numbers of students in each course length of time for college algebra is shown in Table 18. A Chi-Square (χ^2) analysis gave, $\chi^2(4, N = 22) = 3.71$, with a p-value of .447. Therefore, the data did not indicate a difference in A's, B's, C's, D's, and F's for African-American students between the 8-week and 16-week college algebra courses. That is, data did not indicate Hypothesis 3B to be true.

Table 18

Grade Distributions for African-American Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	A	B	C	D	F	Total
8-weeks	4	1	2	0	1	8
	18.2	4.5	9.1	.0	4.5	36.4
	50.0	12.5	25.0	.0	12.5	
	40.0	16.7	50.0	.0	100	
16-weeks	6	5	2	1	0	14
	27.3	22.7	9.1	4.5	.0	63.6
	42.9	35.7	14.3	7.1	.0	
	60.0	83.3	50.0	100.0	.0	
Total	10	6	4	1	1	22
	45.5	27.3	18.2	4.5	4.5	100.0

df = 4, Critical Value for $\chi^2 = 3.71$ ($\alpha = .05$).

Hypothesis 3C: There are statistically significant differences in the number of A's, B's, C's, D's, and F's among Hispanic, Mexican American students in the 8-week college algebra course at Brookhaven College than, Hispanic, Mexican American students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in A's, B's, C's, D's and F's among Hispanic, Mexican American students enrolled in the 8-week and 16-week college algebra courses. The numbers of students in each course length of time for college algebra is shown in Table 19.

A Chi-Square (χ^2) analysis gave, $\chi^2(3, N = 47) = 3.99$, with a p-value of .263. In both the 8-weeks and 16-weeks no grades of D were received. Hence, the data did not indicate a difference in A's, B's, C's, D's and F's for Hispanic, Mexican American students between the 8-week and 16-week college algebra courses. That is, data did not indicate Hypothesis 3C to be true.

Table 19

Grade Distributions for Hispanic, Mexican-American Students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	A	B	C	F	Total
8-weeks	7 14.9 43.8 53.8	4 8.5 25.0 21.1	4 8.5 25.0 30.8	1 2.1 6.3 50.0	16 34.0
16-weeks	6 12.8 19.4 46.2	15 31.9 48.4 78.9	9 19.1 29.0 69.2	1 2.1 3.2 50.0	31 66.0
Total	13 27.7	19 40.4	13 27.7	2 4.3	47 100.0

df = 3, Critical Value for $\chi^2 = 3.99$ ($\alpha = .05$).

Hypothesis 3D: There are statistically significant differences in the number of A's, B's, C's, D's and F's among Asian, Pacific Islander students in the 8-week college algebra courses at Brookhaven College, than Asian, Pacific Islander students who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in A's, B's, C's, D's and F's among Asian, Pacific Islander students enrolled in the 8-week and 16-week college algebra courses.

The numbers of students in each course length of time for college algebra is shown in Table 20. A Chi-Square (χ^2) analysis gave, $\chi^2(4, N = 34) = 6.88$, with a p-value of .142. Hence, the data did not indicate a difference in A's, B's, C's, D's and F's

for Asian, Pacific Islander students between the 8-week and 16-week college algebra courses. That is, data did not indicate Hypothesis 3D to be true.

Table 20

Grade Distributions for Asian, Pacific Islander students in 8-weeks and 16-weeks

Frequency Percent of grand total Percent of row total Percent of column total	A	B	C	D	F	Total
8-weeks	4 11.8 36.4 30.8	2 5.9 18.2 16.7	1 2.9 9.1 25.0	1 2.9 9.1 100.0	3 8.8 27.3 75.0	11 32.4
16-weeks	9 26.5 39.1 69.2	10 29.4 43.5 83.3	3 8.8 13.0 75.0	0 .0 .0 .0	1 2.9 4.3 25.0	23 67.6
Total	13 38.2	12 35.3	4 11.8	1 2.9	4 11.8	34 100.0

df = 4, Critical Value for $\chi^2 = 6.88$ ($\alpha = .05$).

Summary of Purpose 2

The second purpose of this study was to determine whether differences existed within grades among ethnicities of students enrolled in the 8-week and 16-week college algebra courses. There was no evidence to suggest that White, Non-Hispanic; African-American; and Hispanic, Mexican, American students, success rates differed significantly. For Asian, Pacific-Islander, success rates did differ statistically.

It was found that for White students, A's, B's, C's, D's and F's did differ significantly. For African-American; Hispanic, Mexican American; Asian, Pacific-

Islander, there was no evidence to suggest that A's, B's, C's, D's and F's differed statistically.

Purpose 3

The third purpose of this study was stated: To determine whether differences exist within grades among genders of students enrolled in the 8-week and 16-week college algebra courses. This purpose was examined using one hypothesis with parts A & B. This hypothesis was tested using a one-way analysis of variance where course length of time and grades received by each gender were the independent variables and the dependent variable was the number of students based on a particular gender who fell into each category. The text representations of grades were given numeric points. The grade of A had 4 points, a grade of B had 3 points, and grade of C had 2 points, a grade of D had 1 point, and a grade of F had 0 points. Reported enrollments for females in both 8-weeks and 16-weeks were larger than the male enrollments in 8-weeks and 16-weeks: 38 females to 29 males in 8-weeks and 82 females and 50 males in 16-weeks.

Hypothesis 4: There are statistically significant differences in grades among genders of students enrolled in the 8-week college algebra course at Brookhaven College than in those same genders in the traditional 16-week course at Brookhaven College.

Hypothesis 4A: A statistically significant greater number of males in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than males who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in success rates among male students in the 8-week and 16-week college algebra courses.

Males were the first gender to be analyzed.

Table 21

Grade Distributions of Males in 8-weeks and 16-weeks

Frequency	A	B	C	D	F	Total
8-weeks	13	6	2	1	7	29
16-weeks	6	23	13	6	2	50
Total	19	29	15	7	9	79

Table 21 shows the grade distributions for males in 8-weeks and 16-weeks, followed by Table 22 which provides the ANOVA summary table for males between course length of time and success rates.

Table 22

Analysis of Variance Summary Table for Males

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	.354	1	.354	1.516	.222	.019
Within Groups	18.000	77	.234			
Total	18.354	78				

Note. $N = 79$.
 $p > .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .167, this is equivalent to a F_{calc} statistic, since this value was above .05 the researcher interpreted the ANOVA. The occasion source of variance for overall success rates yielded a low 1.9% η^2 effect and was not statistically significant;

$F(1, 78) = 1.516$, with a p-value of .222. The data did not suggest a difference in success rates for males in 8-weeks and 16-week college algebra courses. That is, the data did not indicate that Hypothesis 4A was true.

To further extend hypothesis 4A, a second one-way analysis of variance test was analyzed. This tested whether there were differences in A's, B's, C's, D's and F's among males in the 8-week and 16-week college algebra courses. Table 23 presents the data.

Table 23

Analysis of Variance Summary Table for Males

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	5.345	4	1.336	7.600	.000	.291
Within Groups	13.010	74	.176			
Total	18.355	78				

Note. $N = 79$.
 $p < .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .134, this is equivalent to a F_{calc} statistic, since this value was above .05 the researcher interpreted the ANOVA. The occasion source of variance for overall grades

yielded a moderate 29.1% η^2 effect and was statistically significant;

$F(4, 78) = 7.600$, with a p-value of .000. Therefore, reject the null hypothesis. Data indicated a difference in A's, B's, C's, D's and F's for males in 8-week and 16-week college algebra courses.

The Post Hoc multiple comparisons test was conducted and this test showed exactly where the differences in A's, B's, C's, D's and F's were. Using the multiple comparisons test, it was noted that the A's mean difference were no different than F's (significance .981), but A's mean difference were different from B's (significance .002), C's (significance .003), and D's (significance .036). Statistically A's means equal F's means, but A's and F's means do not equal B's, C's, and D's means. This means for male's course length of time did affect the numbers of A's and F's, but did change the number of B's, C's, and D's.

Hypothesis 4B: A statistically significant greater number of females in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than females who are enrolled in the traditional 16-week college algebra course.

Females were the second gender to be analyzed.

Table 24

Grade Distributions of Females in 8-weeks and 16-weeks

Frequency	A	B	C	D	F	Total
8-weeks	14	11	8	2	3	38
16-weeks	31	27	19	3	2	82
Total	45	38	27	5	5	120

Table 24 shows the grade distribution for females in 8-weeks and 16-weeks, followed by Table 25 which provides the ANOVA summary table for females between course length of time and success rates.

Table 25

Analysis of Variance Summary Table for Females

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	.367	1	.367	1.690	.196	.014
Within Groups	25.600	118	.217			
Total	25.967	119				

Note. $N = 120$.
 $p > .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .174, this value is equivalent to a F_{calc} statistic, since this value was above .05 the researcher interpreted the ANOVA.

The occasion source of variance for overall grades yielded a small 1.4% η^2 effect and was not statistically significant; $F(1,119) = 1.690$, with a p-value of .196. The data did not suggest a difference in success rates for females in 8-weeks and 16-weeks college algebra courses. That is, the data did not indicate that Hypothesis 4B was true.

To further extend hypothesis 4B, a second one-way analysis of variance test was analyzed. This tested whether there were differences in A's, B's, C's, D's and F's among females in the 8-week and 16-week college algebra courses. Table 26 presents the data.

Table 26

Analysis of Variance Summary Table for Females

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	.477	4	.119	.538	.708	.018
Within Groups	25.490	115	.222			
Total	25.967	119				

Note. $N = 120$.
 $p > .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .877, this value is equivalent to a F_{calc} statistic, since this value was above .05 the researcher interpreted the ANOVA.

The occasion source of variance for overall grades yielded a small 1.8% η^2 effect and was not statistically significant; $F(4,119) = .538$, with a p-value of .708. The data did not indicate a difference in A's, B's, C's, D's and F's for females in 8-weeks and 16-weeks college algebra courses.

Summary of Purpose 3

Purpose 3 addressed possible differences in success rates for males and females in 8-week and 16-week college algebra courses. The data did not indicate a difference in success rates for males and females. There was a difference in A's, B's, C's, D's and F's for males. The data did not indicate a difference for females.

Purpose 4

The fourth, and last, purpose of this study was stated: To determine whether differences exist within grades among age groups of students enrolled in the 8-week and 16-week college algebra courses. This purpose was examined using one hypothesis with parts A, B, and C. This hypothesis was tested using a one-way analysis of variance where course length of time and grades received by each age group were the independent variables and the dependent variable was the number of students based on a particular age group who fell into each category. The age group categories tested were the following: age group (18-22), age group (23-30) and age group (31-40+). The text representations of grades were given numeric points. The grade of A had 4 points, a grade of B had 3 points, and grade of C had 2 points, a grade of D had 1 point, and a grade of F had 0 points.

Hypothesis 5: There are statistically significant differences in grades among age groups of students enrolled in the 8-week college algebra course at Brookhaven College than in those same age groups enrolled in the traditional 16-week course at Brookhaven College.

Hypothesis 5A: A statistically significant greater number of students in the age group (18-22), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (18-22), who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in success rates among the age group (18-22) of students in the 8-week and 16-week college algebra courses.

Table 27

Grade Distributions of the Age Group (18-22) in 8-weeks and 16-weeks

Frequency	A	B	C	D	F	Total
8-weeks	13	6	4	0	2	25
16-weeks	16	31	13	4	4	68
Total	29	37	17	4	6	93

Table 27 shows the grade distributions for the age group (18-22) in 8-weeks and 16-weeks, followed by Table 28 which provides the ANOVA summary table for the age group (18-22) between course length of time and success rates.

Table 28

Analysis of Variance Summary Table for Age Group (18-22)

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	.053	1	.053	.265	.608	.002
Within Groups	18.227	91	.200			
Total	18.280	92				

Note. $N = 93$.
 $p > .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .246, this is equivalent to a F_{calc} statistic, since this value was above .05 the researcher interpreted the ANOVA. The occasion source of variance for overall success rates yielded a low .2% η^2 effect and was not statistically significant;

$F(1,92) = .265$, with a p-value of .608. The data did not indicate a difference in success rates for the age group (18-22) in 8-weeks and 16-weeks college algebra courses. That is, the data did not indicate that Hypothesis 5A was true.

Hypothesis 5B: A statistically significant greater number of students in the age group (23-30), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (23-30), who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in success rates among the age group (23-30) of students in the 8-week and 16-week college algebra courses.

Table 29

Grade Distributions of the Age Group (23-30) in 8-weeks and 16-weeks

Frequency	A	B	C	D	F	Total
8-weeks	8	7	4	3	5	27
16-weeks	14	14	16	4	0	48
Total	22	21	20	7	5	75

Table 29 shows the grade distributions for the age group (23-30) in 8-weeks and 16-weeks, followed by Table 30 which provides the ANOVA summary table for the age group (23-30) between course length of time and success rates.

Table 30

Analysis of Variance Summary Table for the Age Group (23-30)

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	1.343	1	1.343	6.154	.015	.077
Within Groups	15.937	73	.218			
Total	17.280	74				

Note. $N = 75$.
 $p < .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .685, this is equivalent to a F_{calc} statistic, since this value was above .05 the

researcher interpreted the ANOVA. The occasion source of variance for overall success rates yielded a moderate 7.7% η^2 effect and was statistically significant;

$F(1, 74) = 6.154$, with a p-value of .015. Hence, reject the null hypothesis. There was a difference in success rates for the age group (23-30) in 8-weeks and 16-weeks college algebra courses. Hypothesis 5B was thus found to be true.

Hypothesis 5C: A statistically significant greater number of students in the age group (31-40+), in the 8-week college algebra course at Brookhaven College will be successful, earn grades of A, B, C, than students in the age group (31-40+), who are enrolled in the traditional 16-week college algebra course.

The null hypothesis tested was: There is no difference in success rates among the age group (31-40+) of students in the 8-week and 16-week college algebra courses.

Table 31

Grade Distributions of the Age Group (31-40+) in 8-weeks and 16-weeks

Frequency	A	B	C	D	F	Total
8-weeks	6	4	2	0	3	15
16-weeks	7	5	3	1	0	16
Total	13	9	5	1	3	31

Table 31 shows the grade distributions for the age group (31-40+) in 8-weeks and 16-weeks, followed by Table 32 which provides the ANOVA summary table for the age group (31-40+) between course length of time and success rates.

Table 32

Analysis of Variance Summary Table for Age Group (31-40+)

<i>Source</i>	<i>SS</i>	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>	η^2
Between Groups	.325	1	.325	1.272	.269	.041
Within Groups	7.417	29	.256			
Total	7.742	30				

Note. $N = 31$.
 $p > .05$.

The Test of Homogeneity of Variances was examined first. The significance value was .029, this is equivalent to a F_{calc} statistic, this value was below .05, but the researcher interpreted the ANOVA. The occasion source of variance for overall success rates yielded a low 4.1% η^2 effect and was not statistically significant;

$F(1, 30) = 1.272$, with a p-value of .269. The data did not indicate a difference in success rates for the age group (31-40+) in 8-weeks and 16-weeks college algebra courses. That is, the data did not indicate that Hypothesis 5C was true.

Summary of Purpose 4

Purpose 4 addressed if there were differences in success rates for the age groups (18-22), (23-30) and (31-40+) in 8-week and 16-week college algebra courses. There was no difference in success rates for the age groups (18-22) and (31-40+). However, there was a difference in success rates for the age group (23-30).

Additional Analysis

In this study, withdrawals were not included in any of the analysis. Since withdrawal and attrition rates are relatively high in college algebra, the researcher chose to do an additional analysis on withdrawal rates in 8-week and 16-week college algebra courses. Since the number of withdrawals was binomially distributed, the binomial distribution was approximated by the normal distribution to test the equality of the proportion of withdrawals from two populations of 8-week students and the population of 16-week students. The following null hypothesis was used: There is no difference in the proportion of students who withdrew from an 8-week course and the proportion of students who withdrew from a 16-week course. A p-value of .8133 was found by consulting the standard normal table. The data did not indicate a significant difference in the proportion of students who withdrew from an 8-week course and the proportion of students who withdrew from a 16-week course. Therefore, the researcher failed to reject the null hypothesis. Table 33 presents the data.

Table 33

Withdrawal Rates in 8-weeks and 16-weeks

Frequency Percent of row total	Withdrawal 8-weeks & 16-weeks	Total # of students in 8-weeks & 16-weeks
8-weeks	12 15.2	79
16-weeks	16 10.5	152

Critical Value = .8874 ($\alpha = .05$).

Summary of Data Analysis

The data did not indicate that Hypothesis 1 and Hypothesis 2A, B, and C were found to be true. Hypothesis 2D was found to be true. Hypothesis 3B, C, and D were found to be false, while 3A was found to be true. Hypothesis 4 was found to be false. Hypothesis 5A and C were found to be false, while 5B was found to be true. Nevertheless, additional conclusions were drawn and presented in Chapter 5.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The intent of this study was to determine the following (1) whether a higher proportion of students were able to be successful in the 8-week college algebra course than in the traditional 16-week college algebra course. In addition, this study considered (2) whether there were differences in success rates among ethnicities, in the 8-week, college algebra course and in those same ethnicities in the 16-week course, (3) whether there were differences in success rates among genders, in the 8-week college algebra course and in those same genders in the 16-week course, (4) whether there were differences in success rates among age groups in the 8-week college algebra course and in those same age groups in the 16-week course. Four purposes were designed to carry out this study and the data was collected for the time period of fall 2004 through fall 2007. These data were analyzed using five sets of hypotheses. This chapter presents a summary and a discussion of the results, draws some conclusions based on the results and previous studies, and provides some recommendations for further study.

Summary and Discussion of Findings

There were five sets of hypotheses examined in this study; each set was related to the four purposes presented in chapter one.

Two course lengths of time were considered for college algebra. The college algebra courses were studied over the time period from fall 2004 through fall 2007. The two course lengths of time were the traditional 16-weeks and a shortened course length of

time 8-weeks.

The course lengths of time were considered for each hypothesis. A Chi-Square (χ^2) test was performed for hypothesis 1 to determine which course length of time provided for the highest number of students to be successful. Success was taken to be earning a grade of A, B, or C as an end of the semester grade. Data did not indicate a difference in success rates for the 8-week and 16-week college algebra courses.

These findings can be accounted for in several ways. Grimes and Niss (1989) in their study that compared 15-weeks versus 8-weeks or 10-weeks in economics courses found that there were no significant differences between the course lengths of time. However, Grimes and Niss (1989) concluded that students learned the same amount of material in a shortened course length of time. As a researcher, who has taught both 8-weeks and 16-weeks college algebra courses, students do learn the same amount of material and sometimes are able to explore the mathematical concepts at a deeper level in the 8-week course. Students voluntarily register for the 8-week course, having been advised that the course is fast pace, meet four days a week, and might explore topics that are not in a traditional college algebra course. One reason for learning concepts more in-depth in the 8-week course is because the interaction between students and the faculty member increases student engagement in the mathematics classroom. Meeting four days a week provides benefits for students such as increased time on task, whereas two days a week provides less time on task per week. The higher education literature did not present a plethora of studies on course length of time for college algebra.

Course length of time was examined in this study to see whether 8-weeks or 16-

weeks affected success rates in college algebra. It was proposed that the 8-week college algebra course would allow for higher success rates. Bartels (1982) and Small (2002b) have both identified that course pace and length of time cause concern in success rates in courses such as college algebra. In this study, there was no statistical difference found between the 8-weeks and 16-weeks college algebra course. (Bartels, 1982) noted in the literature on course length of time that shortened course lengths could have negative effects on student's success rates. It is also possible that barriers or pressures for adult learners are more bearable when a course is shorter in time.

Second, this study also considered success rates among ethnicities in the 8-week and 16-week college algebra course. No difference was found for White, Non-Hispanic; African – American; Hispanic, Mexican American. However, there was a statistical difference for Asian, Pacific Islander students (see Table 16). This could be due to the fact that students are self-disciplined to learn new concepts on a daily basis in a shortened time period. In addition, in this study, for White, Non-Hispanic student's significant differences were found in the numbers of A's, B's, C's, D's, and F's. No significant differences were found for African – American; Hispanic, Mexican American; and Asian Pacific Islander students. There are other factors that go hand in hand with ethnicity such as first generation college student, income level, and whether graduated from high school or earned a GED.

Third, data did not indicate a difference in success rates for males in the 8-week and 16-week college algebra courses or for females in the 8-week and 16-week college algebra courses. However, in examining grades of A's, B's, C's, D's, and F's for both

males and females there was a significant difference for males, but not females (see Table 23).

The last purpose and set of hypotheses of this study considered age groups. The results were mixed in the sense that for the age group (18-22) and (31-40+) there was no difference in success rates between the 8-week and 16-week college algebra courses. On the other hand, in the age group (23-30) there was a statistical difference. The average age at a community college is 29 and for these students the course length of time affected their success rates in college algebra. For students in the age group (23-30), the 8-week course length of time appeared to meet their academic needs by focusing the increased time on task, increased student integration, both socially and academically, and students own perseverance contributed to the higher success rates in the 8-week college algebra courses. These factors are evident in the age group (18-22) and (31-40+), however, there was a statistical difference in the age group (23-30). It was not measured in this study, but the motivation and commitment to advance in their studies due to personal satisfaction, updating skills, or career changes, are all important factors for doing well in their coursework.

Even though there are some statistically significant differences between course length of time and ethnicities, genders, and age groups, it must be noted that the numbers of students in the various combinations might be considered small. As a result, conclusions will be drawn upon these statistics; these may or may not be inferable to the larger population without further study on shortened course length of time for college algebra.

Discussion of Findings

The purpose of this study was to gain a better understanding of course length of time and its impact on success, retention, completion rates, and attrition rates in college algebra. College Algebra is a critical course for degree attainment and requires applying some of the fundamental topics and concepts of mathematics. It encompasses some of the basic skills used in everyday life. As a researcher who is a lead faculty member over college algebra currently working, spring 2008, on the Texas College Readiness Project, a P-16 initiative to align high school mathematics with college level mathematics courses, it became obvious that this study needed to be investigated not only on different course lengths of time, but on other levels and for longer periods of time. The reason for directing attention on course length of time, ethnicities, genders, and age groups is because these specific categories are locally and nationally publicized. However, this study is only a starting point. This study did not provide all of the answers on success rates for college algebra.

The researcher was aware that the student populations tend to be different in the summer, fall and spring semesters. In most cases students are returning from the fall semester and enrolling in the spring semester. However, students who take summer school may be inclined to leave their four-year institution and take classes at a community college or might be a community college student who wants to take courses to advance in their studies. Since college algebra was offered in summer, fall and the spring semesters in both 8-weeks and 16-weeks all three semesters were used in this study for course length of time.

Even though no difference was found in success rates for the 8-week and 16-week college algebra courses, Tinto's (1993) concept of the student integration model remained the basic foundation as to why students persist and leave an institution at the rate at which they do. The additional analysis on withdrawal rates indicated there was no difference in the proportion of students who withdrew from the 8-week course, 15.2 percent, and the 16-week course, 10.5 percent. There being no difference happens for many reasons: e.g. students were engaged in both the 8-week and 16-week college algebra courses, students have less time to forget the information in the 8-week course, since it meets on a daily basis, and since students signed up for the 8-week course, they were willing to persist at a faster rate. Students know the pros and cons of both the 8-weeks and 16-weeks courses. As Johnson, Johnson, and Smith (1998a) indicated in their meta-analysis that meeting more frequently in the college algebra classroom promotes time on task, higher-level reasoning, and cooperation among students and faculty produces greater mathematical achievement.

As presented in the literature review, the traditional 16-week college algebra course has dominated higher education for years; however, shortened course lengths of time have become increasingly popular (in the last 15 years) among college students. Meeting four days a week for college algebra class is a huge commitment for students. Even though this study found no difference in success rates for White, Non-Hispanic; African-American; and Hispanic, Mexican American students in the 8-week and 16-week college algebra course, no assumption is made that 8-week college algebra courses do not need to be offered. There was a difference found in success rates for Asian, Pacific

Islander students. As mentioned in Chapter 2 the highest enrollment populations in 2007 at Brookhaven College were Asian, Pacific Islander and Hispanic, Mexican American students. If community colleges in general, are going to continue to meet all students' needs, offering different course lengths of time for college algebra offers a possibility for increased student success. The direction is supported in this study by the finding which revealed that there was no difference in withdrawal rates of students who were enrolled in the 8-week and 16-week courses.

As mentioned in the findings there was a difference in the grades A's, B's, C's, D's and F's for White, Non-Hispanic students enrolled in 8-week courses. There was also a significant difference in grades for Asian, Pacific Islander students in 8-week and 16-week courses. Since White, Non-Hispanic and Asian, Pacific Islander students tend to make better grades in any course length of time; this might be why they are doing better in shortened course lengths of time. In addition, African-American and Hispanic, Mexican American students complete courses at generally one letter grade lower than White, Non-Hispanic and Asian, Pacific Islander peers, and are more likely to test into the lowest developmental education courses in a sequence, and repeat courses at a higher rate (BHC, 2007). African-Americans tend to earn F's at a higher level (BHC, 2007).

As mentioned in the literature more females as compared to males are taking and excelling in college algebra and other higher mathematics courses in both high school and college. It was not surprising to find that there was no difference in success rates for both the males and the females enrolled in the 8-week and 16-week college algebra courses. However, it was surprising to find that there were differences in A's, B's, C's,

D's and F's for males in the 8-weeks and 16-weeks course. Males tended to have more A's, 44.8 percent in the 8-week course as opposed to 12 percent in the 16-week course. This is important to note since males are more likely to drop out of school at a higher rate than females. As noted by Bae et. al. (2000) and Freeman (2004) Hispanic and African-American females will complete a college degree at a higher rate than their male peers in the same ethnicities. In addition, expanding on this same idea, as mentioned in Chapter 4 under purpose 3 about the higher enrollment trends for females in both the 8-week and 16-week college algebra courses was noted. Studies show that males drop out of high school at a higher rate; and therefore, males do not enroll in (either 2-year or 4-year) higher education institutions at the same rate as do females. As stated in *The Chronicle of Higher Education*, Almanac 2007-2008, the total enrollment for women in higher education, in the State of Texas, was 56.8 percent (p. 89).

The average age at Brookhaven College is 29. Students in the age group (23-30) had higher success rates in the 8-week college algebra course as opposed to the 16-week college algebra course. Frequently, students in this age group work, have children in daycare, and are taking a full-time class load. Shortened course lengths of time for these students, meet their needs to finish faster by taking more courses in any given semester. In the age groups (18-22) and (31-40+) no difference was found in success rates in the 8-week and 16-week college algebra courses. Often the students in the (18-22) age range are right out of high school and are accustomed to meeting five days a week with the mathematics material spread out over nine-months. Students in these high school mathematics courses are used to receiving a lot of repetition. As mentioned in the course

length of time literature, shortened courses tend to leave out the repetition and leave more independent study for students. Also, students in this age range might not have taken any mathematics courses their senior year in high school. If students, brand new to college, register for a shortened course length of time in college algebra, the expectations of the students tend to be: attend class regularly, take notes and participate, be an independent learner, and learn the course material at faster pace and in depth. On the other hand, non-traditional students in the age range (31-40+) who tend to be returning to college might prefer either the 8-weeks or 16-weeks depending on their assessment scores and when they took their last mathematics course. The 8-weeks course might move to fast for these students. Students in both age brackets appear to not be as hurried in their college algebra coursework as the students in the (23-30) age group. Students in the age group (23-30) are more likely to be going to school, raising children, and working part or full-time. The data suggested that students in this age group were determined to put forth the increased effort it takes to complete an 8-week college algebra course, if they discern that they can finish college algebra and possibly start another course in the same semester. Research needs to be conducted that test whether there are differences in the performance in mathematics courses for which college algebra is a prerequisite. Did 8-week students for example, do as well in trigonometry as the 16-week students? This might indicate if hurrying hampers retention.

Since community colleges educate more than half of the nation's undergraduates, and continue to increase in enrollment, it is crucial that research is conducted and disseminated on community colleges. By publishing findings, it adds to the knowledge

base of the profession and helps to improve current practices. According to Pascarella and Terenzini (1991) researchers in higher education who study community colleges continue to ask the two questions: Why do we know so little about the educational and organizational functioning and effectiveness of institutions that enroll nearly 4 in 10 of our students? Why does only about 5 percent of our research on college effects focus on community colleges? Individual community colleges must continue conducting research on themselves. Once the analysis is complete dissemination of results will help close the gap between research and practice.

Conclusions

The critical impact of this study and additional studies on course length of time and the success rates are essential and being able to use those new findings will only enhance current institutional practices that will increase student success and retention in college algebra. Even though no statistical difference was found between the 8-week and 16-week college algebra course, the different options of course lengths of time should be provided for students. Community colleges are known for meeting the requests of their community, students, stakeholders, taxpayers, and board members therefore, providing different course lengths of time, is fulfilling at least one request. Having flexible course schedules helps address the issue of enrolling and retaining students. By having the option to enroll in an 8-week course students can either finish a course mid-semester or they can finish and enroll in a second course for the second half of the semester. However, additional research needs to be conducted in this area. In addition, this study used ex-post facto data, and it might be beneficial for all educators to explore not only the

cognitive domain, but also the affective domain. According to Conner (1997) “entry and exit interviews” as well as focusing on when and why students might choose to leave college algebra within a given semester is imperative in order to improve retention rates (p. 39). Gaining additional data while the course is still in progress might have benefits, in addition to examination of the data once the course has ended. The increased numbers of students on the national level taking college algebra amplify the opportunity for institutions to offer more variations in course lengths of time and then for institutions themselves or the research community that focuses on community colleges, such as the Community College Research Center at Columbia University, to provide additional studies that will provide recommendations and improvement strategies that will ultimately result in increased student success in college algebra.

Recommendations

This study revealed the following research gap: Before this study shortened course length of time for college algebra at community colleges is not a highly researched topic in higher education. Since community colleges are continuing to increase in enrollment and educate half of the nation’s undergraduate population, then attention must be given to research on community colleges institutional practices. When inferring these results to larger populations as a result of this study and a review of the literature, further research and circumspection must be applied because of the small numbers. For this reason, a few recommendations are in order to advance further with the study of course length of time in college algebra.

1. Shortened course length of time should be studied for longer periods of time, now that it is past the initial stage, and involve larger numbers of students.
2. Two-year institutions should be willing to offer two sections of 8-week courses for college algebra.
3. College algebra students should be tracked as to how they succeed in other advanced mathematics courses, such as trigonometry, and whether they retained the information for a longer period of time.
4. College algebra courses whether 8-weeks or 16-weeks should continue to be examined with respect to course length of time and outcomes.
5. Students' learning styles should be examined in addition to ethnicity, gender, and age to see if there is a relationship between the factors.
6. Correlation studies should be done to test whether different modalities, online, or the use of online tools (MyMathLab) in the traditional classroom setting is affecting success rates and grades.
7. Longitudinal studies should be done that analyze several two-year institutions.
8. Cost effectiveness was not included in this study, but it should be included when evaluating whether a particular course length of time is more effective than another.
9. Qualitative methodologies could examine faculty and student's attitudes about college algebra being offered in 8-weeks and 16-weeks.

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