REQUISITE COURSE-BASED PERFORMANCE COMPARISON BETWEEN TECHNICAL COLLEGE TRANSFER STUDENTS AND UNIVERSITY NATIVE STUDENTS

by

PETER T. SNELL

(Under the Direction of Christopher C. Morphew)

ABSTRACT

This study examined the requisite math course performance of 8,273 students at Kennesaw State University from 1998 to 2007. Of these students, 7,849 completed prerequisite math courses at KSU, while 424 transfer students completed prerequisite math courses from in the Math Mini-Core at Chattahoochee Technical College. Aggregate findings and four out of five individual course-based findings indicated there were statistically significant relationships between the source of prerequisite coursework and performance in requisite coursework, with university native students performing better than technical college transfer students. Additional findings that compared university native students and technical college transfer students indicated that the profile for at-risk university math students may be distinguished by younger black male students, especially native students. Further examination of the data that were isolated to technical college transfer students indicated that part-time students with a low GPA at the time of transfer and had recently taken prerequisite math courses were potentially at-risk when compared to peers within the same cohort.

INDEX WORDS: Course-Based, Performance, Technical College, Transfer, Two-Year College

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Two-year colleges, or what were called "junior" colleges at the time of their inception, were conceived in the early 1900s with the notion that students would complete either their first two-years of general education and then transfer upward to pursue a baccalaureate degree or would learn specialized skills by completing a vocational program and then enter the workforce (Townsend, 2002). However, not considered were those who would transfer to baccalaureate programs from terminal workforce development programs (Townsend, 2002).

According to the American Association of Community Colleges (2006), there are 1,186 two-year colleges in the United States serving 6.6 million credit students that account for 45% of all undergraduate enrollments. Cohen and Brawer (1996) indicate that research has found student transfer rates ranging from 11% to 40% and that the fluctuation in the statistics may be attributed to the variety of state structures of higher education, limitations of growth imposed by the government, local conditions, community demographics, proximity of two- and four-year colleges, and local economies.

A national study in 1993 indicated that 93% of two-year colleges offered vocational education and 40% of all two-year college students were enrolled in these programs (Cohen & Brawer, 1996). Phillippe and Patton (2000) found that only 37% of the more than 450,000 associate degrees conferred in 1996-1997 were in liberal arts or general studies while the remaining 63% were in vocational programs.

Statement of the Problem

"The idea of vocational education reflects a belief that separate curricular tracks are the best way to accommodate the varying educational objectives and characteristics of the students" (Cohen & Brawer, 2003, p. 243). A conundrum, manifested within this belief and the blurring lines that distinguish system, institutional, and curricular missions, purposes, goals and objectives, is that many students do not observe these distinguishing lines. What students do realize is that most two-year colleges have open admissions policies that provide a convenient access point to higher education for many who may not otherwise have this access. Students who initially enroll in two-year colleges typically do so because they have lower academic abilities and are unable to meet the minimum admissions standards of the four-year colleges (Cohen & Brawer, 1996). For many of these students who are faced with adversity, it is a choice between the two-year college and no higher education at all (Cohen & Brawer, 1996; Frye, 1992; Townsend, 2001). They simply take the most convenient path of least resistance in pursuit of what may be their only opportunity to obtain a higher education.

While many of these students are of the academic mindset that they are preparing for entry into the workforce, others are under the impression that, regardless of the system, institution, or program, they will also learn the skills necessary for transferring to a four-year college baccalaureate program (Frye, 1992). "Occupational program students know that more education will help them advance in the workplace and intend to get more higher education" (Findlen, 1997, p. 4). Bailey and Jenkins (2005) state that there is growing evidence indicating that the amount of higher education students attain directly corresponds with their future wages and earning potential. Furthermore, "employers increasingly demand workers who not only have

technical expertise, but also skills in language, communication, problem solving, and applied math" (Bailey & Jenkins, 2005, p.1).

"The designations 'transfer,' 'remedial,' and 'occupational' are institutionally inspired. They do not accurately describe the students' intentions" (Cohen & Brawer, 2003, p. 71). Supporting this statement is research on the numbers of students who transferred to four-year colleges from technical colleges. Grubb (1991) found that although overall rates of transfer students had declined in 1980, an astounding 23% of students who transferred came from terminal workforce development programs compared to 49% who came from transfer programs. And these percentages are relatively the same today, providing evidence that more research needs to be conducted on students transferring from technical colleges.

Purpose

The purpose of this study was to compare the performance of technical college transfer students and four-year college native students. Specifically, this study examined the requisite math course performance of 8,273 students at Kennesaw State University, focusing on the differences between native students and technical college transfer students who completed prerequisite coursework within the Math Mini-Core at Chattahoochee Technical College.

Questions and Hypotheses

There were two questions this study sought to answer:

1) How did the requisite math course performance of students native to Kennesaw State University compare with the requisite math course performance of technical college transfer students who completed prerequisite courses at Chattahoochee Technical College?

a. Hypothesis 1: Students native to Kennesaw State University performed, on average, better than Chattahoochee Technical College transfer students in requisite math courses at Kennesaw State University.

2) Of those transfer students included in this study, what demographics and academic characteristics were correlated with requisite math course performance at Kennesaw State University?

   a. Hypothesis 2: Specific demographics, including age, ethnicity/race, and gender, and academic characteristics, including GPA at the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the prerequisite and requisite math courses, were correlated with requisite math course performance of transfer students who completed prerequisite math courses at Chattahoochee Technical College.

Significance

Community colleges traditionally offer transfer programs with a focus on the first two years of undergraduate coursework (Cohen & Brawer, 2003). These programs act as a bridge between high school and the four-year college (Cohen & Brawer, 2003). Emphasis is placed on skills necessary to prepare students for the increased academic rigors of a baccalaureate program and success at a four-year college. Technical colleges "serve a much broader diversity of students, with a wide range of abilities and goals" (Cohen & Brawer, 2003, p.244). They traditionally offer terminal workforce development programs that focus on applied coursework (Cohen & Brawer, 2003). Emphasis is placed on relevant and practical skills necessary for students to enter and succeed in a particular occupation immediately after completion of a program (Cohen & Brawer, 2003). However, what happens if these students later decide to

transfer to a baccalaureate program? Have they been prepared for the increased academic rigors of the four-year college?

Many researchers cite that two-year colleges are not adequately preparing students for transferring to a baccalaureate programs and may be impeding the transfer process as a result of their lack of academic rigor (Dougherty, 1991; Porter 1999; Prager, 1988; Smith, 1995). In a study of Delaware Technical and Community College transfer students, Smith (1995) found that faculty were of the opinion that terminal workforce development programs were not as academically rigorous and, as a result, students were not as well prepared for transferring to four-year colleges as those from transfer programs offered through community colleges. Some researchers have suggested that one of the primary reasons that two-year college curriculums may lack academic rigor is that their faculty are being influenced to inflate their grading practices. Faculty must lower or water down their academic standards and expectations to match the level of students who typically have lower academic abilities and are unable to meet the minimum admissions standards of a baccalaureate program (Cohen & Brawer, 1996; Prager, 1988; Dougherty, 1992; McGrath & Spear, 1991; Carlan & Byxbe, 2000). Supporting this statement are statistics from the National Center for Educational Statistics (NCES, 2005) indicating that in 2003-2004 the average Scholastic Aptitude Test (SAT) score was an 834 for community college students and a 953 for four-year college students.

Bailey and Jenkins (2005) stated that educational equity among different socioeconomic classifications weighs heavily in access to and opportunity for higher education. Lower income students are more likely to begin higher education in short-term vocational programs at a two-year college. Reasons for this stem from evidence suggesting “extreme differences in the quality of elementary and secondary education available to students of different socioeconomic

backgrounds" (Bailey & Jenkins, 2005, p. 2). In many cases, lower-income students cannot afford the luxury of pursuing a degree because not only can they not afford higher education but more importantly because they need short-term programs that will teach them skills necessary for entering the workforce immediately after graduation, if not sooner. They require access to occupational programs that have a focus on concrete application of necessary workforce skills versus a more abstract academic program leading to a baccalaureate degree. Compounding this is first-generation college students who struggle with the mentality that higher education may not be realistic and even short-term programs present their challenges.

Two-year colleges have a reputation for not emphasizing academic rigor as a result of many students participating in developmental or vocational courses who are, consequently, inadequately prepared for transferring to a four-year college (Lee & Frank, 1990; Beckenstein, 1992; House, 1989). This would imply that technical colleges are less likely to prepare students for transfer to a baccalaureate program because they traditionally have a primary focus on terminal workforce development programs and serve a larger population of lower achieving students that require remedial education.

Also to be considered are the differences between vocational and transfer programs based on criteria used for selecting and hiring faculty. According to the Commission on Colleges (COC) of the Southern Association of Colleges and Schools (SACS), institutions must employ faculty who are qualified to accomplish the mission and goals of the institution (SACS, 2005). COC guidelines state that faculty who teach courses designed for transfer to a baccalaureate program should have a doctoral or master's degree in the teaching discipline or a master's degree with at least 18 graduate credit hours in the teaching discipline (SACS, 2005). Faculty who teach courses not designed for transfer to a baccalaureate program should have a bachelor's degree in

the teaching discipline or an associate's degree and demonstrated competencies in the teaching discipline (SACS, 2005). According to Lynch (1994), vocational instructors are selected based on their "relevant job experience or professional certifications in place of the traditional academic degrees valued by higher education" (p. 2). Faculty are encouraged to manifest these professional experiences in their teaching methodologies. They expect students to demonstrate immediate application of the occupational skills being trained versus future application of academic skills at a four-year college (Watford, 2004).

According to Findlen (1997), vocational instructors believe their courses will not transfer because they are part of terminal programs. However, terminal workforce development programs and their faculty are now facing a paradigm shift that requires them to teach students not only the applied skills necessary to succeed in the workforce immediately after completion but also the academic skills necessary to succeed in a baccalaureate program if and when they may decide to transfer. Students are fostering this paradigm shift from terminal workforce development programs to workforce development programs that also prepare students for the possibility of eventually transferring to a baccalaureate program. As a result, an important question that is gaining significance is whether workforce development programs are adequately preparing students for the increased academic rigors of baccalaureate programs.

Many states are exploring or have already explored some version of a comprehensive community college system that offers both transfer programs and workforce development programs. This is being done for a variety of reasons but primarily to improve the seamlessness of higher education and decrease the amount of redundancy. However, simply merging the two types of programs into one system or within the same institution does not assure that transfer students will be better prepared for the increase academic rigors of a baccalaureate program.

Regardless of the mission, vision, goals, purpose, or objectives of a system, institution, or program, students who traditionally enroll in two-year colleges do not distinguish between the blurring lines that separate them from four-year institutions. The consensus is that when it comes to the question of the quality of education at the two-year college, there continues to be controversy and debate over academic rigor and implications for academic success at the four-year college (Brint & Karabel, 1989; Dougherty, 1994). It is critical to assess the academic performance of transfer students who use technical colleges and their workforce development programs that were designed to be terminal as access points to higher education in pursuit of a baccalaureate degree. Findings will directly correspond to their academic preparation received through coursework in terminal workforce development programs.

Higher Education in Georgia

Georgia has two systems of higher education. The University System of Georgia (USG) provides two-year through graduate level education. The Technical College System of Georgia (TCSG) provides terminal workforce development programs. However, the use of the word *terminal* seemingly contradicts the vision of TCSG that identifies with the transfer function and a seamless system of higher education. Additionally, *terminal* has become somewhat of a misnomer as increasing numbers of students use technical colleges as access points to higher education and transfer to institutions within the USG.

In 2002, the development of the "Mini-Core Project" articulated two common English courses and three common math courses between institutions within each system. Several of those involved with this project's development suggested and documented on more than one occasion an ongoing assessment of technical college transfer students taking advantage of this articulation. As of 2007, no assessment has yet taken place. This is essential for institutions

within USG and TCSG if they are to ensure that students are being adequately prepared and appropriate student services are being offered.

Academic Performance and Profiles of Transfer Students

Since the emergence of two-year colleges, there has been a variety of studies conducted on transfer students. Among the landmark studies on performance of two-year college transfer students are two that both occurred in 1965, one by Hills and the other by Knoell and Medsker. Their findings indicated significant declines in GPA of community college transfer students during their first semester at the four-year college that they attributed to increased academic rigor. "Transfer shock" was a term coined by Hills to describe this phenomenon and has been one of the most researched topics with regard to academic performance of two-year college transfer students.

Although the majority of studies related to academic performance of two-year college transfer students have supported the theory of transfer shock, there have also been numerous studies that have contradicted the theory (Diaz, 1992). Much of the existing research is based on students who transfer from community colleges offering transfer programs or a combination of transfer and workforce development programs. These studies examined students aggregately and have not distinguished between those who were enrolled in different programs, disciplines, or courses. As a consequence, it is difficult to draw meaningful conclusions based the variety of findings because they may not hold true for making legitimate inferences about technical college transfer students (Prager, 1988; Hughes & Graham, 1992).

The early research by Hills (1965) and more recent research by Cejda and Kaylor (1997, 1998) indicated that mathematics and sciences revealed the most significant evidence of declines in academic performance of transfer students. Palmer and Eaton (1991) emphasized the need to

examine academic performance of two-year college transfer students in specific disciplines rather than as a whole at the four-year college to determine the strengths and weaknesses of transfer success and adequacy of prerequisite coursework taken at the two-year college. Consequently, the selection of requisite math courses was based on the assumption that they would exhibit the greatest variance in academic performance.

According to Hall (2005), it is important for institutions to make these distinctions so that they may identify local academic performance profiles of transfer students in order to better serve a variety of functions such as student services with offering advisement at both the transferring and receiving institutions. The best way to evaluate the academic performance of technical college transfer students, the effectiveness of vocational curriculum with regard to how well it prepares students for the increased academic rigors of the four-year college, and the effectiveness of existing policies and articulation agreements is to assess the local realities that influence them (Prager, 1988; Hughes & Graham, 1992).

Conceptual Framework

This study uses the conceptual framework of a relatively new assessment developed in 1996 called the Course-Based Model of Transfer Success (CBMTS). This model may be applied at the institutional or system level and has a unique design in that it is course-based as opposed to traditional transfer student research that has been student-based. The primary purpose of this unique model is to help identify specific prerequisite course strengths and weaknesses by comparing specific requisite course grades for native students and transfer students that are divided into cohorts based on the institution where they completed their prerequisite coursework. Using the basic framework of CBMTS along with regression analysis provides a very useful model to examine how additional variables, such as student demographics and academic

characteristics, may affect performance in requisite math courses. Findings are useful for identifying more specific profiles for successful and at-risk native and transfer students.

Definition of Terms

The following terms were defined according to their use in this study:

Career, occupational, technical, vocational, and workforce are used synonymously throughout this study to describe education, programs, and courses designed to be terminal in that they have a focus on only those skills necessary for preparing students for entry into the workforce immediately after their completion.

Department of Technical and Adult Education (DTAE) and Technical College System of Georgia (TCSG) are used synonymously throughout this study as a result of DTAE being changed to TCSG in 2007-2008. For the purpose of clarity, TCSG is referred to most frequently.

Native students are those students who have completed prerequisite math courses at KSU.

CHAPTER 2

REVIEW OF LITERATURE

The purpose of this study was to compare the performance of technical college transfer students and four-year college native students. Specifically, this study examined the requisite math course performance of 8,273 students at Kennesaw State University, paying specific attention to the differences between native students and technical college transfer students who completed prerequisite coursework within the Math Mini-Core at Chattahoochee Technical College.

This review of literature is divided into four sections: 1) Higher Education in Georgia, 2) Transfer and Articulation in Georgia, 3) Academic Performance of Transfer Students, and 4) Profiles of Transfer Students.

Higher Education in Georgia

Georgia has a unique system of higher education. The University System of Georgia (USG) has an institutional classification system that includes two-year colleges, state colleges, state universities, regional universities, and research universities. Providing two-year programs are nine two-year colleges that provide primarily associate degree transfer programs and seven state colleges that provide primarily associate degree transfer programs and a limited number of baccalaureate degree programs. The Technical College System of Georgia (TCSG) includes 33 technical colleges that provide workforce development through terminal certificate, diploma, and degree programs.

The University System of Georgia

Higher education began in Georgia in 1784 when the General Assembly set aside 40,000 acres for the purpose of starting a college that one year later became Franklin College (USG, 2002b). In 1867 Franklin College acquired the Lumpkin Law School that soon thereafter led to its being renamed University of Georgia (USG, 2002b).

By the beginning of the 1900s, Georgia had established a number of other institutions serving a variety of missions including technology training, teaching and industrial training for women, industrial training for African-Americans, teaching, and agricultural and mechanical training (USG, 2002b). In 1929 Governor Lamartine G. Hardman called for the reorganization of Georgia's higher education leading to the Reorganization Act of 1931 that the General Assembly passed establishing the Board of Regents of the USG (USG, 2002b). The original Board comprised eleven members, ten congressional district members and one state-at-large member who were appointed by the governor who served as an ex officio member. Together they governed 26 institutions.

Shortly after this reorganization Georgia exhibited evidence of making efforts to provide a seamless system of higher education including institutions that did not function as separate competitive entities, but as a unified and coordinated system that minimized duplication of services and maximized educational opportunity (USG, 2002b). In 1933 the General Assembly gave the Board power to operate the system as it saw fit through eliminating or rearranging institutions that led to the elimination of the agricultural and mechanical schools among others and the establishment of the first three junior colleges (USG, 2002b).

During the following ten years, Governor Gene Talmadge interfered with the Board and USG to the point that he had several institutional and board members fired or forced to resign

which he replaced with those supporting his efforts (USG, 2002b). As a result, ten institutions lost their accreditation by the Southern Association of Colleges and Schools (SACS) because of what they considered unprecedented political interference (USG, 2002b). This led to Talmadge's defeat in the 1942 election and the beginning of a new era with Governor Ellis Arnall who was committed to and successful with regaining accreditation of those ten institutions (USG, 2002b).

In 1943 the state ratified a constitutional amendment that changed the Board from operating under statutory authority to establishing it as a constitutional body (USG, 2002b). The new board no longer included the governor as an ex officio member and consisted of fifteen members, ten congressional district representatives and five members at large who were all appointed by the governor and approved by the Senate for seven year terms (USG, 2002b). With the exception of the governor's appointing senate approved board members, acting as a constitutional body meant that the board was insulated from political interference and governed the system's programs, allocation of the budget, new facilities, and the addition, merging, or closing of institutions (USG, 2002b).

The USG underwent tremendous growth in the 1960s under Governor Carl Sanders who strongly supported higher education and was responsible for allocating substantial budgets that led to significant changes in the system that tripled in size with the addition of new junior colleges, facilities, and programs (USG, 2002b).

In 1982, Georgia revised the constitution giving the Georgia Assembly authority over the establishment of new institutions and their missions (USG, 2002b). Then, in 1988, the Board agreed to let the junior and community colleges drop the "junior" and "community" from their names and become known as two-year colleges (USG, 2002b). These institutions still primarily

act as junior colleges providing vocational programs through associate degrees satisfying the first two years of the baccalaureate degree.

Today the Board consists of eighteen members, thirteen congressional district members and five state-at-large members who are responsible for electing the chancellor who serves as the chief executive officer and the chief academic officer (USG, 2007a). Together they manage 35 colleges and universities, four research universities, two regional universities, thirteen state universities, three state colleges, and thirteen two-year colleges that enrolled 259,945 students during the fall semester of 2006 (USG, 2006). The four largest institutions in the system are the University of Georgia with approximately 34,000 students, Georgia State University with approximately 26,000 students, and Georgia Perimeter College and Kennesaw State University with approximately 20,000 students each (USG, 2006). The majority of other institutions have enrollment ranging from approximately 1,000-7,000 (USG, 2006).

There are a few blurring lines between the distinctions of each classification of institution, but the overarching purposes include bachelors through doctorate degrees and research for the research universities, bachelors through doctorate degrees for the regional universities, bachelors through masters degrees (with a few offering doctorate degrees) for the state universities, associate through bachelor degrees (with a few offering master degrees) for the state colleges, and associate degrees for the two-year colleges (USG, 2007b). The distinction between the regional and state universities was considered more of a marketing and public relations tactic because the research universities were concentrated in the northern half of Georgia. To add prestige to the larger universities in the southern half of the state, they were categorized as regional universities (Bracco, 1997).

It has been debated since their inception in the 1930s whether the two-year colleges should fall under the USG's governance (Bracco, 1997). In 1949 the Strayer Report, a commissioned report on the state of higher education in Georgia, recommended separating the two-year colleges from the USG and placing them under the governance of the state Board of Education (Bracco, 1997). This remains an ongoing debate in Georgia. Some feel that the two-year colleges are holding back the other institutions in the USG from achieving their true potential. Some feel that the two-year colleges are a weakness in USG, and that the state should merge them with the technical college system to provide a comprehensive community college system. Still others feel that the two-year colleges are undervalued and that a consolidated system allows for optimal collaboration with transfer and articulation in USG (Bracco, 1997).

The Technical College System of Georgia

After recovering from the devastation of the civil war in Georgia, Hoke Smith, a Georgia Senator and future Governor, recognized the need for modern forms of industrial training and co-sponsored a significant piece of federal legislation regarding vocational education called the Smith-Hughes act of 1917. This was the first indication that Georgia would be among the leading proponents of technical education (Breeden, 2003).

However, progress was tempered during the national turmoil of the Great Depression in the 1930s. It wasn't until after World War II that vocational education experienced an expansion resulting from the federal government's allocating significant funds for the development of new programs. In 1943 M.D. Mobley, the State Director of Vocational Education, proposed a new system called the Area Trade Schools that was approved by the State Board of Education and in 1944 opened its first school, North Georgia Trade and Vocational School. Within a few years subsequent schools opened and in the 1950s W.M. Hicks furthered the efforts of technical

training by lobbying for the State Board of Education to approve a set of policies establishing what would become the Area Vocational-Technical Schools (Breeden, 2003).

By the late 1960s there were nineteen schools and thousands of students. In 1967 Quick Start developed and designated these schools to provide workforce training for new business and industry as part of Georgia's economic development incentives. Growth continued throughout the 1970s, and in 1984 Governor Joe Frank Harris created the State Board of Postsecondary Education that ultimately led to the creation of the Department of Technical and Adult Education (DTAE) in 1988. This state agency and its technical schools were responsible for workforce development, including adult literacy, technical training, and, through Quick Start, economic development (Breeden, 2003).

In 1984, 1990, and 1998, the Carl Perkins Act provided federal resources for vocational training that further solidified the role and purpose of DTAE to provide vocational education in Georgia. Georgia added to this with the establishment of Helping Outstanding Pupils Educationally (HOPE) in 1993. HOPE opened new avenues for access to Georgia higher education and currently offers scholarships and grants to Georgia students toward the pursuit of degrees, diplomas, and technical certificates of credit (Breeden, 2003).

In 2000, legislators acknowledged that the public's perception of technical institutes might be holding back the system's true potential for access to higher education. In an effort to improve marketing and public relations, they agreed to change the technical institutes to technical colleges and begin offering associate degrees (Breeden, 2003). These changes were immediately noticed with increased enrollment.

Then, in 2007 the governance of DTAE, comprising eighteen board members including the commissioner, five state-at-large members, and thirteen congressional district members

appointed by the governor came to the conclusion that most citizens were not familiar with the Department of Technical and Adult Education (DTAE). However, most were aware of a technical college system in Georgia. As a consequence, the governance of DTAE tried to convince legislators that from a marketing and public relations viewpoint, DTAE should be changed to an agency name that resembled the more familiar USG. In 2008 legislation was introduced to change DTAE to the Technical College System of Georgia (TCSG). DTAE has optimistically adopted and already implemented this name change even while the legislation was pending during this study.

During the fall semester of 2006, TCSG had an unduplicated enrollment of 87,313 students among 33 technical colleges and their 31 satellite campuses that are strategically located throughout Georgia in an effort to provide every citizen access to a technical college within reasonable distance. The four largest institutions in the system were Chattahoochee Technical College with 5,995 students, Central Georgia Technical College with 4,898 students, Augusta Technical College with 4,445 students, and Gwinnett Technical College with 4,287 students. The remaining technical colleges had enrollments ranging from 718 to 3,967 students (TCSG, 2008).

Higher Education System of Georgia

In 2008, Representative Bob Smith introduced legislation that would abolish the boards that control the TCSG and USG and replace them with a new Georgia Board of Higher Education. The bill would also consolidate TCSG and USG to form the Higher Education System of Georgia. Under this bill, state lawmakers from each of the thirteen congressional districts would elect one member per district to the newly created board and the Governor would appoint five members, all of whom would have to be ratified by the Senate (TCSG, 2008b). This legislation was still pending and being modified at the time of this study.

Transfer and Articulation in Georgia

Discussing transfer and articulation between TCSG and USG is perplexing when consideration is given to use of the word *terminal* in describing TCSG's terminal workforce development programs. They have been designed to promote economic development by preparing students for entry into the workforce immediately after graduation. Ironically, the vision for TCSG at the time of this study contradicted this by identifying and specifically mentioning the transfer of coursework.

> This system will be part of a seamless educational process in which students can easily transfer credits as they move among secondary schools, to technical colleges, and to colleges and universities and in which all Georgians can readily access information and advanced educational resources (DTAE, 2006, Vision).

Terminal has become a misnomer used to describe terminal workforce development programs in TCSG. This is slowly being recognized in Georgia as increasing numbers of students use the larger number of and, in many cases, more conveniently located technical colleges and their terminal workforce development programs as access points to baccalaureate programs. In 2004-2005 USG received a total of 32,130 transfer students with 2,424 (7.5%) of them coming from technical colleges within TCSG (USG, 2005).

USG and TCSG have made efforts to promote a more seamless system of higher education. The first signs of significant collaboration emerged in December 1994 when a joint council of senior administrators from both systems was established to design and implement a transfer agreement (Board of Regents, 1994). By November 1995, the formal agreement was in

place and called A Student-Centered Collaboration for Public Post-Secondary Education in Georgia (Board of Regents, 1995). The introductory statement of this agreement stated:

> The state of Georgia will best be served in the future by strong systems of technical and university education, each with a distinctive and non-duplicative mission, and both supporting academically sound movement of students between the systems. Such a structure extends the separate systems that are already operating effectively, by building bridges so that students can use both systems (Board of Regents, 1995, First Paragraph).

The "bridges" referred to in this agreement were primarily the establishment of program and course articulation agreements between individual institutions within TCSG and USG. However, these agreements weighed heavily on accreditation and faculty credentials of the technical colleges. These created insurmountable obstacles for two reasons. One was that most technical colleges were accredited by the Council on Occupational Education (COE). COE accredits institutions offering up to two-year terminal workforce development programs versus transfer programs that relate to the first two years of undergraduate coursework toward a baccalaureate degree. COE accreditation policies do not meet the minimum expectations for COC accreditation and therefore created a barrier for students wishing to transfer coursework from TCSG to USG institutions that are all accredited by COC. The second was that even for those technical colleges within TCSG that were accredited by COC, there was a possible barrier with faculty credentials. COC requires institutions to employ faculty who are qualified to accomplish the mission and goals (SACS, 2005). Guidelines state that faculty who teach courses designed for transfer to a baccalaureate program should have a doctoral or master's degree in the teaching discipline or a master's degree with at least eighteen graduate credit hours in the teaching discipline (SACS, 2005). Faculty who teach courses not designed for transfer to a

baccalaureate program should have a bachelor's degree in the teaching discipline or an associate's degree and demonstrated competencies in the teaching discipline (SACS, 2005). Programs and courses within TCSG's terminal workforce development programs were not designed for transfer and faculty were recruited and hired under different guidelines. This means that it is still possible for a technical college within TCSG to be accredited by COC yet not meet guidelines required for coursework to transfer to USG. So, while this agreement was a step in the right direction toward promoting a more seamless system of higher education, it still had its barriers to be considered.

In 2002 TCSG and USG again collaborated on addressing the seamlessness of higher education and developed the Mini-Core Project (USG, 2002a).

> Ensuring the success of transfer students is a responsibility shared by the sending institution, the receiving institution, and the transfer students themselves. A fully articulated Core Curriculum for USG institutions was designed in part to assure that there were no impediments to transfer success. To further improve transfer articulation within Georgia, a 'mini-Core' of selected Core Curriculum courses in English and mathematics was developed for transfer between USG institutions and technical colleges within [TCSG] (USG, 2005, p. 1).

This agreement established that "basic skills courses in English and mathematics with common course content will transfer between USG and COC-accredited [TCSG] institutions, and comparable placement and exit test results will be honored between Systems" (USG, 2002a, First Paragraph). In this policy the USG agreed to accept the following five courses from COC-accredited technical colleges:

USG	TCSG Mini-Core equivalent
1) *MATH 1101 (Math Modeling)	1) *MAT 190 (Math Modeling)
2) *MATH 1111 (College Algebra)	2) *MAT 191 (College Algebra)
3) MATH 1113 (Pre-Calculus)	3) MAT 194 (Pre-Calculus)
4) ENGL 1101 (Composition I)	4) ENG 191 (Composition and Rhetoric I)
5) ENGL 1102 (Composition II)	5) ENG 193 (Composition and Rhetoric II)

*In most cases, students will take Math Modeling or College Algebra, not both.

At the time of this agreement there were only twelve technical colleges with COC accreditation. There has been a recent push for all technical colleges to earn COC accreditation. Those that already had this accreditation and those pursuing it were all encouraged to do so under the premise that programs and courses could transfer. Therefore current faculty were required to upgrade their academic credentials, and recruiting and hiring practices reflected COC guidelines for faculty who teach courses designed for transfer to a baccalaureate program. As of January 2007, five more technical colleges had been accredited, four had a classification of "candidate," and six others had a classification of "applicant" (Commission, 2007).

In 2006 TCSG again addressed the issue of seamless higher education when technical colleges converted their Associate of Applied Technology (AAT) degrees to Associate of Applied Science (AAS) degrees in an effort to reduce barriers to seamless transfer. When TCSG was established in 1988, the two systems agreed that USG would offer the AAS and TCSG would offer the AAT (USG, 2006). The two systems did this in part to help maintain a clear line of distinction between their programs and avoid duplication or overlap of services provided. However, as previously illustrated, most two-year college students do not recognize the blurring lines that distinguish one college from another. What resulted was an unexpected barrier to a

seamless system of higher education. When technical college students attempted to transfer out of state with their AAT it was all but unrecognized outside of Georgia because almost every other state offers the AAS with only a few, if any, others offering the AAT. Consequently, in 2006 technical colleges within TCSG converted degree programs from AAT to AAS in an effort to help diminish this barrier to seamless transfer.

The most recent attempt to improve the seamlessness of higher education in Georgia occurred in 2008. Along with the legislation introduced to change the name DTAE to TCSG were also two other introduced changes regarding technical colleges. One was the to change the mission and vision of TCSG to include mention of curricula having an academic focus as opposed to strictly a workforce development focus and exclusion of the transfer of credits. The second was a pilot study within two technical colleges that had a history of high numbers of students transferring to four-year colleges. These two technical colleges broadened their general education to include courses related to history, foreign language, and other undergraduate coursework that had never before been offered within the system. This was done to accommodate the increasing numbers of transfer students with more coursework that would transfer as part of the first two years of a baccalaureate program.

While these are positive changes for improving the seamlessness of higher education in Georgia, they are merely cosmetic. There have been no changes with regard to curricular design or delivery. Essentially, the curriculum and teaching methodologies remain the same. However, what has happened is that the lines distinguishing between USG and TCSG have only become more blurred.

Academic Performance of Transfer Students

The emergence of the first junior college in 1902, Joliet Junior College in Illinois (Solomon, 2001), established a new paradigm in higher education allowing students to complete their first two years of undergraduate study at a junior college and then transfer to a senior institution. With this new paradigm materialized a new population of students identified as *transfer students*. Soon after this advent, Floyd M. McDowell (1919) conducted one of the first studies on 370 transfer students who attended twelve junior colleges and discovered a persistence rate of 73% (Solomon, 2001). Subsequent studies were conducted by Leonard Vincent Koos in 1924 and Walter Crosby Eels in 1931 that did not report on successful outcomes but researched the nature of the transfer program (Cohen, 1994).

Watt and Touton (1930) conducted among the first studies of academic performance of junior college transfer students between 1922 and 1928 that found a decline in their GPA during their first semester at the four-year college. However, it wasn't until thirty years later in the 1960s that more scrupulous quantitative studies surfaced on the academic performance of transfer students with landmark studies by Knoell and Medsker (1965) and Hills (1965). Among other findings, both studies found similar results with a significant decline in GPA of community college transfer students during their first semester at the four-year college which they attributed to increased academic rigor. Hills (1965) most notably coined the term "transfer shock" to describe this phenomenon that has been supported by a wealth of subsequent research including a meta-analysis by Diaz (1992) of 62 transfer shock studies conducted since 1928. Her research discovered that 79% of transfer students experienced a drop in their GPA during their first semester and that 49 of the 62 studies supported the theory of transfer shock. The common theme

among the conclusions of these studies is that students transferring from two-year colleges are not adequately prepared for the increased academic rigor of the four-year colleges.

More recent studies of community college transfer students by Keeley (1993) and Cejda and Kaylor (1997) also found evidence of transfer shock and even more recently Hall (2005) found evidence indicating a decline in GPA from 3.09 to a 2.65 one semester after transferring. Smith (1995) examined Delaware technical college transfer students and found that 75% suffered a significant decline of about 1.12 in their GPA during their first semester at the four-year college. However, she also made a point of stating that there were also substantial numbers of students who after their first semester performed equal to or better than their GPA at the time of transfer. Her entire sample suffered an average decline of .79 in GPA one semester after transferring. From this data Smith (1995) concluded that technical colleges were not adequately preparing students for the academic rigor of the four-year college. Dougherty (1991), Prager (1988), and Porter (1999) express similar sentiments and go on to suggest that as a result two-year colleges are actually impeding the transfer process.

However, the phenomenon and theory of transfer shock did not and still does not go without contention. Nickens (1972) concluded from his research that there was no significant difference in academic performance between transfer and native students and that there was actually evidence of increases in GPA that diametrically opposed the conclusions made by Hills (1965). To describe this reverse phenomenon of an increase in GPA, Nickens (1972) appropriately coined the term "transfer ecstasy." This has also been supported by subsequent studies that contend two-year colleges are adequately preparing transfer students for the increased academic rigor of four-year colleges and illustrated in the previously mentioned meta-analysis of 62 studies that indicated eighteen supported transfer ecstasy (Diaz, 1992). More

recentl is research by Ward-Roof (2003) that did not find evidence supporting the theory of transfer shock for South Carolina technical college transfer students.

Although the majority of research related to the academic performance of transfer students has supported the theory of transfer shock, most of these studies have examined students aggregately and did not distinguish between those who were enrolled in transfer programs or terminal workforce development programs. As a consequence, it is difficult to draw meaningful conclusions based the variety of conflicting findings because they may not hold true for making legitimate inferences about technical college transfer students in general or specifically in Georgia (Prager, 1988; Hughes & Graham, 1992). The consensus is that when it comes to the quality of education at the two-year college, there continues to be controversy and debate over quality and its implications for academic success at the four-year college (Brint & Karabel, 1989; Dougherty, 1994).

Prior to the implementation of the 2002 Mini-Core articulation agreement between USG and TCSG in Georgia, several of those involved with its development insisted on more than one occasion that

> USG and [TCSG] will assess the performance of native students and students who transfer between USG and [TCSG] institutions in transfer courses and in successive mathematics and English courses at the institutions to which they transferred (USG, 2001).

As of 2007 this assessment had not yet taken place. USG has only recently begun to examine data specifically related to technical college transfer students. However, this information provides only aggregate student-based data and does not account for variances within disciplines or courses specific to the Mini-Core or between the variety of institutions

within USG and TCSG. In general, academic performance of transfer students in requisite courses directly reflects on the effectiveness of prerequisite courses, the transfer process and function, and the seamlessness of higher education. In Georgia, academic performance of transfer students in requisite courses taken at institutions within USG directly reflects on the effectiveness of prerequisite courses taken at technical colleges within TCSG, the Mini-Core articulation agreement, and seamlessness between the two systems of higher education.

In 2004-2005 the average TCSG student transferred to USG with 29 credit hours and a GPA of 2.99 that declined to a 2.78 after the first year (USG, 2005). USG indicated that "it appears that most students are not completing the requirements for a two-year degree before transferring" (USG, 2003, p. 5; USG, 2004, p. 6; USG, 2005, p. 8). Despite what appear to have been fairly substantial declines in the GPA of students transferring from two-year colleges, USG concluded that "in general, students transferring from a two-year college to a senior institution were well-prepared for transfer" (USG, 2003, p. 5; USG, 2004, p. 5; USG, 2005, p. 7). USG also concluded

> It is logical that two-year college transfer students should generally do as well as native students. Only a small proportion of students transfer relative to the overall student body, and it is assumed that transfer students (with the exception of reverse transfers) are among the best prepared students (USG, 2005, p. 7).

It is not clear whether these conclusions are referring to only the classification of "two-year colleges" within USG or if they may also pertain to other two-year colleges outside of USG including those within TCSG. Table 2.1 illustrates USG transfer student data in 2004-2005.

Table 2.1

University System of Georgia Transfer Student Academic Data for 2004-2005

		Reported by receiving institution at transfer		At end of year after transfer	
	Number of students	Avg. GPA	Avg. hours	Avg. GPA	Avg. hours
USG					
Research university	1,843	2.91	52	3.12	18
Regional university	1,566	2.68	44	2.73	17
State university	4,141	2.79	44	2.81	17
State/two-year college	8,596	2.95	50	2.85	18
Non-USG					
[TCSG] Technical college	2,424	2.99	29	2.78	13
Other Georgia institution	3,437	2.86	45	2.71	16
Out-of-state institution	10,123	2.79	47	2.91	15

Note. From "Undergraduate Student Transfers in FY2005: Executive Summary," by University System of Georgia, 2005, Available from the University System of Georgia, http://www.usg.edu/research/students/transfer/, p. 7.

There is a great deal of variance within the statistics of studies related to transfer students that, according to Cohen and Brawer (1996), are attributed to the variety of state structures of higher education, limitations of growth imposed by the government, local conditions, community demographics, proximity of two- and four-year colleges, and local economy. As a result, it is common to find studies with conflicting results regarding the academic performance of two-year college transfer students and what characteristics or variables are most related to or best predict the profile of successful transfer students.

Profiles of Transfer Students

According to Hall (2005), it is important for institutions to identify local academic performance profiles of transfer students in order to better serve a variety of functions such as

student services with offering advisement at both the transferring and receiving institutions. She concluded from the findings of her study that advisors should be more aware of transfer students who are male, minority, or have a lower GPA because based on her study's data they are at-risk regarding their academic performance at the four-year college. Furthermore, she suggested that these at-risk students along with those students who may show evidence of transfer shock may require additional academic support or monitoring to ensure their ongoing academic success.

Pascarella (1997) describes the profile of the typical two-year college student body as being "…disproportionate numbers of commuting, part-time, older, non-white, and working class students …" (p. 15). However, the variety of research findings from one state to another and from one institution to another make it all but impossible for other institutions to draw meaningful conclusions based on these existing studies (Hughes & Graham, 1992). The best way to evaluate the academic performance of technical college transfer students, the effectiveness of vocational curriculum with regard for how well it prepares students for the increased academic rigor of the four-year college, and the effectiveness of existing policies and articulation agreements is to assess the local realities that influence them (Prager, 1988; Hughes & Graham, 1992).

Age of Students

Cohen and Brawer (1996) found that the student population of the two-year college had an average age of 29, a median of 25, and a mode of 19. The four-year college is typically associated with the younger, more traditional student population between the ages of 18 and 22 who enter the four-year college directly out of high school. Students attending two-year colleges are typically older nontraditional college-age and, in most respects, more mature (Pascarella, 1999). Consequently, it is sometimes argued that two-year colleges use andragogical

methodologies for teaching adult, older, or more mature learners and four-year colleges use pedagogical methodologies for teaching children, younger, or less mature learners.

Studies of community college transfer students by Keeley (1993), Carlan and Byxbe (2000), Laanan (1999), and Hall (2005) found the age of students to be directly related to their academic performance at the four-year college. A common theme that emerged from these and other studies indicated higher performance of those students under 21 or over 25 years of age. However, research by Graham and Hughes (1994) found no significant relationship and Solomon (2001) found community college transfer students between the ages of 25 and 29 performed well below other age groups including those between 23 and 24 who actually performed the best.

Smith (1995) and Ward-Roof (2003) examined technical college transfer students and found that those aged 26 years or older had a GPA ranging from .40 to .50 higher than younger students. Ward-Roof (2003) posited that one possibility for this difference is that older students typically transfer with more credit hours than younger students, suggesting that older students are more adjusted to the academic standards and rigor of higher education.

Of the 87,313 students enrolled in technical colleges within TCSG in fall of 2006, 29% were under the age of 21, 24% were between 21 and 25, and 48% were 26 or older (DTAE, 2006).

Race/Ethnicity

Race/ethnicity has been somewhat of a perplexing factor when examining smaller minority student sample sizes resulting from transfer rates of blacks and Hispanics being much lower than whites and Asians (Cohen & Brawer, 1996). In research of community college transfer students, Keeley (1993) found that minority students experienced significantly more transfer shock than white students. Carlan and Byxbe (2000) and Hall (2005) supported this with

their study that found white students earned significantly higher grades than other ethnic groups of students. Based on their findings, Carlan and Byxbe (2000) suggested that minority students consider beginning their higher education at a two-year college in order to build confidence and find emotional support before facing the increased academic rigor of the four-year college. However, research by Graham and Hughes (1994) contradicted these findings with data that indicated no significant relationship between ethnicity and academic performance of community college transfer students at the four-year college.

Smith (1995) examined technical college transfer students and found that whites and Asians outperformed African-Americans and Hispanics at the four-year college. She also found that among those students who experienced transfer shock, Asian students suffered the most with an average decline of 1.38, whites with 1.06, African-Americans with 1.17, and others with 1.14. Contradicting these findings, Ward-Roof (2003) also examined technical college transfer students and found no significant differences between white students who performed slightly below non-white students after their first semester.

Of the 87,313 students enrolled in technical colleges within TCSG in fall of 2006, 54% were white, 39% were black, 3% were Hispanic, and 2% were Asian (DTAE, 2006).

Gender

According to Cohen and Brawer (1996), gender has been the most commonly studied variable as a result of its ease in classification and assessing students. In an examination of community college transfer students, Keeley (1993) and Hall (2005) found gender to be a significant predictor of academic performance. However, Graham and Hughes (1994) and Carlan and Byxbe (2000) found no significant relationship.

According to Smith (1995) in her study of technical college transfer students, the majority of research indicated that women have shown slightly higher rates of academic performance but there have been no clear indications of trends toward a majority of either gender. She found in her study that women with a GPA of 2.34 slightly outperformed men with a 2.27. She also found that among those students who experienced transfer shock, women experienced slightly more with an average decline of 1.10 than men with 1.07. Ward-Roof (2003) also found that gender for technical college transfer students was related to academic performance with a GPA of 2.72 for women and 2.30 for men after their first semester. She posited that one possibility for this difference is that women typically transfer with more credit hours than men, suggesting that women are more adjusted to the academic standards and rigor of higher education.

Of the 87,313 students enrolled in technical colleges within TCSG in fall of 2006, 37% were male and 63% were female (DTAE, 2006).

Entrance Exam Scores

Carlan and Byxbe (2000) suggested that differences in aptitude are among the primary reasons two-year college transfer students perform below those at the four-year college. However, data in a study by Dougherty (1994) indicated that approximately one-third of two-year college transfer students achieved entrance exam scores in the top quartile that compared very closely to nearly one-half of the four-year college native students that achieved these scores. This implies that transfer and native students should perform similarly, but the majority of studies have supported the theory of transfer shock and a decline in the GPA of transfer students after their first semester (Carlan & Byxbe, 2000). This conflict has led many researchers to conclude that the source of variance in academic performance of transfer and native students is

not aptitude, but requisite preparation (Carlan & Byxbe, 2000). Again, the common theme has emerged that two-year colleges are inadequately preparing students for the increased academic rigor of the four-year college.

GPA at the Time of Transfer

Townsend (1993c) inspected influential characteristics of transfer students such as gender, ethnicity, age, achievement test scores, GPA, class rank, major, credit hours, and degree status to determine which may be the best predictors of academic achievement. She concluded that GPA was the best indicator of transfer student achievement at the four-year college. Supporting this conclusion are the findings of Phlegar, Andrew, and McLaughlin (1981), Lee and Frank (1990), Carlan and Byxbe (2000), and Graham and Hughes (1994). Additionally, Diaz (1992) found in her meta-analysis of 62 studies that those students transferring with a GPA of below 2.0 were generally not as successful at the four-year college.

In research examining technical college transfer students, Smith (1995) also found that there was a significant relationship between academic performance and GPA at the time of transfer. USG indicates that, "in general, students transferring from a two-year college to a senior institution were well-prepared for transfer" (USG, 2003, p. 5; USG, 2004, p. 5; USG, 2005, p. 7). Based on this statement, one would not expect to find evidence of significant declines in the GPA of technical college transfer students. However, data provided by USG indicates what do appear to be significant declines after one year of coursework at four-year colleges with technical college transfer students dropping, on average, from a 2.99 to a 2.78.

The findings of Hills (1965) and Cejda, Kaylor, and Rewey (1998) indicated evidence of transfer shock with significant declines in GPA specifically for mathematics and sciences. However, Hughes and Graham (1992) concluded there was not a significant relationship.

According to Carlan and Byxbe (2000), many researchers have concluded that the source of variance in academic performance of transfer and native students was a result of inadequate preparation in the prerequisite courses. Interestingly, Lee and Frank (1990) suggested that taking more mathematics and sciences at the two-year college facilitated students' transferring to the four-year college. Supporting this supposition, Phlegar, Andrew, and McLaughlin (1981) emphatically stated that students who fulfilled prerequisite requirements in the areas of math, science, and English performed better than their peers at the four-year college.

While some claim that two-year colleges are inadequately preparing students for transfer, others claim that taking more courses at the two-year college will help offset the inadequate preparation and, in fact, better prepare students for transfer. The obvious questions are whether it may be generalized that two-year colleges are inadequately preparing students to transfer to four-year colleges and whether taking more courses, even if they are considered inadequate, helps students prepare for transferring to the four-year college. Palmer and Eaton (1991) emphasized the need to examine academic performance of two-year college transfer students in specific disciplines at the four-year college to determine the strengths and weaknesses of transfer success.

Credit Hours Transferred

Cohen and Brawer (1984) made educated guesses based on incomplete existing state data that nationwide there are probably fewer than 5% of transfer students who complete their first two years at a two-year college before transferring to a four-year college and there are probably another 7% or 8% who transfer prior to completing their first-two years of coursework. In her meta-analysis of 62 studies on academic performance of transfer students, Diaz (1992) found that several studies indicated that impact of transfer shock experienced by students was significantly related to how long a student remained at the two-year college. More recent studies also support

these findings with Keeley (1993), Best and Gehring (1993), and Hall (2005) finding that community college students who transferred with junior level or 30 to 60 credit hours or an associate degree performed significantly better than those who transferred with fewer. Furthermore, it was found that these students compared very closely to native students and suggested that taking more courses at the two-year college allows students to acquire additional skills that help them prepare for the academic rigor of the four-year college. Their conclusion was that students should be encouraged to finish their first two years of coursework at the two-year college before transferring. However, a study by Carlan and Byxbe (2000) found no significant relationship between credit hours and GPA for community college transfer students. Townsend (2001) performed a study that falls somewhat in between those of traditional community and technical college transfer students by examining and finding no significant relationship for community college transfer students with an AAS degree and their academic performance at the four-year college. In a study examining technical college transfer students, Smith (1995) found a significant relationship between the academic performance at the four-year college and the number of credit hours earned at the time of transfer.

There are opposing conclusions related to the number of credit hours earned and subsequent academic performance of transfer students. With technical college transfer students averaging a transfer of 29 credit hours, USG indicated that "it appears that most students are not completing the requirements for a two-year degree before transferring" (USG, 2003, p. 5; USG, 2004, p. 6; USG, 2005, p. 8). However, it must be noted that most of the courses within terminal workforce development programs offered by technical colleges within TCSG are not designed for transfer and do not meet the criteria required by COC for transferring to a baccalaureate program within USG. Therefore, it is possible and very likely that technical college students may

earn their associate degrees but at the time of transfer appear to have only limited experience with higher education coursework based on number of courses that are eligible for transfer.

Technical College of Origin

According to Pascarella and Terenzini (1991), students' origin of entry into higher education relates significantly to educational goals and attainment and persistence. This supposition would also imply that students' subsequent academic performance is also significantly related to their origin of entry into higher education.

In a study that examined technical college transfer students, Ward-Roof (2003) found a relationship between GPA and technical college of origin of transfer. She suggested that two possibilities for these findings may be students' access to technology and other resources needed to succeed at four-year colleges and familiarity with their larger size campus and local environment. Smith (1995) also found a significant relationship between the technical college of origin and GPA at the four-year college. She posited that the variance between technical colleges of origin and academic performance was related to the number of credit hours earned by students from those technical colleges. This implied that those technical colleges that had better performing students also had higher averages of credit hours transferred. This may be coincidence or evidence of a better understanding of articulation and transfer between those technical colleges and the four-year college. However, contradicting these findings in a study of community college transfer students, Beckenstein (1992) found that there was no relationship between the two-year college of origin and success at the four-year college.

Enrollment Status

The review of literature by Smith (1995) indicated there were very few, if any, existing studies that examined the relationship between enrollment status and academic performance of transfer students. Her study found that technical college transfer students with part-time status earned a GPA of 2.41 and full-time students earned a 2.23. Some may speculate that part-time students achieve higher grades because they have more time to study. Others, however, may suggest that the reason students enroll part-time is because they have other commitments such as family or work and, consequently, actually have less time to study than full-time students.

Time Between Prerequisite and Requisite Courses

The time between students taking prerequisite and requisite courses was not evident in the review of literature as being commonly examined with regard to performance of two-year college transfer students. Many requisite math courses rely heavily on previously learned formulas either in application of new math skills or to lay the foundation for learning new math skills. This study will examine data to determine if there may be a correlation between performance in requisite math courses and time between prerequisite and requisite math courses.

Summary

Georgia has a unique system of higher education that that has two systems that are making efforts to improve the seamlessness between them despite their significant differences in mission, vision, admissions policies, curriculum, faculty, and student populations among others. One such effort to improve the seamlessness was the 2002 Mini-Core Project that established that "basic skills courses in English and mathematics with common course content will transfer between USG and COC-accredited [TCSG] institutions" (USG, 2002a, First Paragraph).

According to Hall (2005), it is important for institutions to identify local academic performance profiles of transfer students in order to better serve a variety of functions such as student services with offering advisement at both the transferring and receiving institutions.

In general, the academic performance of transfer students in requisite courses directly reflects on the effectiveness of prerequisite courses, the transfer process and function, and the seamlessness of higher education. There is a great deal of variance within the findings of existing studies related to transfer students that, according to Cohen and Brawer (1996), are attributed to the variety of state structures of higher education, limitations of growth imposed by the government, local conditions, community demographics, proximity of two- and four-year colleges, and local economy. As a result, it is common to find studies with conflicting results regarding the academic performance of two-year college transfer students and about what characteristics or variables are most related to or best predict the profile of successful transfer students.

CHAPTER 3

METHODOLOGY

The purpose of this study was to compare the performance of technical college transfer students and four-year college native students. Specifically, this study examined the requisite math course performance of 8,273 students at Kennesaw State University, paying specific attention to the differences between native students and technical college transfer students who completed prerequisite coursework within the Math Mini-Core at Chattahoochee Technical College.

There were two questions this study sought to answer:

1) How did the requisite math course performance of students native to Kennesaw State University compare with the requisite math course performance of technical college transfer students who completed prerequisite courses at Chattahoochee Technical College?
    a. Hypothesis 1: Students native to Kennesaw State University performed, on average, better than Chattahoochee Technical College transfer students in requisite math courses at Kennesaw State University.
2) Of those transfer students included in this study, what demographics and academic characteristics correlated with requisite math course performance at Kennesaw State University?
    a. Hypothesis 2: Specific demographics, including age, ethnicity/race, and gender, and academic characteristics, including GPA at the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the

prerequisite and requisite math courses, were correlated with requisite math course performance of transfer students who completed prerequisite math courses at Chattahoochee Technical College.

This chapter is divided into six sections: 1) The Course-Based Model of Transfer Success, 2) Sample Populations, 3) Data Collection, 4) Sample Populations Descriptive Statistics, 5) Data Analysis, and 6) Limitations.

The Course-Based Model of Transfer Success

Described as a model study by Kozeracki (2001) and mentioned in the research of others such as Solomon (2001), an alternative approach to measuring the performance of transfer students is called the Course-Based Model of Transfer Success (CBMTS) that examines requisite course-based performance data to help identify specific prerequisite course strengths and weaknesses. The overarching question the CBMTS attempts to answer is: Based on requisite course-based academic performance data, how do students' academic preparations in prerequisite courses contribute to their performance in subsequent courses (Quanty, 1999)?

The evolution of the CBMTS began with a prior study in 1989 on the performance of students transferring from Thomas Nelson Community College (TNCC) to Christopher Newport University (CNU) (Quanty, 1999). The study identified several statistically significant performance trends controlling for influential variables such as credit hours completed prior to transfer, ethnicity, age, and gender (Quanty, 1999). After one year of faculty from both institutions analyzing the data, follow-up analyses, and the acquisition of an external consultant to interview students regarding their perceptions of their transfer experience, it was finally realized that the data provided interesting sociological information but no relevant or useful information pertaining to the curriculum (Quanty, 1999).

In 1995 another study was conducted analyzing transcripts, persistence, and performance by major of students transferring from TNCC to Old Dominion University (ODU) (Quanty, 1999). Although the study was detailed, well constructed, and produced statistically significant findings, it, again, provided no useful course-based information (Quanty, 1999).

The presence of transfer students and articulation agreements between two- and four-year colleges necessitates collaboration between faculty of these institutions and involvement with the entire research process to "ensure the consistency in course content and quality" (Townsend, 2001, p. 39). Faculty members take pride in their teaching and the students who successfully complete their courses and subsequent courses (Quanty, 1999). For those students who show academic deficiencies, faculty members want to know why so they can correct or improve their curricula (Quanty, 1999).

Michael B. Quanty, Richard W. Dixon, and Dennis R. Ridley came to the realization that the common theme emerging from these prior studies was that while the findings produced interesting and statistically significant findings relating students' academic performance to their demographics and academic characteristics, they were not useful to faculty or administrators for improving curriculum because they could not change the students' demographics or academic characteristics. They noted that most research was being conducted with a student-based focus that provided broadly defined results with no suggestions for specific action (Quanty, 1999). However, relevant course-based data could be immediately used by faculty to improve courses to better prepare future transfer students (Quanty, 1999). What resulted was a new paradigm for evaluating the performance of transfer students called the CBMTS that is an "action-oriented paradigm for evaluating transfer success which is course-based rather than student-based" (Quanty, 1999, p. 457).

The CBMTS first identifies courses at the four-year college that have prerequisites that may be satisfied at the two-year college (Quanty, 1999). Next, data are collected from the four-year college including the grades for each student in each identified course (Quanty, 1999). The students are then divided into two cohorts that comprise transfer and native students (Quanty, 1999). An examination of the data is conducted at this time to describe the initial context of performance comparing the two cohorts based on the grades earned for the identified course (Quanty, 1999). Next, the transfer students are subdivided into cohorts based on their transfer institution to isolate the source of the prerequisite coursework (Quanty, 1999). Again, the data are examined to compare the performance of these transfer-institution-specific cohorts with that of the cohort of native students (Quanty, 1999). These are the data that faculty from both institutions will use as their primary source of evidence as to whether strengths or weaknesses may exist with specific prerequisite coursework that may be evaluated to make possible corrections or improvements.

The topics of study in the CBMTS are the specific prerequisite courses, not the students, and the most important element of the study is faculty collaboration to make use of the data for correcting or improving the prerequisite courses (Quanty, 1999). The CBMTS acts as the alarm indicating potential problems with articulation or the transfer process; it does not provide the solution. The solution is up to the faculty and this may require follow-up studies such as interviewing or surveying students regarding their specific prerequisite course experience to further isolate the source of the curricular deficiency.

The CBMTS was originally designed to evaluate two-year college prerequisite course strengths and weaknesses, but it is apparent that it is also useful to the four-year colleges to evaluate their prerequisite coursework (Quanty, 1999). Additionally, this model allows for other

influential variables to be examined during its process. Described above is merely the base model, and it is very easy to further divide students into additional cohorts and add other influential factors to the study for examining tangent outcomes such as evidence of transfer shock or transfer ecstasy or predicting performance based on age, ethnicity, gender, socioeconomic status, enrollment status, GPA at the time of transfer, credit hours at the time of transfer, course discipline, etc.

In 1996, Quanty, Dixon, and Ridley (1999) conducted the first study using the CBMTS to examine students transferring from two community colleges to two universities in Virginia. Data were collected and categorized by semester and prerequisite institution and then examined for each course across all semesters and for each discipline across all courses and then all semesters. The results of this study proved to be both interesting and useful. Overall, community college transfer students performed equal to or better than native university students. However, three of the discipline- and course-specific results provided the most relevant and useful information. First, transfer students having taken computer science prerequisites at a community college performed below those taking the prerequisites at the university. Faculty members determined there was a problem with the sequence of courses taken and rearranged the course sequencing so that more recent results reflected an equal comparison. Second, university faculty members found that transfer students were performing better in three business courses. This was investigated and the conclusion was that the university faculty of economics prerequisite courses and the three subsequent business courses were not communicating with each other partially because their courses were in different disciplines. The faculty of the three business courses agreed to examine the content of the prerequisite economics courses to help determine where the deficiencies might exist. Finally, university faculty members found that transfer students

performed better in Psychology II. Further examination showed that transfer institutions were offering only one condensed level of psychology as opposed to two levels offered at the universities. There was an overlap of course content that resulted with transfer students better prepared based on the fact that they had already covered some of the content in Psychology II that native students had not covered when taking Psychology I. The conclusion was that this did not alert the existence of a "problem," because there was not an indication of inadequate preparation; it was just a difference in curriculum design and sequencing.

Subsequent studies performed by Quanty using the CBMTS eventually included all 23 community colleges and six universities in Virginia (Quanty, 2001). The comprehensive data illustrated encouraging evidence that the CBMTS made the task of identifying and improving curricular deficiencies a manageable undertaking (Quanty, 2001). The comprehensive data were collected in 1,273 courses at the six universities that compared the grades of 38,768 transfer students and 183,365 native students (Quanty, 2001). Only 5.8% of the comparisons revealed native students outperforming transfer students and in .8% of the comparisons transfer students actually outperformed native students (Quanty, 2001). One community college was identified with a significant percentage of transfer students performing below native students in one class (Quanty, 2001). Of the 23 community colleges, ten were identified as producing adequately prepared transfer students and the remaining thirteen were identified as questionable with regard to adequately prepared transfer students (Quanty, 2001).

The results of these studies demonstrated the uniqueness and significance of the CBMTS as a research model for providing faculty and administrators with a quick and powerful instrument to identify prerequisite curricular strengths and weaknesses (Quanty, 2001). This model also provided systems and institutions with a method of determining the effectiveness of

existing articulation agreements and whether certain prerequisite courses needed to be modified or possibly excluded. This model may also serve as a precursor in establishing future articulation agreements. Most articulation agreements are based on an enrollment and transfer history that indicates evidence of a demand for seamless transfer of coursework. The CBMTS model may be used to help determine whether prerequisite courses are already successfully preparing students for requisite courses and should be part of an articulation agreement. Townsend (2001) speculated that if this model were to be used nationally, specific prerequisite course strengths could be identified and perhaps help contradict the myth of inadequate preparation of students transferring from two-year colleges, or specific prerequisite course weaknesses could be identified that would allow faculty and administrators to make necessary corrections or improvements to strengthen the curriculum.

Sample Populations

Kennesaw State University (KSU) was selected as the four-year college providing requisite coursework for two primary reasons. First, as illustrated in Table 3.1, KSU was the largest four-year non-research institution within USG and the fourth largest of all institutions within USG with 19,854 students during the fall semester of 2006 (USG, 2006). Second, as illustrated in Table 3.2, in FY 2005, KSU had the highest rate of all four-year institutions within USG and the second highest rate of all institutions within USG of students transferring from TCSG with 260 (USG, 2005).

Table 3.1

University System of Georgia Fall 2006 Semester Enrollment Report

Institution	Current enrollment
Georgia Institute of Technology	17,936

Institution	Current enrollment
Georgia State University	26,135
Medical College of Georgia	2,696
University of Georgia	33,959
Research universities	80,726
Georgia Southern University	16,425
Valdosta State University	10,888
Regional universities	27,313
Albany State University	3,927
Armstrong Atlantic State University	6,728
Augusta State University	6,573
Clayton State University	6,081
Columbus State University	7,597
Fort Valley State University	2,176
Georgia College & State University	6,040
Georgia Southwestern State University	2,457
Kennesaw State University	19,854
North Georgia College & State University	4,922
Savannah State University	3,241
Southern Polytechnic State University	4,207
University of West Georgia	10,163
State universities	83,966
Abraham Baldwin Agricultural College	3,574
Dalton State College	4,349
Gainesville State College	6,719
Georgia Gwinnett College	118
Gordon College	3,596
Macon State College	6,244
Middle Georgia College	3,051
State colleges	27,651
Atlanta Metropolitan College	1,683
Bainbridge College	2,783
Coastal Georgia Community College	3,054
Darton College	4,679
East Georgia College	1,719
Georgia Highlands College	3,933
Georgia Perimeter College	19,955
South Georgia College	1,465
Waycross College	1,018
Two-year colleges	40,289
University System Total	259,945

Note. From "Semester enrollment report: Fall 2006," by University System of Georgia, 2006, Available from the University System of Georgia, http://www.usg.edu/research/students/enroll/, p. 1.

Table 3.2

University System of Georgia 2004-2005 Undergraduate Student Transfer Report

		Upon transfer		One year after transfer	
Receiving institution	Total	Avg. GPA	Average hours	Avg. GPA	Average hours
Georgia Institute of Technology	5	NR	39	3.02	25
Georgia State University	96	3.11	50	2.93	17
Medical College of Georgia	15	3.47	61	3.45	NR
University of Georgia	97	3.36	42	2.87	21
Research universities	213	3.26	47	2.94	19
Georgia Southern University	25	3.09	26	2.61	19
Valdosta State University	35	2.83	41	2.43	15
Regional universities	60	2.95	35	2.51	17
Albany State University	0	NA	NA	NA	NA
Armstrong Atlantic State University	94	3.09	28	2.45	14
Augusta State University	62	2.81	24	2.54	16
Clayton State University	96	2.91	42	2.74	14
Columbus State University	85	2.82	22	2.64	10
Fort Valley State University	6	3.02	50	3.3	19
Georgia College & State University	21	3	43	2.91	18
Georgia Southwestern State University	13	NR	49	2.72	16
Kennesaw State University	260	3.05	35	2.71	15
North Georgia College & State University	48	3.09	57	2.88	15
Savannah State University	35	2.65	37	3.03	16
Southern Polytechnic State University	80	NR	34	2.51	11
University of West Georgia	58	3.03	24	2.75	16
State universities	858	2.97	34	2.69	14
Dalton State College	143	NR	34	2.81	10
Gainesville State College	176	2.69	30	2.92	14
Macon State College	10	2.58	10	2.75	12
State colleges	329	2.69	31	2.87	12
Abraham Baldwin Agricultural College	26	2.82	16	2.75	15
Atlanta Metropolitan College	17	2.53	12	2.74	11
Bainbridge College	77	3.39	18	2.7	12
Coastal Georgia Community College	26	2.78	24	2.55	12
Darton College	29	NR	26	2.56	8
East Georgia College	18	2.51	14	2.77	17
Georgia Highlands College	159	3.12	13	3.16	10
Georgia Perimeter College	488	NR	15	2.78	10

		Upon transfer		One year after transfer	
Receiving institution	Total	Avg. GPA	Average hours	Avg. GPA	Average hours
Gordon College	103	NR	12	2.77	12
Middle Georgia College	21	3.08	14	2.36	13
South Georgia College	0	NA	NA	NA	NA
Waycross College	0	NA	NA	NA	NA
Two-year colleges	964	3.07	15	2.8	11
Total	2,424	2.99	29	2.78	13

Note. From "Undergraduate student transfers in FY2005: Executive summary," by University System of Georgia, 2005, Available from the University System of Georgia, http://www.usg.edu/research/students/transfer/, p. 36.

To define the scope of courses examined in this study, the Math Mini-Core was used to specifically identify requisite math courses at KSU. The Mini-Core was an articulation agreement developed in 2002 as a means of addressing seamlessness of transfer between USG and the Technical College System of Georgia (TCSG) (USG, 2002a). This agreement established that USG would accept specific coursework from COC-accredited technical colleges. The Mini-Core included the following three math courses, also known as the Math Mini-Core.

USG	TCSG Mini-Core Equivalent
1) *MATH 1101 (Math Modeling)	1) *MAT 190 (Math Modeling)
2) *MATH 1111 (College Algebra)	2) *MAT 191 (College Algebra)
3) MATH 1113 (Pre-Calculus)	3) MAT 194 (Pre-Calculus)

*In most cases students take Math Modeling or College Algebra, not both.

Examination of the KSU *2007-2008 Undergraduate Catalog* and course enrollment data for fall of 2002 through summer of 2004 revealed that the following three requisite math courses have prerequisites satisfied by the Math Mini-Core and have among the highest enrollments for

requisite math courses at KSU (KSU, 2008; KSU, 2008a). KSU course enrollment history for MATH 1106, 1107, and 1190 is illustrated in Table 3.3.

KSU Requisite Courses	Prerequisite Courses
1) MATH 1106 (Elementary Calculus)	1) MATH 1101, 1111, or 1113 OR MAT 190, 191, or 194
2) MATH 1107 (Elementary Statistics)	2) MATH 1101, 1111, or 1113 OR MAT 190, 191, or 194
3) MATH 1190 (Calculus)	3) MATH 1113 OR MAT 194

Table 3.3

Kennesaw State University Math Course Enrollment History from Spring 2003 to Summer 2004

Classes		Summer 2004	Summer 2003	Fall 2003	Fall 2002	Spring 2004	Spring 2003
MATH	1101	257	318	1,700	1,550	932	929
MATH	1106	161	182	738	634	908	849
MATH	1107	334	316	889	812	1,100	960
MATH	1113	160	188	1,088	1,080	656	550
MATH	1190	121	116	470	387	498	471
MATH	2202	48	41	111	112	164	139
MATH	2203	26	13	40	22	37	42
MATH	2590	30		29	32	30	29
MATH	3260	30	21	64	64	58	62
MATH	3261			6	12		
MATH	3310	23	23	14	20	10	
MATH	3315	38	37	164	135	167	131
MATH	3316	33	38	74	57	132	107
MATH	3317	42	64	86	86	93	50
MATH	3322	11	28	80	56	57	81
MATH	3332	14	25	54	52	67	56
MATH	3333			12	18		
MATH	3390	17	22	20	24	31	29
MATH	3395	18	27	22	13	16	15
MATH	3400	16	14	46	48	46	47

Classes		Summer 2004	Summer 2003	Fall 2003	Fall 2002	Spring 2004	Spring 2003
MATH	3495	12		33	14	35	24

Note. From "KSU student profile: Fall semester 2006 [Data file]," by Kennesaw State University, 2006, Available from Kennesaw State University, https://vic2.kennesaw.edu/Portal/main.do

About the Courses

The following course descriptions are for prerequisite math courses taken by Chattahoochee Technical College (CTC) transfer students from within the Math Mini-Core. Course descriptions were taken from the TCSG *List of all Credit Courses offered by Georgia Technical Colleges* and include MAT 190, 191, and 194 (TCSG, 2008a).

- MAT 190 (Math Modeling) is designed as an alternative to College Algebra for those students who will not take Trigonometry, Pre-Calculus, or Calculus. It is an applications-driven course that introduces functions using real-world phenomena as models. The major topics include: fundamental concepts of algebra; linear, quadratic, polynomial, exponential, and logarithmic functions and models of real-world phenomena; systems of equations; and additional topics in algebra.
- MAT 191 (College Algebra) emphasizes techniques of problem solving using algebraic concepts. Topics include: algebraic concepts and operations, linear and quadratic equations and functions, simultaneous equations, inequalities, exponents and powers, graphing techniques, and analytic geometry.
- MAT 194 (Precalculus) prepares students for Calculus. The topics discussed include an intensive study of polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs. Applications include simple maximum and minimum problems, exponential growth and decay.

The following course descriptions are for prerequisite math courses taken by KSU native students. Course descriptions were taken from the KSU *2007-2008 Undergraduate Catalog* and include MATH 1101, 1111, and 1113 (KSU, 2008).

- MATH 1101 (Mathematical Modeling) is an applications-driven course that focuses on modeling real data concerning environmental issues. Incorporates collaborative learning, oral and written reports, and technology in the form of graphing calculators. Topics include linear, quadratic, piece-wise defined, rational, polynomial, exponential and logarithmic functions.
- MATH 1111 (College Algebra) is a functional approach to algebra that incorporates the use of appropriate technology. Emphasis will be placed on the study of functions and their graphs, inequalities, and linear, quadratic, piece-wise defined, rational, polynomial, exponential, and logarithmic functions. Appropriate applications will be included.
- MATH 1113 (Precalculus) provides students with the foundation in elementary functions and understanding of mathematics needed to succeed in subsequent mathematics and science courses, especially calculus. Topics include polynomial, rational, exponential, logarithmic, and trigonometric functions. In each case, properties, graphs, and applications will be presented. Technology, in the form of graphing calculators and/or computers, will be integrated throughout the course for instruction and study. Required for math/science majors.

The following course descriptions are for requisite math courses taken by both CTC transfer students and KSU native students. Course descriptions were taken from the KSU *2007-2008 Undergraduate Catalog* and include MATH 1106, 1107, and 1190 (KSU, 2008).

- MATH 1106 (Elementary Applied Calculus) has a prerequisite of MATH 1101, MATH 1111, MATH 1112, or MATH 1113. This course uses techniques of college algebra and elementary calculus to analyze and model real world phenomena. Emphasis will be on applications using an intuitive approach to the mathematics rather than formal development. Topics include graphs, derivatives, and integrals of functions. This course incorporates collaborative learning, oral and written reports, and technology.
- MATH 1107 (Elementary Statistics) has a prerequisite of MATH 1101, MATH 1111, MATH1112, or MATH 1113. This course emphasizes techniques and applications rather than derivation. Topics include methods of summarizing data, probability, statistical inference and regression. This course incorporates collaborative learning, oral and written reports and technology.
- MATH 1190 (Calculus) has a prerequisite of a C or better grade in MATH 1112 or MATH 1113. This course is designed as a first course in calculus and analytic geometry. Topics include fundamental concepts of limits, continuity, derivatives, and integrals of functions of one variable. Incorporates applications from a variety of disciplines. Modern computing technology will be used where necessary and appropriate.

Kennesaw State University

KSU was chartered in 1963 and opened in 1966 under the name of Kennesaw Junior College (KSU, 2006a). In 1976, the college was granted senior college status and renamed Kennesaw College in 1977 (KSU, 2006a). This led to the addition of a junior year in 1978 and the senior year in 1979 (KSU, 2006a). By 1980 the college conferred its first baccalaureate degrees and became fully accredited as a four-year institution by the Southern Association of Colleges and Schools (KSU, 2006a). The college also introduced intercollegiate athletics in 1982

(KSU, 2006a). In 1988, Kennesaw College became Kennesaw State College (KSU, 2006a). Shortly after this name change and pursuit of becoming a four-year college, all associate degrees with the exception of nursing were discontinued and the first graduate programs were already in progress (KSU, 2006a). In 1996, Kennesaw State College became Kennesaw State University and in 2002 KSU opened its first residential apartments to accommodate 1,100 students. By 2004-2005 KSU athletics had moved from Division II to Division I and joined the Atlantic Sun Conference (KSU, 2006a). Figure 3.1 illustrates KSU's student profile during fall 2006.

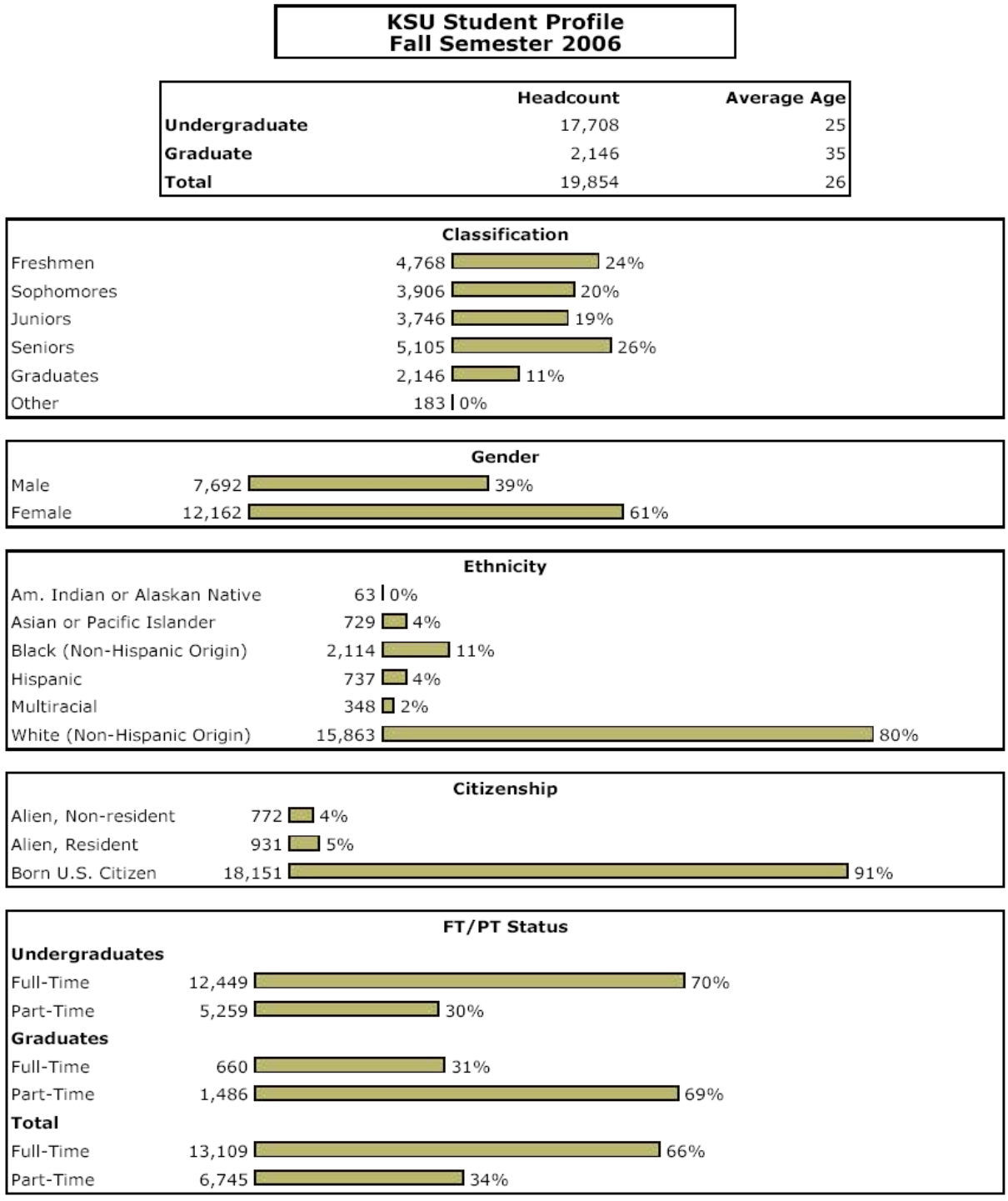

Figure 3.1. Kennesaw State University Fall 2006 Student Profile. From "KSU student profile: Fall semester 2006 [Data file]," by Kennesaw State University, 2006, Available from Kennesaw State University, https://vic2.kennesaw.edu/Portal/main.do.

Data Collection

The KSU Office of Institutional Research gathered and removed student identifiers from data extracted from Banner's student management software that is used by KSU to enroll, register, and track students as well as to report data to the Board of Regents. Information was retrieved in two files. The first isolated data for KSU native students who were enrolled in requisite math courses MATH 1106, 1107, and/or 1190 from fall semester of 1998 through fall semester of 2007 that satisfied prerequisite coursework through MATH 1101, 1111, and/or 1113. The second isolated data for technical college transfer students who were enrolled in the same requisite math courses during the same timeframe and satisfied prerequisite coursework through the Math Mini-Core (MAT 190, 191, and/or 194) at a technical college within TCSG. Following CBMTS, the following parameters were used to isolate the data:

- Only the first grade earned by a student in a requisite math course (MATH 1106, 1107, and/or 1190) at KSU is included in the data. It is possible students may have taken a course more than once in effort to improve their GPA, better prepare themselves for requisite coursework, or they may have withdrawn, among other possibilities. Consequently, it is possible for a student to have earned more than one grade for each course.
- Success was defined as students' receiving a grade of A, B, or C.
- Incompletes (I) were not included with the requested data because they didn't fit within the context of being defined as successful or unsuccessful.
- Unsuccessful was defined as receiving a grade of D, F, Withdrawal (W), or Withdrawal Fail (WF). Withdrawals (W) were categorized as unsuccessful completion of a requisite

course under the assumption that many students may have elected to withdraw rather than receive an unsuccessful grade.

- Only the last successful grade (A, B, or C) earned by a student in a prerequisite course (MATH 1101 or MAT 190, MATH 1111 or MAT 191, and/or MATH 1113 or MAT 194) is included in the data. This was done because this study is designed to examine requisite course performance based on successful completion of prerequisite coursework.
- Technical college transfer students were defined as students who took one or more prerequisite courses within the Math Mini-Core (MAT 190, 191, and/or 194) at Chattahoochee Technical College.
- Native students were defined as students who took one or more prerequisite math courses (MATH 1101, MATH 1111, and/or MATH 1113) at KSU. This was done regardless of how many credit hours were earned at KSU or whether students may have transferred coursework from other institutions.
- The unit of analysis in this study was the course, not the student. The sample population was determined by the number of grades, not the number of students. It is possible for students to be included in the data more than one time if they had taken more than one requisite course.

Specific data elements extracted for KSU native students included age, ethnicity/race, gender, requisite course grades for MATH 1106, 1107, and/or 1190, and prerequisite course grades for MATH 1101, MATH 1111, and MATH 1113. Specific data elements extracted for technical college transfer students included age, ethnicity/race, gender, requisite course grades for MATH 1106, 1107, and/or 1190, prerequisite course grades for MAT 190, MAT 191, and

MAT 194, GPA at the time of transfer, technical college of origin, credit hours transferred, SAT scores, prerequisite semester, requisite semester, and enrollment status.

Omitted Data

The original data for technical college transfer students included 739 cases. However, this study is designed to examine requisite course performance based on successful completion of prerequisite coursework. Only the last successful grade (A, B, or C) earned by a student in a prerequisite course (MATH 1101 or MAT 190, MATH 1111 or MAT 191, and/or MATH 1113 or MAT 194) is included in the data. As a result, 292 of the cases with unsuccessful grades (D, F, W, or WF) were omitted.

As illustrated by Figure 3.2, 424 (95%) of the remaining 447 technical college transfer students had Chattahoochee Technical College (CTC) as their technical college of origin. The 23 cases who had a technical college of origin other than CTC created a highly imbalanced comparison and, as a consequence, were omitted from this study. Angela Evans, KSU Director of Admissions, stated that the most likely reason for this was because KSU refers students who may not meet admissions standards almost exclusively to CTC and many of these students eventually transfer to KSU (personal communication, February 25, 2008). CTC is only about 12 miles from KSU and until recently was the nearest technical college accredited by the Commission on Colleges (COC) for the Southern Association of Colleges and Schools (SACS) (A. Evans, personal communication, February 25, 2008). This accreditation makes the transfer of coursework much easier and is also a stipulation in the Mini-Core articulation agreement between USG and TCSG. Although several other technical colleges that are nearby have recently earned accreditation by COC, KSU continues to refer students almost exclusively to CTC based on the relationship between the two institutions that has evolved over the years (A. Evans,

personal communication, February 25, 2008). Another factor to consider is that CTC has the highest enrollment of all technical colleges within TCSG and is, therefore, more likely to have higher numbers of students transferring to KSU than other technical colleges

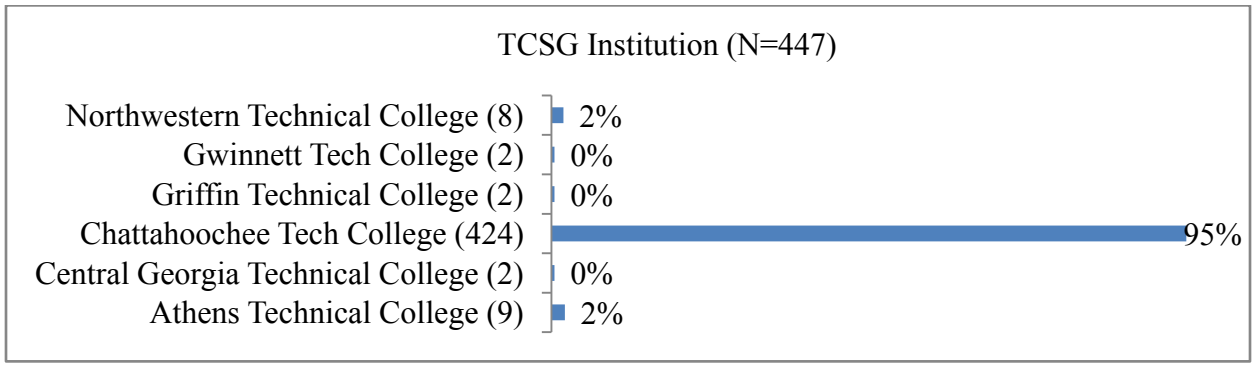

Figure 3.2. Technical College of Origin for the Sample Population of Technical College Transfer Students at Kennesaw State University from 1998 to 2007

SAT math scores were not available for 261 (62%) of the 424 CTC transfer students who may have satisfied admissions testing via other methods such as COMPASS or ASSET. There was no way to accurately correlate the variety of admissions testing with a single score for every case as required by the multinomial regression model that was used for this study. As a consequence, examination of SAT math scores was omitted from this study.

Descriptive Statistics

SPSS statistical software and Microsoft Excel 2007 were used to analyze the course-based data for MATH 1106, 1107, and 1190 at KSU and generate descriptive statistics for the sample populations.

Descriptive Statistics for Both Sample Populations

As illustrated in Figure 3.3, from fall semester of 1998 through fall semester of 2007 there were 424 CTC transfer students enrolled in MATH 1106, 1107, and/or 1190 at KSU who satisfied prerequisites by taking courses within the Math Mini-Core (MAT 190, 191, and/or 194). During this same timeframe there were 7,849 KSU native students enrolled in these courses who satisfied prerequisites by taking courses (MATH 1101, 1111, and/or 1113) at KSU.

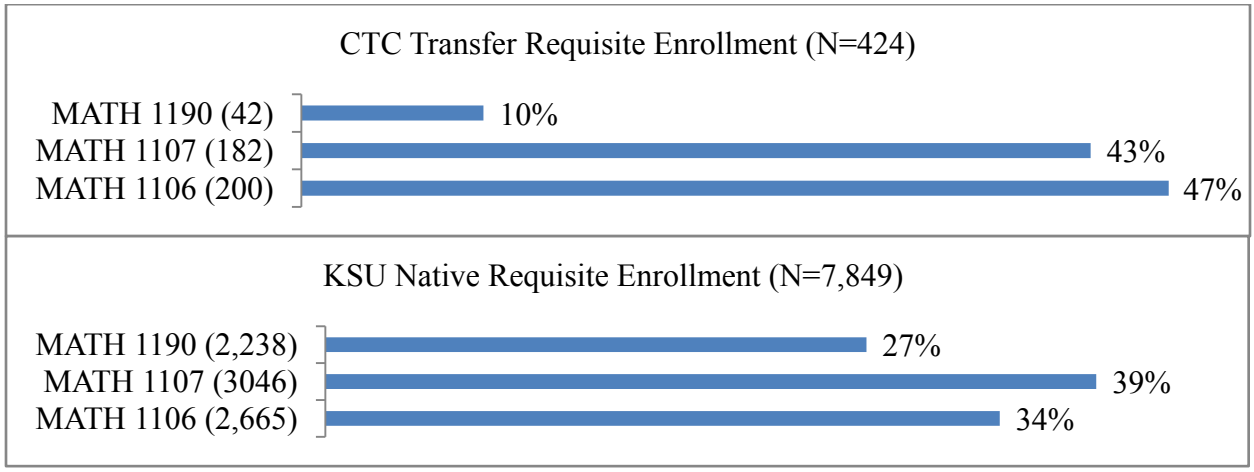

Figure 3.3. Requisite Course Enrollment for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Figures 3.4, enrollment for prerequisite math courses from within the Math Mini-Core for CTC transfer students included 64 (15%) from MAT 190, 262 (62%) from MAT 191, and 98 (23%) from MAT 194. Enrollment for prerequisite math courses for KSU native students included 4,399 (56%) from MATH 1101, 373 (5%) from MATH 1111, and 3,077 (39%) from MATH 1113.

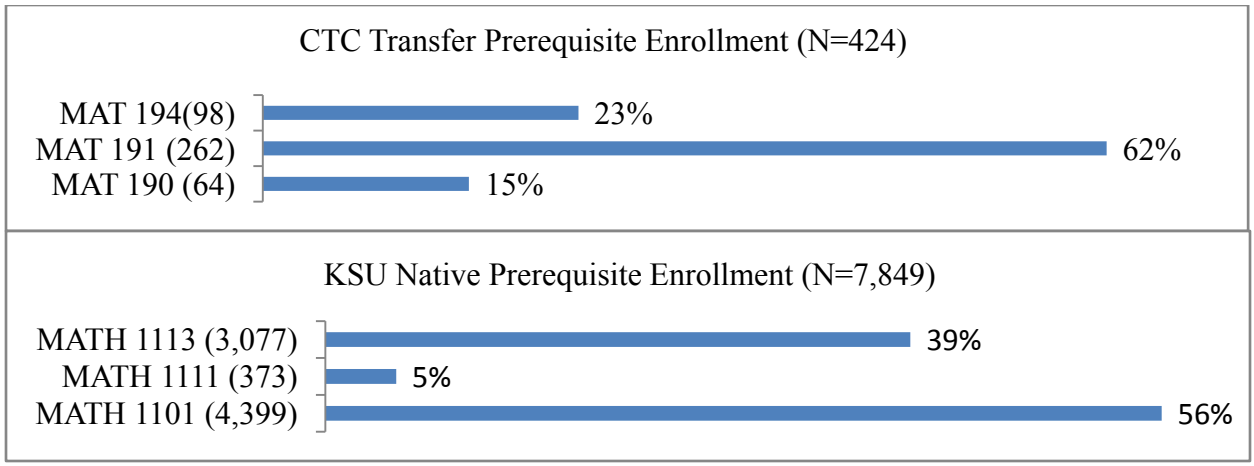

Figure 3.4. Prerequisite Course Enrollment for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Figure 3.5, ethnicity/race for CTC transfer students included 314 (74%) white, 67 (16%) black, 11 (3%) Hispanic, 19 (4%) Asian or Pacific Islander, 10 (2%) multiracial, two (less than 1%) American Indian or Alaskan Native, and one (less than 1%) other students. Ethnicity/race for KSU native students included 6,512 (83%) white, 593 (7%) black, 300 (4%) Hispanic, 283 (4%) Asian or Pacific Islander, 130 (2%) multiracial, 26 (less than 1%) American Indian or Alaskan Native, and five (less than 1%) other students.

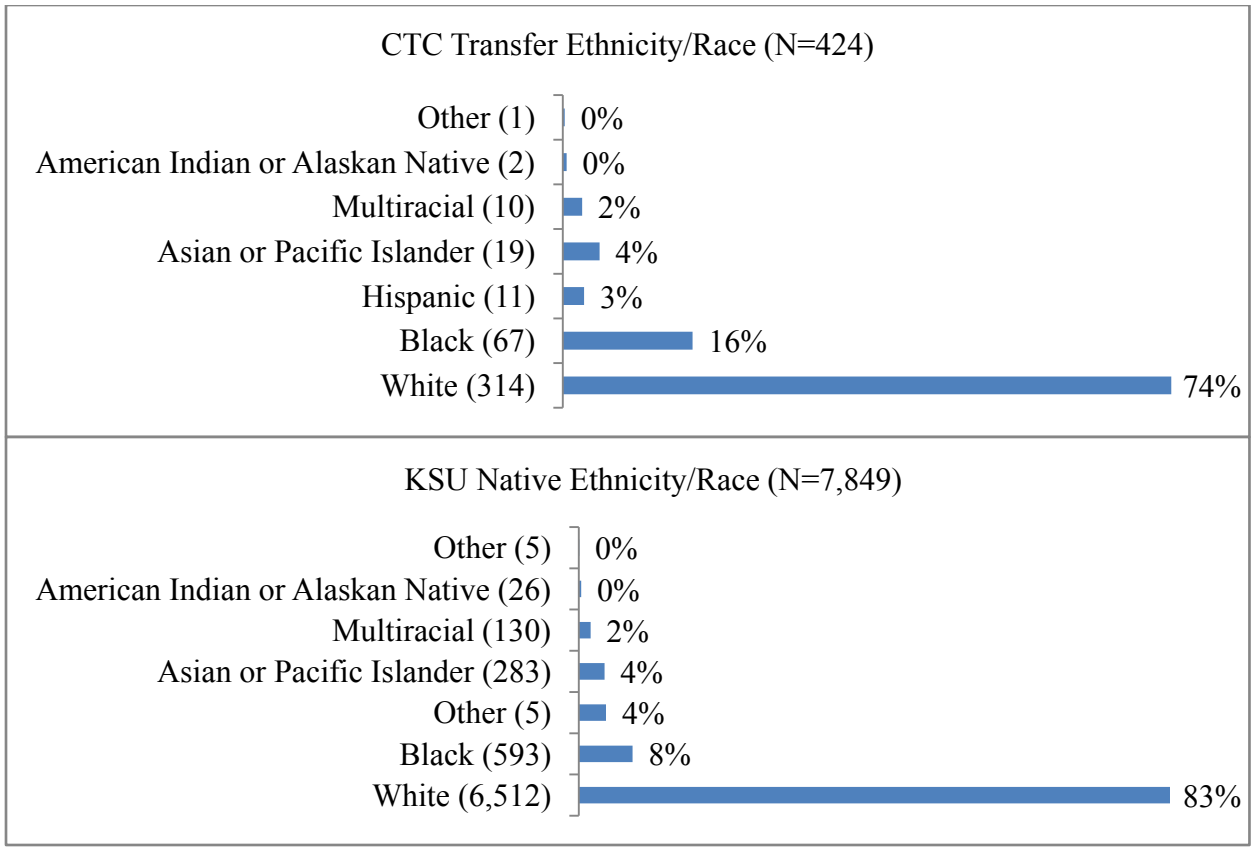

Figure 3.5. Ethnicity/Race (Uncondensed) for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

The low number of cases for other, American Indian or Alaskan Native, Asian or Pacific Islander, and Hispanic created an imbalanced comparison that was not suitable for the multinomial logit model (MLM) regression analysis used in this study and, as a result, were grouped together in the "other" ethnicity/race category. As illustrated in Figure 3.6, ethnicity/race for CTC transfer students included 314 (74%) white, 67 (16%) black, and 43 (10%) other students. Using the same ethnicity/race classification, KSU native students included 6,512 (83%) white, 593 (7%) black, and 744 (9%) other students.

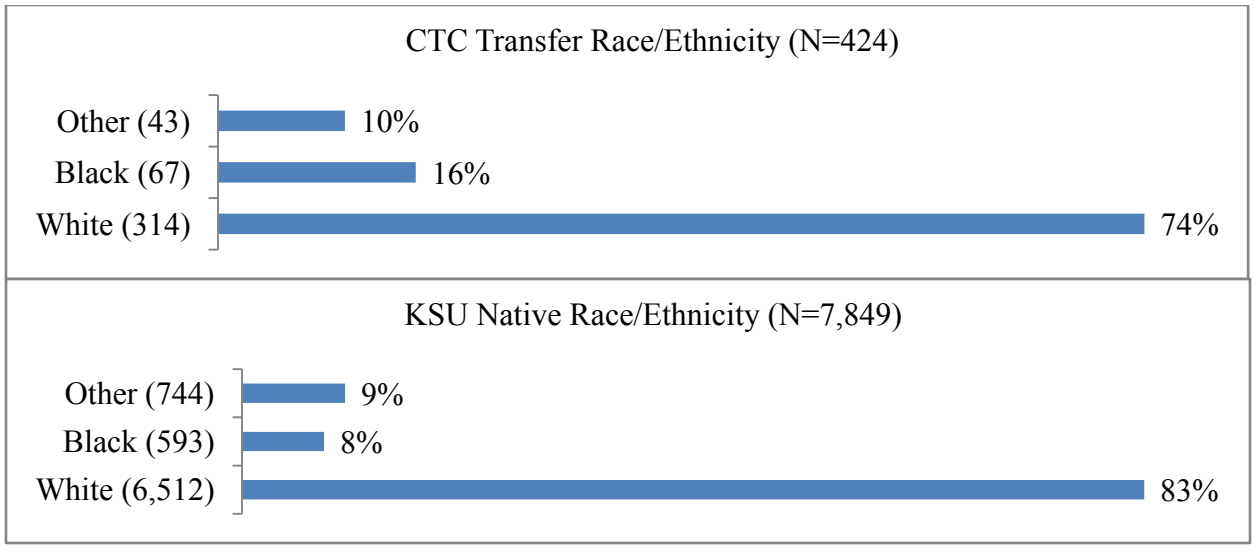

Figure 3.6. Ethnicity (Condensed) for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Figure 3.7, gender for CTC transfer students included 243 (57%) females and 181 (43%) males. Gender for KSU native students included 4,809 (61%) female students and 3,040 (39%) male students.

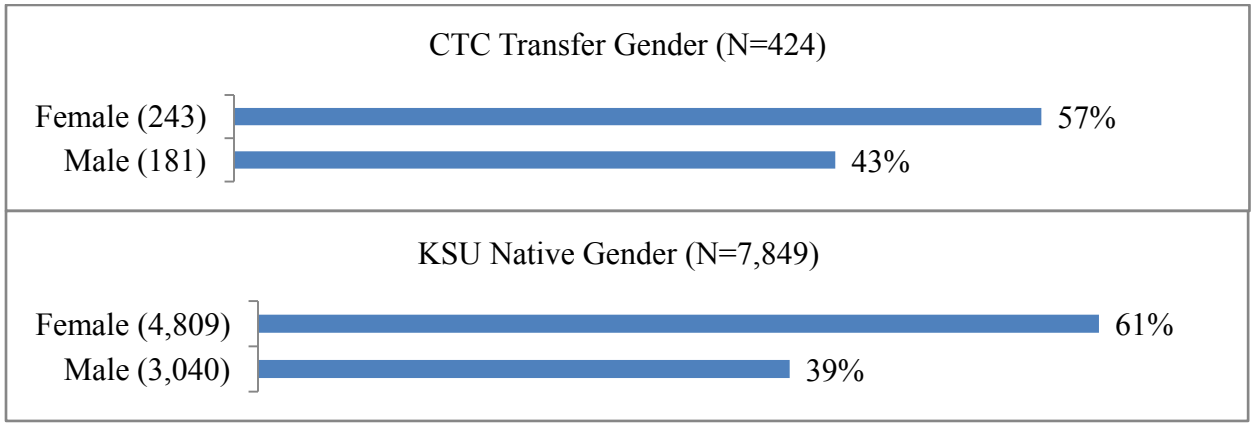

Figure 3.7. Gender for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Table 3.4, age for CTC transfer students had a range between 19 and 57, an average of 27, a median of 26, a mode of 25, an interquartile range between 23 and 29, and a standard deviation of six. Age for KSU native students had a range of 48 between 18 and 66, an average of 25, a median of 23, a mode of 22, an interquartile range between 22 and 26, and a standard deviation of six.

Table 3.4

Age for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

CTC transfer ages		
N		424
Mean		27
Median		26
Mode		25
Std. deviation		6
Range		38
Minimum		19
Maximum		57
Percentiles	25	23
	50	26
	75	29

KSU native ages		
N		7849
Mean		25
Median		23
Mode		22
Std. deviation		6
Range		48
Minimum		18
Maximum		66
Percentiles	25	22
	50	23
	75	26

As illustrated in Figure 3.8, requisite course grades for CTC transfer students included 245 (58%) successful grades consisting of 78 (18% of total) receiving an A, 79 (19% of total) receiving a B, and 88 (21% of total) receiving a C and 179 unsuccessful grades consisting of 38 (9% of total) receiving a D, 44 (10% of total) receiving an F, and 97 (23% of total) receiving a W. Requisite course grades for KSU native students included 5,545 (71%) successful grades consisting of 2,168 (28% of total) receiving an A, 1,927 (25% of total) receiving a B, and 1,450

(18% of total) receiving a C and 2,304 (29% of total) unsuccessful grades consisting of 646 (8% of total) receiving a D, 628 (8% of total) receiving an F, and 1,030 (13% of total) receiving a W.

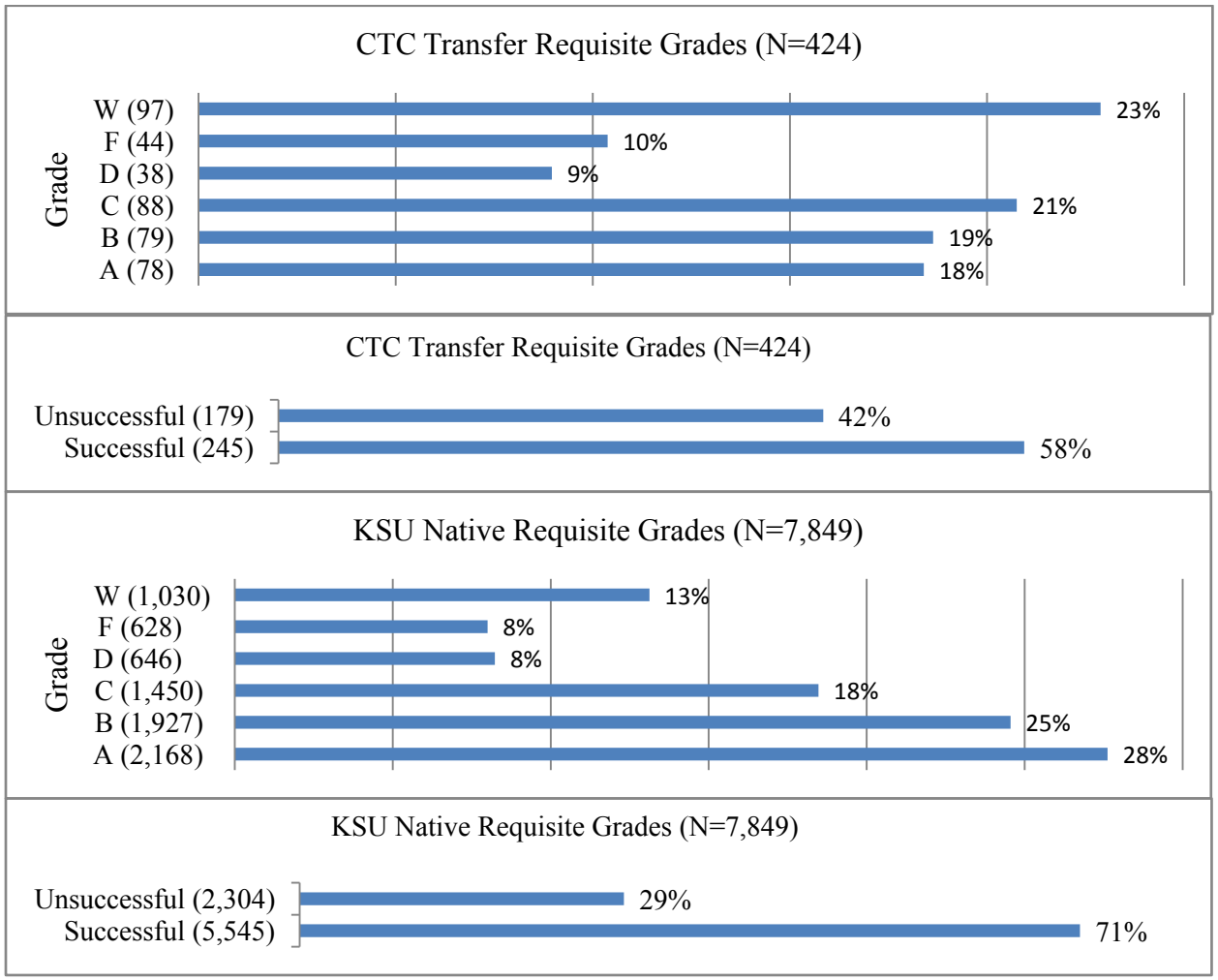

Figure 3.8. Requisite Grades for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Table 3.5, the number of semesters between the last successfully completed prerequisite course within the Math Mini-Core and requisite math course at KSU for CTC transfer students had a range between zero and 40, an average of five semesters, a median

of four semesters, a mode of two semesters, an interquartile range between two and seven, and a standard deviation of five.

Table 3.5

Semesters between Prerequisite and Requisite Math Courses for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

N		424
Mean		5
Median		4
Mode		2
Std. deviation		5
Range		40
Minimum		0
Maximum		40
Percentiles	25	2
	50	4
	75	7

Other Data for CTC Transfer Students

As illustrated in Figures 3.9, enrollment status for CTC transfer students while taking the requisite course at KSU included 127 (30%) full-time students, 207 (49%) part-time, and 90 (21%) unidentified.

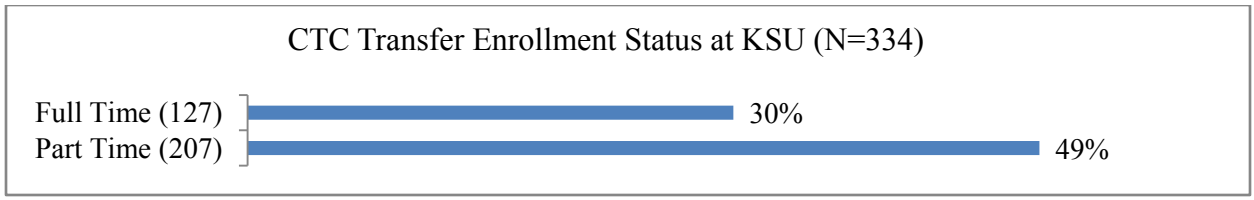

Figure 3.9. Enrollment Status for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

As illustrated in Table 3.6, hours transferred for CTC transfer students had a range between 3 and 150, an average of 33, a median of 29, a mode of 29, an interquartile range between 26 and 35, and a standard deviation of 16.

Table 3.6

Hours Transferred for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

N		424
Mean		33
Median		29
Mode		29
Std. deviation		16
Range		147
Minimum		3
Maximum		150
Percentiles	25	26
	50	29
	75	35

As illustrated in Table 3.7, GPA at the time of transfer for CTC transfer students had a range between 2.00 and 4.00, an average of 3.17, a median of 3.18, an interquartile range between 2.86 and 3.50, and a standard deviation of 0.47.

Table 3.7

GPA at the Time of Transfer for the Sample of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

N		424.0000
Mean		3.1678
Median		3.1800
Std. deviation		.4651
Range		2.0000
Minimum		2.0000
Maximum		4.0000
Percentiles	25	2.8612
	50	3.1800
	75	3.5000

Data Analysis

To determine if technical college transfer students who completed prerequisite coursework within the Math Mini-Core at a technical college within TCSG performed as well as native students, the conceptual framework of CBMTS was used along with SPSS statistical software to produce and examine requisite math course-based performance data at KSU. To determine how demographics--including age, ethnicity, and gender--factored into requisite math course performance at KSU, logistic regression was conducted using parameters of the multinomial logit model (MLM) along with SPSS statistical software to produce and examine data. And to determine how CTC transfer students' academic characteristics, including GPA at

the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the prerequisite and requisite math courses, factored into requisite math course performance at KSU, logistic regression was conducted using parameters of the multinomial logit model (MLM) along with SPSS statistical software to produce and examine data.

Question One

The strength of CBMTS lies in its simplicity. In order to produce reliable findings, it required a minimum of five years of course-based performance data for the identified requisite and prerequisite math courses (Quanty, 1999). Following the application of CBMTS, SPSS was used to conduct Pearson's chi-square testing to compute the success rate in the requisite math courses for CTC transfer students who completed prerequisites within the Math Mini-Core and for native students who completed prerequisites at KSU.

A test of statistical significance determines the degree of confidence with accepting or rejecting a null hypothesis. A null hypothesis tested with chi-square indicates whether or not two samples are different enough that it may be generalized that the populations are also different. Pearson's chi-square is the original and most widely used chi-square test. It is a nonparametric test that has less restrictive assumptions about data that is made up of discrete dichotomous variables that may be numerical and/or categorical and may not have a normal distribution. Chi-square provides a rough estimate of confidence and may be used in a wide variety of research contexts, such as with this study, because it is more forgiving in the data it will accept. It is used to test a null hypothesis that will lead to the determination of whether the distributions of two variables are independent of each other. A chi-square probability of .05 or less is commonly considered justification for rejecting a null hypothesis that the variables are dependent of each

other. A probability of anything greater than .05 is commonly considered justification for accepting the null hypothesis that the variables are independent of each other.

In general, larger sample sizes generate more reliable distributions and, consequently, a more reliable test of the hypothesis. Smaller sample sizes generate less reliable distributions and, consequently, a less reliable test of the hypothesis. In cases where the sample sizes are small or the table is highly imbalanced such as with some categories numbering in the thousands and others in the single digits, it is common to use Fisher's exact test as an alternative to Pearson's chi-square test.

Pearson's chi-square test was first used to measure whether there was a statistically significant difference between CTC transfer students and KSU native students with success in the requisite math courses taken at KSU. The categorical independent variable, where the students satisfied prerequisite coursework (CTC or KSU), was compared against a categorical dependent variable, successful (A, B, or C) or unsuccessful (D, F, or W) completion of requisite math courses at KSU. This was done to aggregately evaluate student performance for all requisite courses in this study (1106, 1107, and 1190), based on the source for all prerequisite courses in this study (190, 191, and 194 from within Math Mini-Core for CTC transfer students and 1101, 1111, and 1113 for KSU native students).

Pearson's chi-square test was then used to measure whether there were statistically significant differences between CTC transfer students and KSU native students with success in each requisite math course taken at KSU. The categorical independent variables, each prerequisite course (190 and 1101, 191 and 1111, and 194 and 1113), was compared against a categorical dependent variable, successful (A, B, or C) or unsuccessful (D, F, or W) completion of each requisite course (1106, 1107, and 1190) at KSU. This was done to evaluate student

performance for each requisite course in this study (1106, 1107, and 1190) based on the source for each prerequisite course in this study (190, 191, and 194 from within Math Mini-Core for CTC transfer students and 1101, 1111, and 1113 for KSU native students).

Question Two

The multinomial logit model (MLM) is a generalized logistic regression model that allows for analysis of categorical independent predictor variables with more than two discrete categorical outcomes. In this study, the categorical independent predictor variables are cohort, specific demographics, and specific academic characteristics that include some that are nominal and some that are ordinal. This study also has more than two discrete categorical outcomes with nominal requisite course grades: A, B, C, D, F, and W. MLM assumes that data for independent variables are specific and have a single value for each case and that they cannot perfectly predict the dependent variable.

MLM also assumes that the independent variables are not highly correlated and that their relationships with dependent variables do not depend on and are not affected by the addition or omission of alternative variables. In this study, it is assumed that the cohorts, demographics, and academic characteristics are not highly correlated and that their relationship with requisite course grades does not depend on and is not affected by the addition or omission of these or other variables. For example, if the performance (dependent variable) of full-time students (independent variable) was specifically being examined, the outcome produced by MLM would not be affected if age or any other independent variable were added to or omitted from the model. The same may be said for any other relationship between dependent and independent variables being examined; the outcome is not affected by the inclusion or omission of other independent variables.

The MLM uses one arbitrarily chosen category of the dependent variable as the baseline category (sometimes referred to as comparison or reference category) that is omitted from the analysis while regression coefficients are calculated for all independent variables for each remaining category of the dependent variable. In this study, the arbitrarily chosen baseline category is the requisite course grade "A." The regression coefficients illustrate the affects of the independent variables on the odds of a case being in the dependent variable category versus the baseline category. The results of the MLM represent an explanation of whether or not independent variables are likely to influence a case being in the dependent variable category versus the baseline category. For example, since "A" is the baseline category for performance (dependent variable) in this study, then the affects had by independent variables on performance are all being compared to receiving an "A." The independent variable increases or decreases the odds of receiving an A compared to some other grade.

As related to this study, MLM was used to analyze and explain the requisite math course performance for students. Specifically, the MLM illustrated the extent that demographics and academic characteristics influenced a student's performance in requisite math courses. Results may be used by a variety of college staff and faculty to develop profiles for successful and at-risk students with regard to these specific prerequisite and requisite math courses and, consequently, develop programs and services tailored specifically for these students.

Using MLM, variables were entered in blocks. First, the block of cohort data was analyzed to determine if the source of prerequisite coursework affected performance in requisite math courses at KSU. This analysis will help determine if the source of prerequisite coursework may be a statistically significant predictor of future performance. Cohort was selected as the first block of variables to be analyzed because it was the primary emphasis of this study and what

distinguished between the two groups of students identified and selected for the sample population. This analysis complements the Course-Based Model of Transfer Success in that it examines performance of the two cohorts of students without consideration for other factors. Comparing the findings for the two models with only consideration for the source of prerequisite coursework will lead to more reliable conclusions and increase the validity of this study.

Next, demographic data were added to determine if cohort with consideration for specific demographic variables were statistically significant predictors for performance in requisite math courses at KSU. This analysis will help determine if specific innate student demographics may be statistically significant predictors of future performance. Demographic data were selected as the second block of variables to be analyzed because they are innate student characteristics that aren't and haven't been affected by other variables.

Finally, academic characteristics for only the cohort of CTC transfer students were added to determine if specific demographics with consideration academic characteristics affected performance in requisite math courses at KSU. This analysis will help determine if specific academic characteristics of students may be statistically significant predictors of future performance. Academic characteristics was selected as the last block of variables because they may have been previously affected by other variables but necessary to analyze in order to help determine if there may be a correlation between these characteristics and performance.

Researcher Bias

As a former high school math teacher and employee of Chattahoochee Technical College I have witnessed lower achieving students planning to use and using technical colleges and their terminal workforce development programs as access points to four-year colleges and their baccalaureate programs. As a consequence, I have developed a strong professional and personal

interest in the practicality of these students making such a transition. It is my hope this study may provide a model for TCSG and USG to assess the effectiveness of how well prerequisite courses within TCSG prepare students for the increased academic rigor of a baccalaureate degree program within USG. Specifically, it is my hope that this study may provide a model to assess the effectiveness of the Math Mini-Core and provide administrators and faculty of TCSG and USG a tool for improving courses, programs, articulation agreements and policy, and the seamlessness of higher education in Georgia.

Limitations of the Study

This study does not attempt to discover the cause of fluctuation in requisite course-based academic performance data for students completing prerequisite coursework in TCSG or students completing prerequisite coursework at KSU. This study provides a tool for faculty and administrators to identify the possibility of curricular strengths and weaknesses that may impact the transfer process and, consequently, the academic performance of students in requisite courses. Additionally, there are numerous environmental and personal factors to consider when assessing academic performance and this study does not claim to account for all such factors. This study uses several of the more commonly researched academic and demographic variables of students to help provide faculty, staff, and administrators develop transfer student profiles. These profiles may be used to identify successful or at-risk transfer students in order to provide services that will better facilitate their successful transfer process.

The selection of data for this study is a convenience sample in that it is derived from KSU. While KSU provides a strong representative sample within USG and the state of Georgia it is not a global data set and may not accurately reflect the local realities of other four-year institutions. Additionally, this study does not account for student selection of institution.

Dougherty (1994) indicated that approximately one-third of two-year college transfer students achieved entrance exam scores in the top quartile that compared very closely to nearly one-half of the four-year college native students that achieved these scores. The stereotype that two-year college students are lower achieving may not be a valid generalization. Many higher achieving students choose to begin their higher education at a two-year college for a variety of other reasons such as financial, convenience, environment, etc. Consequently, the presence of this possibility has potential to skew the resulting data for cohorts of TCSG and KSU students.

CHAPTER 4

FINDINGS

The purpose of this study was to compare the performance of technical college transfer students and four-year college native students. Specifically, this study examined the requisite math course performance of 8,273 students at Kennesaw State University, paying specific attention to the differences between native students and technical college transfer students who completed prerequisite coursework within the Math Mini-Core at Chattahoochee Technical College.

There were two questions this study sought to answer:

1) How did the requisite math course performance of students native to Kennesaw State University compare with the requisite math course performance of technical college transfer students who completed prerequisite courses at Chattahoochee Technical College?
    a. Hypothesis 1: Students native to Kennesaw State University performed, on average, better than Chattahoochee Technical College transfer students in requisite math courses at Kennesaw State University.
2) Of those transfer students included in this study, what demographics and academic characteristics were correlated with requisite math course performance at Kennesaw State University?
    a. Hypothesis 2: Specific demographics, including age, ethnicity/race, and gender, and academic characteristics, including GPA at the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the

prerequisite and requisite math courses, were correlated with requisite math course performance of transfer students who completed prerequisite math courses at Chattahoochee Technical College.

The conceptual framework of the Course-Based Model of Transfer Success (CBMTS) was used to establish the parameters for selecting sample populations and course-based data. To answer the first question, CBMTS guiding principles were used along with SPSS statistical software to produce and examine data. To answer the second question, additional student demographics and academic characteristics were selected, gathered, and subjected to regression analysis using SPSS statistical software and the multinomial logit model (MLM) to produce and examine data.

This chapter is divided into three sections: 1) The First Question, 2) The Second, and 3) The Third Question.

The First Question

How did the requisite math course performance of students native to Kennesaw State University compare with the requisite math course performance of technical college transfer students who completed prerequisite courses at Chattahoochee Technical College? To answer this question, CBMTS guiding principles were followed and SPSS statistical software was used to compute rates for successful/unsuccessful completion of requisite math courses at Kennesaw State University (KSU) for native students and students who completed prerequisite math courses from within the Math Mini-Core at Chattahoochee Technical College (CTC). SPSS was then used to conduct Pearson's chi-square testing to compute data that was used to determine if there was a correlation between requisite math course performance and the source of prerequisite coursework.

The hypothesis for the first question was that students native to KSU performed, on average, better than CTC transfer students in requisite math courses at KSU. Consequently, the null hypothesis for the first question was that students native to KSU didn't perform, on average, better than CTC transfer students in requisite math courses at KSU. A chi-square probability of .05 or less is commonly considered justification for rejecting a null hypothesis and that the variables are dependent of each other. A probability of anything greater than .05 is commonly considered justification for not rejecting the null hypothesis and that the variables are independent of each other.

Pearson's Chi-Square Test is an *estimation* typically used with larger more balanced samples that produce more reliable distributions. However, Fisher's *Exact* Test is an alternative typically used with smaller highly imbalanced samples that produce less reliable distributions, such as samples with some categories numbering in the thousands and others in the single digits. Pearson's Chi-square is an estimation that does not require a laborious calculation process and is more practical with larger more balanced samples that produce more reliable distributions. Fisher's Exact Test requires a laborious calculation process that is more practical and reliable with smaller highly imbalanced samples that produce less reliable distributions.

Pearson's Chi-Square Test was first used to determine if there was a statistically significant relationship between the source of prerequisite coursework and student performance in the requisite math courses as a whole. The categorical independent variable, the source of prerequisite coursework (CTC or KSU), was compared against a categorical dependent variable, successful (A, B, or C) or unsuccessful (D, F, or W) completion of requisite math courses.

Pearson's Chi-square Test was then used to measure whether there were statistically significant relationships between the source of each prerequisite course and student performance in requisite math courses.

Findings – Aggregate

There were a total of 8,273 cases. Table 4.1 illustrates that 424 (5.1%) of these cases satisfied prerequisite coursework from within the Math Mini-Core at CTC and that 179 (42.2%) of these were unsuccessful and 245 (57.8%) were successful in the requisite math courses at KSU. 7,849 (94.9%) of the cases satisfied prerequisite coursework at KSU and 2,304 (29.4%) of these were unsuccessful and 5,790 (70.6%) were successful in the requisite math courses at KSU.

Table 4.1

Performance Summary (Aggregate) for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

			Performance		Total
			Unsuccessful	Successful	
Institution	CTC	Count	179	245	424
		% within institution	42.2%	57.8%	100.0%
		% within performance	7.2%	4.2%	5.1%
		% of total	2.2%	3.0%	5.1%
	KSU	Count	2304	5545	7849
		% within institution	29.4%	70.6%	100.0%
		% within performance	92.8%	95.8%	94.9%
		% of total	27.8%	67.0%	94.9%
Total		Count	2483	5790	8273
		% within institution	30.0%	70.0%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	30.0%	70.0%	100.0%

As illustrated in Table 4.2, the Pearson Chi-Square probability of .00 was reinforced by the Fisher's Exact Test probability of .00. There was a statistically significant relationship between the source of prerequisite coursework and requisite math course performance. Consequently, the null hypothesis was rejected. KSU native students performed, on average, better than CTC transfer students in requisite math courses at KSU.

Table 4.2

Chi-Square Tests (Aggregate) for the Sample Population of Native Students and Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	31.686(b)	1	.000		
Continuity correction(a)	31.077	1	.000		
Likelihood ratio	29.885	1	.000		
Fisher's Exact Test				.000	.000
N	8273				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 127.26.

Findings – Requisite 1106 Performance & Prerequisites 190 and 1101

There were a total of 1,982 cases for students who took MATH 1106 at KSU and satisfied prerequisites by taking either MATH 1101 at KSU or MAT 190 from within the Math Mini-Core at CTC. Table 4.3 illustrates that 32 (1.6%) of these cases satisfied prerequisite coursework by taking MAT 190 and that 13 (40.6%) of these were unsuccessful and 19 (59.4%) were successful in MATH 1106. Also illustrated, 1,950 (98.4%) of the cases satisfied prerequisite coursework by taking MATH 1101 and 709 (36.4%) of these were unsuccessful and 1,241 (63.6%) were successful in the MATH 1106.

Table 4.3

Performance Summary for MATH 1106 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1101 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 190 as a Prerequisite

			1106 Performance		Total
			Unsuccessful	Successful	
Institution	CTC 190	Count	13	19	32
		% within institution	40.6%	59.4%	100.0%
		% within performance	1.8%	1.5%	1.6%
		% of total	.7%	1.0%	1.6%
	KSU 1101	Count	709	1241	1950
		% within institution	36.4%	63.6%	100.0%
		% within performance	98.2%	98.5%	98.4%
		% of total	35.8%	62.6%	98.4%
Total		Count	722	1260	1982
		% within institution	36.4%	63.6%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	36.4%	63.6%	100.0%

As illustrated in Table 4.4, the Pearson Chi-Square probability of .619 was reinforced by the Fisher's Exact Test probability of .712. There wasn't a statistically significant relationship between the source of prerequisite coursework (MATH 1101 or MAT 190) and performance in requisite course MATH 1106. Consequently, the null hypothesis was accepted. KSU native students didn't perform, on average, better than CTC transfer students in MATH 1106 at KSU.

Table 4.4

Chi-Square Tests on Performance for MATH 1106 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1101 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 190 as a Prerequisite

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	.247(b)	1	.619		
Continuity correction(a)	.097	1	.755		
Likelihood ratio	.244	1	.621		
Fisher's Exact Test				.712	.372
N	1982				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.66.

Findings – Requisite 1106 Performance & Prerequisites 191 and 1111

There were a total of 403 cases for students who took MATH 1106 at KSU and satisfied prerequisites by taking either MATH 1111 at KSU or MAT 191 from within the Math Mini-Core at CTC. Table 4.5 illustrates that 130 (32.3%) of these cases satisfied prerequisite coursework by taking MAT 191 and that 55 (42.3%) of these were unsuccessful and 75 (57.7%) were successful in MATH 1106. Also illustrated, 273 (67.7%) of the cases satisfied prerequisite coursework by taking MATH 1111 and 37 (13.6%) of these were unsuccessful and 236 (86.4%) were successful in MATH 1106.

Table 4.5

Performance Summary for MATH 1106 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1111 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 191 as a Prerequisite

			1106 performance		Total
			Unsuccessful	Successful	
Institution	CTC 191	Count	55	75	130
		% within institution	42.3%	57.7%	100.0%
		% within performance	59.8%	24.1%	32.3%
		% of total	13.6%	18.6%	32.3%
	KSU 1111	Count	37	236	273
		% within institution	13.6%	86.4%	100.0%
		% within performance	40.2%	75.9%	67.7%
		% of total	9.2%	58.6%	67.7%
Total		Count	92	311	403
		% within institution	22.8%	77.2%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	22.8%	77.2%	100.0%

As illustrated in Table 4.6, the Pearson Chi-Square probability of .00 was reinforced by the Fisher's Exact Test probability of .00. There was a statistically significant relationship between the source of prerequisite coursework (MATH 1111 or MAT 191) and performance in requisite course MATH 1106. Consequently, the null hypothesis was rejected. KSU native students performed, on average, better than CTC transfer students in MATH 1106 at KSU.

Table 4.6

Chi-Square Tests on Performance for MATH 1106 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1111 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 191 as a Prerequisite

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	41.331(b)	1	.000		
Continuity correction(a)	39.715	1	.000		
Likelihood ratio	39.218	1	.000		
Fisher's Exact Test				.000	.000
N	403				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 29.68.

Findings – Requisite 1107 Performance & Prerequisites 190 and 1101

There were a total of 2,479 cases for students who took MATH 1107 at KSU and satisfied prerequisites by taking either MATH 1101 at KSU or MAT 190 from within the Math Mini-Core at CTC. Table 4.7 illustrates that 30 (1.2%) of these cases satisfied prerequisite course work by taking MAT 190 and that 15 (50%) were unsuccessful and 15 (50%) were successful in MATH 1107. Also illustrated, 2,249 (98.8%) of the cases satisfied prerequisite coursework by taking MATH 1101 and 589 (23.8%) were unsuccessful and 1,860 (75.9%) were successful in MATH 1107.

Table 4.7

Performance Summary for MATH 1107 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1101 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 190 as a Prerequisite

			1107 performance		Total
			Unsuccessful	Successful	
Institution	CTC 190	Count	15	15	30
		% within institution	50.0%	50.0%	100.0%
		% within performance	2.5%	.8%	1.2%
		% of total	.6%	.6%	1.2%
	KSU 1101	Count	589	1860	2449
		% within institution	24.1%	75.9%	100.0%
		% within performance	97.5%	99.2%	98.8%
		% of total	23.8%	75.0%	98.8%
Total		Count	604	1875	2479
		% within institution	24.4%	75.6%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	24.4%	75.6%	100.0%

As illustrated in Table 4.8, the Pearson Chi-Square probability of .001 was reinforced by the Fisher's Exact Test probability of .002. There was a statistically significant relationship between the source of prerequisite coursework (MATH 1101 or MAT 190) and performance in requisite course MATH 1107. Consequently, the null hypothesis was rejected. KSU native students performed, on average, better than CTC transfer students in MATH 1107 at KSU.

Table 4.8

Chi-Square Tests on Performance for MATH 1107 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1101 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 190 as a Prerequisite

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	10.829(b)	1	.001		
Continuity correction(a)	9.467	1	.002		
Likelihood ratio	9.281	1	.002		
Fisher's Exact Test				.002	.002
N	2479				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.31.

Findings – Requisite 1107 Performance & Prerequisites 191 and 1111

There were a total of 232 cases for students who took MATH 1107 at KSU and satisfied prerequisites by taking either MATH 1111 at KSU or MAT 191 from within the Math Mini-Core at CTC. Table 4.9 illustrates that 132 (56.9%) of these cases satisfied prerequisite coursework by taking MAT 191 and that 42 (31.8%) were unsuccessful and 90 (68.2%) were successful in MATH 1107. Also illustrated, 100 (43.1%) of the cases satisfied prerequisite coursework by taking MATH 1111 and 15 (15%) were unsuccessful and 85 (85%) were successful in MATH 1107.

Table 4.9

Performance Summary for MATH 1107 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1111 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 191 as a Prerequisite

			1107 performance		Total
			Unsuccessful	Successful	
Institution	CTC 191	Count	42	90	132
		% within institution	31.8%	68.2%	100.0%
		% within performance	73.7%	51.4%	56.9%
		% of total	18.1%	38.8%	56.9%
	KSU 1111	Count	15	85	100
		% within institution	15.0%	85.0%	100.0%
		% within performance	26.3%	48.6%	43.1%
		% of total	6.5%	36.6%	43.1%
Total		Count	57	175	232
		% within institution	24.6%	75.4%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	24.6%	75.4%	100.0%

As illustrated in Table 4.10, the Pearson Chi-Square probability of .003 was reinforced by the Fisher's Exact Test probability of .003. There was a statistically significant relationship between the source of prerequisite coursework (MATH 1111 or MAT 191) and performance in requisite course MATH 1107. Consequently, the null hypothesis was rejected. KSU native students performed, on average, better than CTC transfer students in MATH 1107 at KSU.

Table 4.10

Chi-Square Tests on Performance for MATH 1107 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1111 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 191 as a Prerequisite

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	8.684(b)	1	.003		
Continuity correction(a)	7.800	1	.005		
Likelihood ratio	9.032	1	.003		
Fisher's Exact Test				.003	.002
N	232				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 24.57.

Findings – Requisite 1190 Performance & Prerequisites 194 and 1113

There were a total of 2,178 cases for students who took MATH 1190 at KSU and satisfied prerequisites by taking either MATH 1113 at KSU or MAT 194 from within the Math Mini-Core at CTC. Table 4.11 illustrates that 40 (1.8%) of these cases satisfied prerequisite coursework by taking MAT 194 and that 22 (55%) were unsuccessful and 18 (45%) were successful in MATH 1190. Also illustrated, 2,138 (98.2%) of the cases satisfied prerequisite coursework by taking MATH 1113 and 783 (36.6%) were unsuccessful and 1,355 (63.4%) were successful in MATH 1190.

Table 4.11

Performance Summary for MATH 1190 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1113 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 194 as a Prerequisite

			1190 performance		Total
			Unsuccessful	Successful	
Institution	CTC 194	Count	22	18	40
		% within institution	55.0%	45.0%	100.0%
		% within performance	2.7%	1.3%	1.8%
		% of total	1.0%	.8%	1.8%
	KSU 1113	Count	783	1355	2138
		% within institution	36.6%	63.4%	100.0%
		% within performance	97.3%	98.7%	98.2%
		% of total	36.0%	62.2%	98.2%
Total		Count	805	1373	2178
		% within institution	37.0%	63.0%	100.0%
		% within performance	100.0%	100.0%	100.0%
		% of total	37.0%	63.0%	100.0%

As illustrated in Table 4.12, the Pearson Chi-Square probability of .017 was reinforced by the Fisher's Exact Test probability of .020. There was a statistically significant relationship between the source of prerequisite coursework (MATH 1113 or MAT 194) and performance in requisite course MATH 1190. Consequently, the null hypothesis was rejected. KSU native students performed, on average, better than CTC transfer students in MATH 1190 at KSU.

Table 4.12

Chi-Square Tests on Performance for MATH 1190 at Kennesaw State University from 1998 to 2007 for the Sample Population of Native Students Who Took MATH 1113 as a Prerequisite and Chattahoochee Technical College Transfer Students Who Took MAT 194 as a Prerequisite

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson Chi-Square	5.691(b)	1	.017		
Continuity correction(a)	4.930	1	.026		
Likelihood ratio	5.458	1	.019		
Fisher's Exact Test				.020	.014
N	2178				

Note. (a) Computed only for a 2x2 table. (b) 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.78.

The Second Question

Of those transfer students included in this study, what demographics and academic characteristics were correlated with requisite math course performance at Kennesaw State University? To answer the second question, the multinomial logistic model (MLM) was conducted using SPSS on the data to determine if there was a statistically significant relationship between requisite math course academic performance and specific demographics and academic characteristics, including age, ethnicity/race, gender, GPA at the time of transfer, credit hours

transferred, SAT math scores, enrollment status, and time between the prerequisite and requisite math courses.

The hypothesis for the second question was that specific demographics and academic characteristics, including age, ethnicity/race, gender, GPA at the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the prerequisite and requisite math courses, were correlated with requisite math course performance of CTC transfer students at KSU. Consequently, the null hypothesis for the second question was that specific demographics and academic characteristics, including age, ethnicity/race, gender, GPA at the time of transfer, credit hours transferred, SAT math scores, enrollment status, and time between the prerequisite and requisite math courses, weren't correlated with requisite math course performance of CTC transfer students at KSU.

The review of literature suggested that among the more commonly selected academic characteristics that factored into performance of two-year college transfer students at a four-year were entrance exam scores, GPA at the time of transfer, and credit hours transferred. Additional academic characteristics considered of interest for this study were enrollment status and time between prerequisite and requisite math courses.

Findings – The Second Question

First, the multinomial logit model (MLM) was used to determine if cohort, KSU native students and CTC transfer students, fit significantly well within the model. As illustrated in Table 4.13, the significance had a value below .05 that indicated this model as a whole fit significantly better with including cohort as a predictor variable.

Table 4.13

Multinomial Logit Model (MLM) Significance of Using Cohort as a Predictor of Performance for the Sample Population at Kennesaw State University from 1998 to 2007

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept	70.953(a)	.000	0	.
Cohort	118.869	47.917	5	.000

Note. The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. (a) This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

As illustrated in Table 4.14 and Appendix A, there were four individual comparisons, listed below, that indicated a significance of less than or equal to .05 with regard to the effect of the cohort on performance in requisite math courses at KSU. These independent variables were statistically significant predictors of the dependent variable. Consequently, the null hypothesis that stated these independent variables weren't correlated with requisite math course performance of CTC transfer students at KSU was rejected. For these individual comparisons, cohort was correlated with requisite math course performance of KSU native and CTC transfer

students at KSU. Only one individual comparison indicated a significance of greater than .05. The independent variable wasn't a statistically significant predictor of the dependent variable. For this individual comparison, cohort wasn't correlated with requisite math course performance of KSU native and CTC transfer students at KSU.

1) KSU native students were 59.3% as likely as CTC transfer students to receive a C relative to an A.
2) KSU native students were 61.2% as likely as CTC transfer students to receive a D relative to an A.
3) KSU native students were 51.4% as likely as CTC transfer students to receive an F relative to an A.
4) KSU native students were 38.2% as likely as CTC transfer students to receive a W relative to an A.

Table 4.14

Multinomial Logit Model (MLM) Likelihood of Receiving a Grade Compared to Receiving an "A" Using Cohort as a Variable for the Sample Population at Kennesaw State University from 1998 to 2007

Requisite grade(a)	B			C			D			F			W		
	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)
Intercept	0.013	0.936		0.121	0.438		-0.719	0.000		-0.573	0.002		0.218	0.152	
KSU native = 0	-0.131	0.422	0.878	-0.523	0.001	0.593	-0.492	0.015	0.612	-0.667	0.001	0.514	-0.962	0.000	0.382
CTC transfer = 1	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.

Second, MLM was used to determine if cohort with consideration for specific demographics, including age, ethnicity/race, and gender, used as variables fit significantly well within the model. As illustrated in Table 4.15, the significance for all these variables had a value below .05 that indicated this model as a whole fit significantly better with including cohort and all these demographics as predictor variables.

Table 4.15

Multinomial Logit Model (MLM) Significance of Using Cohort and Demographics as Predictors of Performance for the Sample Population at Kennesaw State University from 1998 to 2007

Effect	Model fitting criteria	Likelihood ratio tests		
	-2 log likelihood	Chi-square	Df	Sig.
Intercept	3492.620(a)	.000	0	.
Age	3559.791	67.171	5	.000
Cohort	3545.722	53.102	5	.000
Ethnicity/Race	3554.369	61.749	10	.000
Gender	3547.687	55.067	5	.000

Note. The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. (a) This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

As illustrated in Table 4.16 and Appendix B, when the individual effects of demographics were considered for the cohorts, the same four comparisons, listed below, indicated a significance of less than or equal to .05. These independent variables were statistically significant predictors of the dependent variable. Consequently, the null hypothesis that stated these independent variables weren't correlated with requisite math course performance of CTC transfer students at KSU was rejected. For these individual comparisons,

cohort with consideration for specific demographics was correlated with requisite math course performance of KSU native and CTC transfer students at KSU. The same one remaining comparison indicated a significance of greater than .05. The independent variable wasn't a statistically significant predictor of the dependent variable. Consequently, the null hypothesis was accepted for this individual comparison. For this individual comparison, cohort with consideration for specific demographics wasn't correlated with requisite math course performance of KSU native and CTC transfer students at KSU.

1) KSU native students were 49% as likely as CTC transfer students to receive a C relative to an A. Without consideration for demographics, KSU native students were 59.3% as likely as CTC transfer students to receive a C relative to an A. This effect decreased 10.3% when consideration was given to demographics.
    a. For each additional year older, students were 98% as likely to receive a C relative to an A.
    b. Other students were 40.7% more likely than white students to receive an A than a C.
    c. Other students were 148.1% more likely than black students to receive an A than a C.
    d. Female students were 37.3% more likely than male students to receive an A than a C.
2) KSU native students were 46.4% as likely as CTC transfer students to receive a D relative to an A. Without consideration for demographics, KSU native students were 61.2% as likely as CTC transfer students to receive a D relative to an A. This effect decreased 14.8% when consideration was given to demographics.

a. For each additional year older, students were 96.7% as likely to receive a D relative to an A.
b. Other students were 57.5% more likely than white students to receive an A than a D.
c. Other students were 189.5% more likely than black students to receive an A than a D.
d. Female students were 44.8% more likely than male students to receive an A than a D.

3) KSU native students were 39.3% as likely as CTC transfer students to receive an F relative to an A. Without consideration for demographics, KSU native students were 51.4% as likely as CTC transfer students to receive an F relative to an A. This effect decreased 12.1% when consideration was given to demographics.
    a. For each additional year older, students were 96.7% as likely to receive an F relative to an A.
    b. Other students were 64.2% more likely than white students to receive an A than an F.
    c. Other students were 221.2% more likely than black students to receive an A than an F.
    d. Female students were 68.8% more likely than male students to receive an A than an F.
4) KSU native students were 31.4% as likely as CTC transfer students to receive a W relative to an A. Without consideration for demographics, KSU native students were

38.2% as likely as CTC transfer students to receive a W relative to an A. This effect decreased 6.8% when consideration was given to demographics.

a. For each additional year older, students were 98.7% as likely to receive a W relative to an A.
b. Other students were 58.6% more likely than white students to receive an A than a W.
c. Other students were 117.2% more likely than black students to receive an A than a W.
d. Female students were 51.3% more likely than male students to receive an A than a W.

Table 4.16

Multinomial Logit Model (MLM) Likelihood of Receiving a Grade Compared to Receiving an "A" Using Cohort and Demographics as Variables for the Sample Population at Kennesaw State University from 1998 to 2007

Requisite grade(a)	B			C			D			F			W		
	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)
Intercept	0.258	0.230		0.361	0.104		-0.210	0.485		-0.174	0.559		-0.511	0.020	
Age	-0.018	0.000	0.982	-0.020	0.000	0.980	-0.033	0.000	0.967	-0.033	0.000	0.967	0.013	0.015	1.013
KSU native = 0	-0.295	0.097	0.744	-0.713	0.000	0.490	-0.767	0.001	0.464	-0.934	0.000	0.393	-1.158	0.000	0.314
CTC transfer = 1	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.
Ethnicity/race = white = 0	0.276	0.006	1.318	0.342	0.002	1.407	0.454	0.003	1.575	0.496	0.001	1.642	0.461	0.000	1.586
Ethnicity/race = black = 1	0.664	0.000	1.942	0.909	0.000	2.481	1.063	0.000	2.895	1.167	0.000	3.212	0.776	0.000	2.172
Ethnicity/race = other = 2	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.
Gender = male = 0	0.267	0.000	1.306	0.317	0.000	1.373	0.370	0.000	1.448	0.524	0.000	1.688	0.414	0.000	1.513
Gender = female = 1	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.

Finally, data were isolated to CTC transfer students and MLM was used to determine if specific demographics with consideration for specific academic characteristics, including GPA at the time of transfer, credit hours transferred, enrollment status, and time between the prerequisite and requisite math courses, used as variables fit significantly well within the model. The data were isolated to CTC transfer students for three primary reasons. First, this phase of the study was designed to analyze the performance of CTC transfer students to help identify at-risk students as compared to their peers within the same cohort. Second, isolating the data to CTC transfer students allowed for further analysis of the affect that the demographic variables had on performance of the two cohorts previously illustrated in Table 4.16. And third, specific variables for academic characteristics, such as GPA at the time of transfer and credit hours transferred, included data that weren't applicable to KSU native students because they weren't considered transfer student as defined by this study.

As illustrated in Table 4.17, the significance for GPA at the time of transfer, number of semesters between prerequisite and requisite course, and enrollment status had a value below .05. This indicated that this model as a whole fit significantly better with including these demographics and academic characteristics as predictor variables. The significance for age, the number of credit hours transferred, race/ethnicity, and gender had a value above .05 that indicated this model as a whole fit significantly better without including these demographics and academic characteristics as predictor variables.

Table 4.17

Multinomial Logit Model (MLM) Significance of Using Demographics and Academic Characteristics as Predictors of Performance for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

Effect	Model fitting criteria	Likelihood ratio tests		
	-2 log likelihood	Chi-square	df	Sig.
Intercept	1314.153(a)	.000	0	.
Age	1321.780	7.627	5	.178
GPA at the time of transfer	1356.464	42.311	5	.000
Number of hours transferred	1317.759	3.606	5	.607
Number of semesters between prerequisite and requisite course	1334.553	20.400	5	.001
Race/Ethnicity (Comparison category = white)	1331.034	16.881	10	.077
Gender (Comparison category = male)	1321.657	7.504	5	.186
Enrollment status (Comparison category = full-time)	1356.097	41.944	10	.000

Note. The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. (a) This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

As illustrated in Table 4.18 and Appendix C, there were eighteen individual comparisons (noted below) that indicated a significance of less than or equal to .05 with regard to the affect of specific demographics and academic characteristics on performance of CTC transfer students in requisite math courses. Each of the eighteen independent variables listed below was a statistically significant predictor of the dependent variable. Consequently, the null hypothesis that stated these independent variables weren't correlated with requisite math course performance of CTC transfer students at KSU was rejected. For these individual comparisons, specific demographics and academic characteristics were correlated with requisite math course performance of CTC transfer students at KSU. All other comparisons indicated a significance of

greater than .05. The independent variable was not a statistically significant predictor of the dependent variable. Consequently, the null hypothesis for the remaining comparisons was accepted. For these individual comparisons, specific demographics and academic characteristics were not correlated with requisite math course performance of CTC transfer students at KSU.

1) Although age did not contribute significantly to the model as a whole, for each additional year older, a student was 89.6% as likely to receive an F relative to an A.
2) For each additional point in GPA at the time of transfer, a student was 17.5% as likely to receive a B relative to an A.
3) For each additional point in GPA at the time of transfer, a student was 10.1% as likely to receive a C relative to an A.
4) For each additional point in GPA at the time of transfer, a student was 7.3% as likely to receive a D relative to an A.
5) For each additional point in GPA at the time of transfer, a student was 6.6% as likely to receive an F relative to an A.
6) For each additional point in GPA at the time of transfer, a student was 12.3% as likely to receive a W relative to an A.
7) For each additional semester between taking the prerequisite and requisite math course, a student was 85.4% as likely to receive a C relative to an A.
8) For each additional semester between taking the prerequisite and requisite math course, a student was 82.6% as likely to receive a D relative to an A.
9) For each additional semester between taking the prerequisite and requisite math course, a student was 92.1% as likely to receive a W relative to an A.

10) Although race/ethnicity did not contribute significantly to the model as a whole, white students were 472.4% more likely than black students to receive an A than a C.
11) Although race/ethnicity did not contribute significantly to the model as a whole, white students were 399.4% more likely than black students to receive an A than a D.
12) Although race/ethnicity did not contribute significantly to the model as a whole, white students were 500.1% more likely than black students to receive an A than an F.
13) Although race/ethnicity did not contribute significantly to the model as a whole, white students were 674.8% more likely than black students to receive an A than a W.
14) Although gender did not contribute significantly to the model as a whole, male students were 146.9% more likely than female students to receive an A than a C.
15) Full-time students were 670.5% more likely than unidentified students to receive an A than an F.
16) Full-time students were 530.6% more likely than part-time students to receive an A than an F.
17) Full-time students were 186.7% more likely than unidentified students to receive an A than a W.
18) Full-time students were 186.7% more likely than unidentified students to receive an A than a W.

Table 4.18

Multinomial Logit Model (MLM) Likelihood of Receiving a Grade Compared to Receiving an "A" Using Demographics and Academic Characteristics as Variables for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University from 1998 to 2007

Requisite grade(a)	B			C			D			F			W		
	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)	B	Sig.	Odds Ratio Exp (B)
Intercept	6.290	.000		8.698	.000		10.475	.000		10.238	.000		7.060	.000	
Age	-.013	.640	.987	-.038	.214	.963	-.072	.119	.931	-.110	.023	.896	-.025	.375	.975
GPA at the time of transfer	-1.742	.000	.175	-2.293	.000	.101	-2.613	.000	.073	-2.713	.000	.066	-2.094	.000	.123
Number of hours transferred	-.005	.663	.995	-.008	.505	.992	-.029	.111	.971	-.021	.216	.980	-.008	.507	.993
Number of semesters between prerequisite and requisite course	-.014	.665	.986	-.158	.001	.854	-.191	.005	.826	-.068	.196	.934	-.082	.037	.921
Ethnicity/race = white = 0	.188	.707	1.207	.044	.933	1.045	.115	.865	1.122	-.921	.274	.398	-.318	.560	.728
Ethnicity/race = black = 1	1.229	.082	3.416	1.745	.013	5.724	1.608	.044	4.994	1.792	.020	6.001	2.047	.003	7.748
Ethnicity/race = other = 2	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.
Gender = male = 0	.494	.148	1.638	.904	.011	2.469	.755	.086	2.128	.657	.125	1.928	.412	.229	1.510
Gender = female = 1	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.
Enrollment status = unidentified = 0	-.367	.438	.693	.293	.546	1.341	.514	.401	1.672	2.042	.003	7.705	1.053	.038	2.867
Enrollment status = part-time = 1	-.366	.348	.693	.699	.083	2.011	.882	.089	2.416	1.841	.004	6.306	1.634	.000	5.125
Enrollment status = full-time = 2	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.	0(b)	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.

CHAPTER 5

CONCLUSIONS, IMPLICATIONS, & RECOMMENDATIONS

The purpose of this study was to compare the performance of technical college transfer students and four-year college native students. Specifically, this study examined the requisite math course performance of 8,273 students at Kennesaw State University, paying specific attention to the differences between native students and technical college transfer students who completed prerequisite coursework within the Math Mini-Core at Chattahoochee Technical College.

This chapter is divided into three sections: 1) First Question, 2) Second Question, and 3) Overall. First are the conclusions, implications, and recommendations based on the examination of how requisite math course performance at Kennesaw State University (KSU) compared between native students and technical college transfer students who complete prerequisite courses within the Math Mini-Core at Chattahoochee Technical College (CTC). Second are the conclusions, implications, and recommendations based on the examination of how demographics and academic characteristics factored into requisite math course performance at KSU. And third are the overall conclusions, implications, and recommendations of this study.

The First Question

The 2002 Mini-Core Project was intended to promote seamlessness between the Technical College System of Georgia (TCSG) and the University System of Georgia (USG). However, what is seamlessness in policy is not necessarily seamlessness in reality. This is one of the reasons why it was recommended that an ongoing analysis be conducted within USG. It is imperative to analyze the performance of technical college transfer students who transferred

coursework from the Mini-Core in order to help determine if they were effectively prepared for the increased academic rigor of a baccalaureate program. As of 2008, no analysis had been conducted. This study presents a potential model for conducting this analysis.

Overall findings for the first question in this study illustrated that there was a statistically significant difference with 12.8% more KSU native students performing better than CTC transfer students in requisite math courses. Individual requisite math course-based findings indicated that MATH 1106 was the only one out of five comparisons that didn't have a statistically significant difference in performance. Only 4% more KSU native students who took MATH 1101 as a prerequisite performed better than CTC transfer students who took MAT 190 as a prerequisite. The remaining five individual requisite math course-based comparisons did indicate statistically significant differences: 1) MATH 1107 had 25.9% more KSU native students who took MATH 1101 perform better than CTC transfer students who took MAT 190, 2) MATH 1106 had 28.7% more KSU native students who took MATH 1111 perform better than CTC transfer students who took MAT 191, 3) MATH 1107 had 16.8% more KSU native students who took MATH 1111 perform better than CTC transfer students who took MAT 191, and 4) MATH 1190 had 18.4% more KSU native students who took MATH 1113 perform better than CTC transfer students who took MAT 194.

These findings are indirectly supported by the wealth of previous aggregate research conducted on academic performance of two-year college transfer students. The general consensus of these studies has been that two-year colleges are inadequately preparing students for transfer to a four-year college. However, this study is more specific with its analysis of performance of technical college transfer students in particular requisite math courses that were

selected based on their prerequisite courses. This study raises the question as to whether declines in requisite course performance may be directly linked to these specific prerequisite courses.

The statistically significant gaps in performance indicated by the findings for this study have potential implications for articulation policy between terminal workforce development programs and baccalaureate programs. Specifically, the findings of this study have potential implications for the Math Mini-Core articulation policy between KSU and CTC as well as USG and TCSG. This study does not indicate that articulation between technical colleges and four-year colleges has failed or is failing or that the Math Mini-Core at CTC has failed or is failing. It indicates that there is a gap between how students perform depending on whether they took prerequisites at CTC or KSU.

It is recommended that additional research be conducted to help further determine where and why these performance gaps may exist. Specifically, it is recommended that administrators and faculty from KSU and CTC begin this research by collaborating to examine their respective curricula, instructors, and teaching methodologies for MATH 1106, 1107, and 1190. It is also recommended they examine their respective prerequisite math courses at KSU and from within the Math Mini-Core at CTC to help determine the source of the performance gaps found in this study. And lastly, it is recommended that USG conduct a system-wide study such as this to determine if these performance gaps exist at other institutions.

The Second Question

Identification of performance profiles for transfer students is critical for institutions to better serve a variety of functions such as with student services offering advisement or academic support (Hall, 2005). The variety of research findings from one state to another and from one institution to another make it all but impossible for other institutions to draw meaningful

conclusions (Hughes & Graham, 1992). The best way to evaluate students is to assess the local realities that influence them (Prager, 1988; Hughes & Graham, 1992).

Findings--Summary for the Second Question

An initial comparison indicated a statistically significant relationship between the effects of cohort with performance in requisite math courses at KSU. When consideration was also given for demographics, the affect of cohort became even more statistically significant. Older, non-white/non-black (other), female students were more likely to receive an A than C, D, F, or W. It should be noted that the likelihood of other students receiving higher grades was dramatically more evident when compared to black students than to white students. Consequently, based on these findings the profile for potentially at-risk KSU students taking math courses at KSU is younger black male transfer students.

Findings for demographics with consideration for academic characteristics of students who transferred to KSU from CTC indicated a statistical significance for GPA at the time of transfer, the number of semesters between taking prerequisite and requisite math courses, and enrollment status. Ethnicity/race fell just outside of an acceptable level of statistical significance. Individual comparisons indicated older white full-time students with a higher GPA at the time of transfer who had not recently taken prerequisite math courses were more likely to perform better.

Based on the findings for both questions, the profile for potentially at-risk CTC transfer students taking requisite math courses at KSU may be described as part-time students who had a lower GPA and had recently taken prerequisite math courses at CTC. If consideration is also given to the individual comparisons that indicated they did not fit significantly well within the model as a whole, a profile for potentially at-risk CTC transfer students taking math courses at KSU may also be described as younger black part-time students who have a low GPA and had

recently taken prerequisite math courses at CTC. Although gender did not fit significantly well within the model as a whole, there was one individual comparison that indicated male students were more likely than female students to receive an A than a C. This was not a consideration for the potentially at-risk CTC transfer student because receiving a C is not defined as unsuccessful by this study.

Age

When examining cohort with consideration for demographics, age was found to be a statistically significant variable with regard to its effect on performance in requisite math courses at KSU. However, when the data were isolated to CTC transfer students, it was found that age did not contribute significantly as a variable in this model. The aggregate conclusion was that age was a statistically significant predictor for performance of students in requisite math courses at KSU but was much more pronounced with KSU native students than CTC transfer students.

As related to studies on two-year college transfer students, Graham and Hughes (1994) found no relationship between age and performance. Keeley (1993), Carlan and Byxbe (2000), Laanan (1999), and Hall (2005) found the age of students to be directly related to performance at the four-year college. As related to technical college transfer students, Smith (1995) and Ward-Roof (2003) that found older students performed better than younger students.

It may be argued that older students perform better than younger students because as students age they also become more mature. However, it may also be argued that younger students perform better because they are still very much in the academic mindset because they have not been away from secondary education as long. Older students may be more mature by age, but they may also be lacking the academic mindset as a result of how much time has passed

since they were last in a classroom setting. It may take more time for older students to acclimate themselves to being in school again and redevelop study habits.

Ethnicity/Race

When examining cohort with consideration for demographics, ethnicity/race was a statistically significant variable with regard to its effect on performance in requisite math courses at KSU. However, when the data were isolated to CTC transfer students, ethnicity/race fell just outside of what was considered acceptable significance for this study and did not contribute significantly to the model as a whole. The aggregate conclusion was that ethnicity/race was a statistically significant predictor for performance of students in requisite math courses at KSU but was more evident with KSU native students than CTC transfer students.

Keeley (1993), Carlan and Byxbe (2000), and Hall (2005) found that white students earned significantly higher grades than other ethnicities/races. However, research by Graham and Hughes (1994) found that there wasn't a significant relationship between ethnicity/race and academic performance of two-year college transfer students.

In studies of technical college transfer students, Smith (1995) that found white and Asian students outperformed black and Hispanic students at the four-year college. Ward-Roof's (2003) research found that there wasn't a significant difference between white students and non-white students after their first semester.

Carlan and Byxbe (2000) suggested that minority students should consider beginning their higher education at a two-year college in order to build confidence and emotional support before facing the increased academic rigor of the four-year college. Although ethnicity/race did not significantly contribute to the model as a whole for data that were isolated to CTC transfer students, it should be noted that there were four out of five individual course comparisons that

reflected a statistically significant gap in performance with non-black students receiving higher grades than black students despite both of them having begun their higher education at CTC.

Gender

When examining cohort with consideration for demographics, gender was a statistically significant variable with regard to its effect on performance in requisite math courses at KSU. However, when the data were isolated to CTC transfer students, gender was not statistically significant as a variable in this model. The aggregate conclusion was that gender was a statistically significant predictor for performance of students in requisite math courses at KSU but was much more apparent with KSU native students than CTC transfer students.

Keeley (1993) and Hall (2005) indicated that gender was a significant predictor of academic performance among two-year college transfer students. However, Graham and Hughes (1994) and Carlan and Byxbe (2000) contradicted these findings with a conclusion indicating there was not a significant relationship. Smith's (1995) study of technical college transfer students found there were no clear indications of trends toward a majority of either gender.

GPA at the Time of Transfer

Findings for the data that were isolated to CTC transfer students indicated that GPA at the time of transfer was a statistically significant variable with regard to its effect on performance in requisite math courses at KSU. In fact, this was the only factor that had a statistically significant comparison in all five individual grade comparisons. For each additional point in GPA a student was at least 82.5% more likely to receive an A than a B, C, D, F, or W.

Townsend's (1993c) meta-analysis concluded that GPA was the best indicator of transfer student achievement at the four-year college. Similar conclusions were presented by Phlegar, Andrew, and McLaughlin (1981), Lee and Frank (1990), Carlan and Byxbe (2000), Diaz (1992),

and Graham and Hughes (1994). In research examining technical college transfer students, Smith (1995) also found that there was a statistically significant relationship between academic performance and GPA at the time of transfer.

Although there are numerous studies that found an initial decline in GPA after transfer, most indicated that students eventually adjusted to the increased academic rigor of the four-year college and not only did their GPAs recover but in many cases GPA improved by the time they graduated. With this in mind, it may be speculated that as students progress with higher education, so will the improvement of their academic knowledge and skills.

Credit Hours Transferred

Findings for the data that were isolated to CTC transfer students indicated that credit hours transferred did not contribute significantly as a variable in this model. Reinforcing this outcome were findings that indicated not a single individual grade comparison illustrated any statistical significance.

Diaz (1992), Keeley (1993), Best and Gehring (1993), and Hall (2005) all found that two-year college students who transferred with more credit hours performed significantly better than those who transferred with fewer. However, Carlan and Byxbe (2000) found no statistically significant relationship between credit hours and performance. Townsend (2001) performed a study that was somewhat different in that she found no statistically significant relationship between two-year college transfer students with an AAS degree and their academic performance at the four-year college. Smith's (1995) study of technical college transfer students found a statistically significant relationship between the academic performance at the four-year college and the number of credit hours earned at the time of transfer.

It seems logical that as students take more courses they also mature academically, learn new skills, become more resourceful, and develop new and improved study habits. However, the findings for this study contradict this notion. One possible explanation for the findings in this study is that the number of credit hours transferred does not accurately reflect the students' true academic experience. Students may have previously earned many more hours that did not transfer because most courses within terminal workforce development programs offered by technical colleges within TCSG were not designed for transfer. For this reason among a variety of other reasons, most courses are not part of articulation agreements with four-year institutions within USG. Therefore, it is possible and very likely that technical college students may have earned many more credit hours than indicated at the time of transfer but appear to have only limited experience with higher education coursework based on smaller number of courses that were eligible for transfer.

Semesters between Courses

Findings for the data that were isolated to CTC transfer students indicated that the number of semesters between prerequisite and requisite math courses contributed significantly as a variable in this model. Specifically, three out of five individual grade comparisons indicated a statistical significance. In each of these comparisons, for each additional semester between taking the prerequisite and requisite math course a student was more likely to perform better.

The time between students' taking prerequisite and requisite courses was not evident in the review of literature as being commonly examined with regard to performance of two-year college transfer students. Many requisite math courses rely heavily on previously learned math skills and the application of these skills in order to retain them. The findings of this study indicated the opposite. Although it should be noted that the more time there was between courses

does not necessarily mean that it was the cause for better performance; it simply means that those students with more time between courses performed better.

There is a variety in possible explanations for this finding. One possibility is that students may have acquired better knowledge and skills through other coursework taken between the prerequisite and requisite math course. A second possibility might be greater maturity of students that is typically associated with age. A third possibility is that students may have participated in academic assistance programs between the prerequisite and requisite math courses, such as accessing tutors or other academic help programs. While there may be many other possibilities for these findings, the conclusion of this study was that the other coursework and academic assistance programs (not necessarily related to math) completed by a student between the prerequisite and requisite math courses must have played a statistically significant role in academic success.

Enrollment Status

Findings for the data that were isolated to CTC transfer students indicated that enrollment status contributed significantly as a variable in this model. Specifically, two out of five individual grade comparisons indicated a statistical significance with full-time students performing better than part-time or unidentified students. Smith (1995) indicated there were very few, if any, existing studies that examined the relationship between enrollment status and academic performance of transfer students. However, her results contradicted those of this study with part-time students who had a higher GPA than full-time students.

Some speculate that part-time students achieve higher grades because they have more time to study. Others, however, suggest that the reason students enroll part-time is because they

have other commitments such as family or work and, consequently, actually have less time to study than full-time students.

Overall

The findings for this study illustrate clear evidence that KSU native students performed, on average, better than CTC transfer students. When consideration was given to demographics, findings indicated that younger black male students didn't perform as well as other students and may be characterized as the most at-risk, especially for KSU native students. Further analysis of the data that were isolated to CTC transfer students indicated that part-time students with a low GPA who had recently taken prerequisite math courses were potentially the most at-risk. Other variables that had statistically significant individual comparisons but did not significantly contribute to the model as a whole illustrated that consideration for potentially at-risk CTC transfer students may also include younger black students.

Profiles such as this serve well during the admissions process because they afford student affairs personnel an alert system for at-risk students who may need more advisement regarding supplemental academic services such as tutoring, peer study groups, mentors, etc. These services may make the difference between at-risk students' being successful or unsuccessful.

The findings for the first question with regard for the requisite math course performance comparison between cohorts, students who satisfied prerequisite math coursework at KSU and transfer students who satisfied prerequisite math coursework from within the Math Mini-Core at CTC indicated that the Math Mini-Core was not preparing students as well as prerequisite math courses offered at KSU for requisite math coursework. As a consequence, students having participated in the CTC Math Mini-Core may be at-risk when compared to those students having participated in KSU prerequisite math courses.

Courses within the Math Mini-Core were designed to teach students practical skills necessary to prepare them for entry into the workforce immediately after completion. They were not designed to prepare students for the increased academic rigor of a baccalaureate program if and when they may transfer. Articulation agreements imply that despite whether a student successfully completed a course at the sending or receiving institution, the students will be *equally* prepared for requisite coursework. The results of this study do not support this statement. The development of articulation agreements between USG and TCSG or their respective institutions does not translate to the sound academic preparation of technical college transfer students for requisite coursework. The programs and courses offered by USG and TCSG were designed with two different missions in mind and faculty were hired based on different criteria respective to those missions and accreditation policy. Those involved with the development of the Mini-Core Project specifically recommended that there be an ongoing assessment of technical college transfer students who transferred coursework as a result of this project. Administration and faculty were expected to use findings to more closely examine the articulation, curricula, and the teaching methodologies of those courses.

It is clear that efforts are being made to accommodate the seamlessness of higher education and better serve students who may not distinguish between the blurring lines that separate institutional missions. Evidence of this is illustrated with several states, such as Alabama, Connecticut, Indiana, Kentucky, Louisiana, Minnesota, and Washington among others, that have considered merging or have merged their technical/vocational and community college systems. These mergers have either combined the systems under a single administrative umbrella or developed a single system that is or resembles a comprehensive community college system.

However, what has not happened yet and appears to be in high demand by individuals, employers, and society as a whole, is what may amount to merging what have been traditionally considered as distinct and separate undergraduate curricular tracks and teaching methodologies found within liberal arts, general, professional, career, occupational, technical, technical, vocational, applied, etc. education. The resulting product is a more comprehensive seamless system of higher education that meets employers' demands for employees to possess technical expertise as well as language, communication, problem-solving and applied math skills (Bailey & Jenkins, 2005). A system that teaches peoples how to play an active role with helping improve the economic well-being and quality of life for themselves, employers, and communities.

This study did not find that the CTC Math Mini-Core has failed or is failing. Furthermore, this study does not find that articulation policy between USG and TCSG or its institutions has failed or is failing. What this study did find was that KSU native students are performing better than CTC transfer students in requisite math courses at KSU. It is recommended that USG adhere to the suggestion of those who developed the Mini-Core articulation policy and conduct a system-wide examination to determine if the findings of this study may be common. If so, then it is recommended that collaboration take place between system and institutional administrators and faculty to help determine why and where these performance gaps may exist.

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APPENDIX A

Table A1

Multinomial Logit Model (MLM) SPSS Output for Likelihood of Receiving a Grade Compared to Receiving an "A" Using Cohort as Variables for the Sample Population at Kennesaw State University

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
B	Intercept	.013	.160	.006	1	.936			
	KSU native	-.131	.163	.644	1	.422	.878	.638	1.207
	CTC transfer	0(b)	.	.	0	.	.	.	.
C	Intercept	.121	.156	.602	1	.438			
	KSU native	-.523	.159	10.791	1	.001	.593	.434	.810
	CTC transfer	0(b)	.	.	0	.	.	.	.
D	Intercept	-.719	.198	13.214	1	.000			
	KSU native	-.492	.203	5.874	1	.015	.612	.411	.910
	CTC transfer	0(b)	.	.	0	.	.	.	.
F	Intercept	-.573	.189	9.221	1	.002			
	KSU native	-.667	.194	11.814	1	.001	.514	.351	.751
	CTC transfer	0(b)	.	.	0	.	.	.	.

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
W	Intercept	.218	.152	2.055	1	.152			
	KSU native	-.962	.157	37.697	1	.000	.382	.281	.519
	CTC transfer	0(b)	.	.	0	.	.	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.

APPENDIX B

Table B1

Multinomial Logit Model (MLM) SPSS Output for Likelihood of Receiving a Grade Compared to Receiving an "A" Using Cohort and Demographics as Variables for the Sample Population at Kennesaw State University

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
B	Intercept	.258	.215	1.443	1	.230			
	Age	-.018	.005	12.328	1	.000	.982	.973	.992
	KSU native	-.295	.178	2.746	1	.097	.744	.525	1.055
	CTC transfer	0(b)	.	.	0	.	.	.	.
	Ethnicity/race = white	.276	.100	7.587	1	.006	1.318	1.083	1.603
	Ethnicity/race = black	.664	.151	19.370	1	.000	1.942	1.445	2.610
	Ethnicity/race = other	0(b)	.	.	0	.	.	.	.
	Gender = male	.267	.064	17.353	1	.000	1.306	1.152	1.481
	Gender = female	0(b)	.	.	0	.	.	.	.
C	Intercept	.361	.222	2.645	1	.104			
	Age	-.020	.006	13.348	1	.000	.980	.969	.991
	KSU native	-.713	.178	16.059	1	.000	.490	.346	.695
	CTC transfer	0(b)	.	.	0	.	.	.	.

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
	Ethnicity/race = white	.342	.110	9.607	1	.002	1.407	1.134	1.747
	Ethnicity/race = black	.909	.158	33.076	1	.000	2.481	1.820	3.381
	Ethnicity/race = other	0(b)	.	.	0	.	.	.	.
	Gender = male	.317	.069	21.147	1	.000	1.373	1.199	1.571
	Gender = female	0(b)	.	.	0	.	.	.	.
D	Intercept	-.210	.300	.487	1	.485			
	Age	-.033	.008	16.665	1	.000	.967	.952	.983
	KSU native	-.767	.229	11.219	1	.001	.464	.297	.727
	CTC transfer	0(b)	.	.	0	.	.	.	.
	Ethnicity/race = white	.454	.153	8.863	1	.003	1.575	1.168	2.124
	Ethnicity/race = black	1.063	.206	26.714	1	.000	2.895	1.935	4.332
	Ethnicity/race = other	0(b)	.	.	0	.	.	.	.
	Gender = male	.370	.090	16.950	1	.000	1.448	1.214	1.727
	Gender = female	0(b)	.	.	0	.	.	.	.
F	Intercept	-.174	.298	.341	1	.559			
	Age	-.033	.008	16.548	1	.000	.967	.952	.983
	KSU native	-.934	.222	17.718	1	.000	.393	.255	.607
	CTC transfer	0(b)	.	.	0	.	.	.	.

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
	Ethnicity/race = white	.496	.155	10.222	1	.001	1.642	1.211	2.225
	Ethnicity/race = black	1.167	.205	32.395	1	.000	3.212	2.149	4.800
	Ethnicity/race = other	0(b)	.	.	0	.	.	.	.
	Gender = male	.524	.090	33.858	1	.000	1.688	1.415	2.014
	Gender = female	0(b)	.	.	0	.	.	.	.
W	Intercept	-.511	.219	5.431	1	.020			
	Age	.013	.005	5.914	1	.015	1.013	1.003	1.024
	KSU native	-1.158	.181	40.999	1	.000	.314	.220	.448
	CTC transfer	0(b)	.	.	0	.	.	.	.
	Ethnicity/race = white	.461	.125	13.496	1	.000	1.586	1.240	2.028
	Ethnicity/race = black	.776	.176	19.362	1	.000	2.172	1.538	3.069
	Ethnicity/race = other	0(b)	.	.	0	.	.	.	.
	Gender = male	.414	.076	30.098	1	.000	1.513	1.305	1.755
	Gender = female	0(b)	.	.	0	.	.	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.

APPENDIX C

Table C1

Multinomial Logit Model (MLM) SPSS Output for Likelihood of Receiving a Grade Compared to Receiving an "A" Using Demographics and Academic Characteristics as Variables for the Sample Population of Chattahoochee Technical College Transfer Students at Kennesaw State University

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
B	Intercept	6.290	1.592	15.606	1	.000			
	Age	-.013	.028	.219	1	.640	.987	.935	1.042
	GPA at the time of transfer	-1.742	.455	14.683	1	.000	.175	.072	.427
	Number of hours transferred	-.005	.011	.189	1	.663	.995	.974	1.017
	Number of semesters between prerequisite and requisite course	-.014	.033	.188	1	.665	.986	.925	1.051
	Ethnicity/race = other	.188	.499	.142	1	.707	1.207	.454	3.208
	Ethnicity/race = black	1.229	.707	3.022	1	.082	3.416	.855	13.649
	Ethnicity/race = white	0(b)	.	.	0	.	.	.	.
	Gender = female	.494	.341	2.097	1	.148	1.638	.840	3.196

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
	Gender = male	0(b)	.	.	0	.	.	.	.
	Enrollment status = unidentified	-.367	.473	.603	1	.438	.693	.274	1.751
	Enrollment status = part-time	-.366	.390	.880	1	.348	.693	.323	1.490
	Enrollment status = full-time	0(b)	.	.	0	.	.	.	.
C	Intercept	8.698	1.670	27.123	1	.000			
	Age	-.038	.030	1.546	1	.214	.963	.908	1.022
	GPA at the time of transfer	-2.293	.461	24.730	1	.000	.101	.041	.249
	Number of hours transferred	-.008	.012	.444	1	.505	.992	.969	1.016
	Number of semesters between prerequisite and requisite course	-.158	.047	11.255	1	.001	.854	.778	.936
	Ethnicity/race = other	.044	.530	.007	1	.933	1.045	.370	2.956
	Ethnicity/race = black	1.745	.699	6.232	1	.013	5.724	1.455	22.520
	Ethnicity/race = white	0(b)	.	.	0	.	.	.	.
	Gender = female	.904	.353	6.545	1	.011	2.469	1.235	4.935
	Gender = male	0(b)	.	.	0	.	.	.	.

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
	Enrollment status = unidentified	.293	.486	.364	1	.546	1.341	.517	3.473
	Enrollment status = part-time	.699	.403	3.002	1	.083	2.011	.912	4.434
	Enrollment status = full-time	0(b)	.	.	0	.	.	.	.
D	Intercept	10.475	2.202	22.628	1	.000			
	Age	-.072	.046	2.433	1	.119	.931	.850	1.019
	GPA at the time of transfer	-2.613	.559	21.839	1	.000	.073	.025	.219
	Number of hours transferred	-.029	.018	2.539	1	.111	.971	.937	1.007
	Number of semesters between prerequisite and requisite course	-.191	.068	7.921	1	.005	.826	.723	.944
	Ethnicity/race = other	.115	.678	.029	1	.865	1.122	.297	4.234
	Ethnicity/race = black	1.608	.797	4.068	1	.044	4.994	1.047	23.830
	Ethnicity/race = white	0(b)	.	.	0	.	.	.	.
	Gender = female	.755	.439	2.956	1	.086	2.128	.900	5.034
	Gender = male	0(b)	.	.	0	.	.	.	.
	Enrollment status = unidentified	.514	.612	.706	1	.401	1.672	.504	5.543

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
	Enrollment status = part-time	.882	.519	2.891	1	.089	2.416	.874	6.676
	Enrollment Status = full-time	0(b)	.	.	0	.	.	.	.
F	Intercept	10.238	2.201	21.642	1	.000			
	Age	-.110	.048	5.171	1	.023	.896	.815	.985
	GPA at the time of transfer	-2.713	.543	24.929	1	.000	.066	.023	.192
	Number of hours transferred	-.021	.017	1.533	1	.216	.980	.948	1.012
	Number of semesters between prerequisite and requisite course	-.068	.053	1.675	1	.196	.934	.842	1.036
	Ethnicity/race = other	-.921	.841	1.198	1	.274	.398	.077	2.071
	Ethnicity/race = black	1.792	.773	5.373	1	.020	6.001	1.319	27.303
	Ethnicity/race = white	0(b)	.	.	0	.	.	.	.
	Gender = female	.657	.427	2.359	1	.125	1.928	.834	4.457
	Gender = male	0(b)	.	.	0	.	.	.	.
	Enrollment status = unidentified	2.042	.678	9.065	1	.003	7.705	2.039	29.107
	Enrollment status = part-time	1.841	.638	8.340	1	.004	6.306	1.807	22.005
	Enrollment Status = full-time	0(b)	.	.	0	.	.	.	.

Requisite grade(a)		B	Std. error	Wald	df	Sig.	Exp (B)	95% confidence	
								Lower bound	Upper bound
W	Intercept	7.060	1.610	19.223	1	.000			
	Age	-.025	.028	.788	1	.375	.975	.923	1.031
	GPA at the time of transfer	-2.094	.447	21.958	1	.000	.123	.051	.296
	Number of hours transferred	-.008	.011	.440	1	.507	.993	.971	1.015
	Number of semesters between prerequisite and requisite course	-.082	.039	4.344	1	.037	.921	.852	.995
	Ethnicity/race = other	-.318	.545	.340	1	.560	.728	.250	2.119
	Ethnicity/race = black	2.047	.684	8.956	1	.003	7.748	2.027	29.617
	Ethnicity/race = white	0(b)	.	.	0	.	.	.	.
	Gender = female	.412	.343	1.445	1	.229	1.510	.771	2.958
	Gender = male	0(b)	.	.	0	.	.	.	.
	Enrollment status = unidentified	1.053	.507	4.317	1	.038	2.867	1.062	7.741
	Enrollment status = part-time	1.634	.428	14.560	1	.000	5.125	2.214	11.863
	Enrollment Status = full-time	0(b)	.	.	0	.	.	.	.

Note. (a) The reference category is: A. (b) This parameter is set to zero because it is redundant.