THE EFFECT OF COLLEGE ENTRANCE TEST SCORES, HIGH SCHOOL BIOLOGY GRADE, AND HIGH SCHOOL PREPARATION TRACK ON COLLEGE LEVEL BIOLOGY

by

CINDY LEE LOAR

(Under the Direction of Clifton L. Smith)

ABSTRACT

College entrance scores have been used as predictors of student success for many years. The purpose of this study was to determine if there was an interconnectedness between Occupational Therapy Assistant program student variables of high school biology grade, college preparatory or non-college preparatory track, and COMPASS college entrance test scores in math, algebra, writing, and reading, and student success in Biology 193 for first-time takers. The study was performed at a large technical college in east Georgia. In all, 400 students were examined with data used on 202 as the remaining 198 were missing variables. A multiple regression analysis revealed one variable, student grade in high school biology, that was statistically significant. A stepwise regression analysis revealed three independent variables that were interrelated and statistically significant that could be used as predictors of student success in college level biology. These were high school biology grade, COMPASS math test score, and COMPASS reading test score.Based on these findings, we can conclude students who show a low interconnectedness of these three model selected variables could be advised to take a lower level biology course prior to taking Biology 193 to help ensure success in it. These variables could be used to help predict OTA student retention levels. For this study, the end-of-course

grade in Biology 193, reported on student transcripts in letter form, was converted to a numerical form. These grades were used as the predicted scores. Regression coefficients were calculated and actual student scored in Biology 193 were computed. Findings indicated the predicted and computed scores were statistically similar and reliable. The three model selected independent variables could also be used to compute an approximate grade a student might expect to make in Biology 193 and make faculty advisement of the student more accurate.

INDEX WORDS: College entrance examinations, COMPASS scores, Occupational therapy assistant program student, Technical college, College level biology, High school biology grade, End-of-course college biology grade

THE EFFECT OF COLLEGE ENTRANCE TEST SCORES, HIGH SCHOOL BIOLOGY GRADE, AND HIGH SCHOOL PREPARATION TRACK ON COLLEGE LEVEL BIOLOGY

by

CINDY LEE LOAR

B.S., The Medical College of Georgia, 1983

M.H.S., The Medical University of South Carolina, 1990

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF EDUCATION

ATHENS, GEORGIA

2009

THE EFFECTS OF COLLEGE ENTRANCE TEST SCORES, HIGH SCHOOL BIOLOGY GRADE, AND HIGH SCHOOL PREPARATION TRACK ON COLLEGE LEVEL BIOLOGY

by

CINDY LEE LOAR

Major Professor: Clifton L. Smith

Committee: Elaine Adams
Thomas Koballa
Desna Wallin

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
May 2009

DEDICATION

I would like to dedicate this dissertation to my family.

To my husband, Karl Halmstad, I want to express my love and appreciation. Thank you for supporting me every step of the way. You always had confidence in me achieving this goal even when I did not. Your gentle nudgings were irritating but well needed. Without you, I could never have accomplished this dissertation.

To my daughter, Tessla Koch, looking at your angel face and red hair reminded me that all things I put my mind to are possible in time with hard work and dedication. My wish for you is that you always follow your dreams. They can come true if you put in the time and energy. I will always be there to cheer you on just as you have done for me.

To my brother, Bob, who was the first doctor in the family, I appreciate the ear you loaned on so many occasions.

To my parents, William and Geraldine Loar, you invested so much time in me. This degree is my way of giving back to you. I know you will be smiling down at me as I graduate.

ACKNOWLEDGEMENTS

I wish to thank my major professor, Dr. Cliff Smith. I know you lost patience with me and wondered if I would ever finish. Believe me, I wondered the same thing. However, your leadership and encouragement helped keep me focused and I appreciate all you put up with from me. I wish to also thank my committee: Dr. Elaine Adams, Dr. Tom Koballa, and Dr. Desna Wallin. Your comments kept me on my toes. A special thanks to Jongmin Ra at the Academic Computer Center. You rock!

I wish to thank Mr. Terry Elam, President of Augusta Technical College, for allowing me the opportunity to be a member of the second cohort in the Educational Leadership Initiative.

Thank you to my co-workers, students, peers, and friends who gave me encouragement and kind words throughout the years to get through this educational endeavor.

A special thanks to Dr. Marilyn Willis for her support and guidance during my prospectus and dissertation. You will never realize how much encouragement you gave me.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

Page

CHAPTER 1

INTRODUCTION

In the United States, it is customary for young people to complete secondary education, then move on to higher education, with the culmination of study being entrance into the community workforce. However, for some students nearing completion of secondary education, the route to community workforce entrance as a productive member of society may need to be altered (TCSG, 2008). Some students do not wish to further their formal education and choose to enter professions where on-the-job training of skills is performed. Other students decide to enter a technical college where formal training of job skills and theory for success in local business and industry are taught. Here, students learn skills necessary for a career in class and laboratory settings, then complete an internship in the community where these learned skills and theory are put into practice, then mentored by professionals in that work environment (Georgia Department of Technical and Adult Education, 2005). These students graduate with a certificate or diploma recognizing the completion of their formal training, or with a two-year associate degree. A large east Georgia technical college was used in this study as an example of a two-year technical education institution.

The Technical College System of Georgia (TCSG), formerly known as the Department of Technical and Adult Education (DTAE), consists of 36 similar colleges in Georgia. The college chosen for this study is a large technical college in east Georgia. It has a rich, diverse offering of 66 educational endeavors (Augusta Technical College Catalog, 2007-2008) for students. It opened its doors in 1964 and experienced phenomenal growth through the years in programs

offered, educational staff, and student enrollment. As of November, 2007, the active student enrollment from the main and two satellite campuses combined was 4,513 (Knowledge Management System (KMS) Database for Georgia Technical College Systems, 2007). Yet, even with statistics such as this, programs of study at the college have had their share of student retention problems and are not unlike other technical colleges in the United States in general (B. Roberts, personal communication, January 7, 2008). Table 1 shows the comparability of this technical college to similar two-year technical colleges in Georgia.

Table 1

Georgia Technical College Retention Data (2007)

Name of Two-Year Georgia Technical College	Full-time Student Enrollment	Retention Rate Reported to IPED
Augusta Technical College	4,445	51%
Athens Technical College	3,961	58%
Atlanta Technical College	3,172	48%
Central Georgia Technical College	4,898	39%
Columbus Technical College	3,327	46%
Chattahoochee Technical College	5,994	47%
DeKalb Technical College	3,641	43%
Griffin Technical College	3,287	52%
Gwinnett Technical College	4,253	47%
Lanier Technical College	3,145	58%
Savannah Technical College	3,965	46%
West Central Georgia Technical College	3,010	51%

Note. Integrated Post-secondary Education Data System (IPED) (2007) data can be accessed at www.nces.ed.gov/collegenavigator. Only institutions with 3,000 or more full-time students were used for comparability.

The occupational therapy assistant (OTA) program is one of 15 programs of study offered in health sciences at a large east Georgia technical college (Augusta Technical College Catalog, 2007-2008). The program has a low retention rate for its students though it accepted 25 students each fall via competitive admission (Schumann, 1998-1999) from its first class in 2001

until 2005. In an effort to increase retention rates in light of numerous OTA students not passing Biology 193, the OTA program administrators chose to raise the admission rate in 2006 and the rate remains at 35 students admitted annually (Loar, 2007). Table 2 lists the historical OTA class retention data.

Table 2

Historical OTA Class Retention Rates

Year	Admissions	Retention after Biology 193	Graduation Rate	Overall Retention Percentage
2001	25	4	4	16
2002	25	11	11	44
2003	25	4	4	16
2004	25	9	9	36
2005	25	7	5	20
2006	35	6	6	17
2007	35	16	12	34
2008	35	10	10	29

Biology 193 is a lecture/lab-dissection courses that is a required prerequisite for all associate degree students in the technical college system college (Augusta Technical College Catalog, 2007-2008). At the technical colleges, student involvement and participation in the learning process is key (Georgia Department of Technical and Adult Education (GDTAE), 2005). Indeed, in the Biology 193 classes, the instructor utilizes a variety of media such as PowerPoint's, videos, and on-line support to enhance the lecture. Students are actively involved in the learning process and form study groups with peers for repetition and learning key concepts. These students are typically together many months, so the study group becomes a social support group for them as well (Tinto, 1997). Peer learning groups and instructor/advisor

interaction are important to make students feel valued. Students who feel cared for and supported are more likely to persist to overcome difficulties (Peel, 2000).

And yet, despite the study groups, the social support, the variations in teaching style and use of media, and the involvement of the instructor and advisor with the student, there is still a low retention rate in Biology 193 at this technical college (see Table 2). It could possibly be that the student was not placed correctly in a biology course that was on their educational level to begin with and may have benefitted from taking a developmental biology class that would have given them a firm knowledge base in order to promote success in Biology 193.

Typically, students must take some type of test in high school that profiles their measured ability at college entry (Noel, Levitz, & Saluri, 1985). This can include the American College Testing Program (ACT) and/or the Scholastic Aptitude Test (SAT). Noel et al. noted that academic under preparedness in college students was a major concern and that students are frequently placed in classes they are not prepared to undertake.

Background of the Problem

Students entering the OTA program (and all other associate degree programs) must have a "C" or better average and take required classes such as English, Humanities, Algebra, Sociology, Psychology, and Biology 193 (Anatomy and Physiology). Students must successfully complete these courses in order to be admitted to the OTA program. Successful completion means the student cannot make below a "C" in these required courses. Once admitted into the OTA program, students cannot make below a "C" in OTA program courses (Augusta Technical College Catalog, 2007-2008). The overall retention rate, as outlined in Table 1, is low as many students cannot meet the demands of these college-level pre-requisite courses with the lowest

retention rate in Biology 193. Additionally, 75% of the entering students need to take developmental classes in Math and English (Loar, 2007).

At this technical college, the OTA students, and all other associate degree health students, are together in classes of greater than 50 students per section, to one instructor. There is no consistent lab help and the instructor has little time for one-on-one interaction that would enhance student learning and hopefully increase the retention rate of the OTA program students (C. David, personal communication, August 25, 2007). The college is working to rectify this problem and has recently hired more instructors to teach Biology 193 (T. Elam, personal communication, June 9, 2008).

The OTA program has a disproportionately low overall retention rate (see Table 2) as compared with its acceptance rate. However, the graduation and workforce placement rates range from 83.3% to 100% in field with the remainder placed in related fields such as recreation therapy, rehabilitation aide, and educational program assistant. The OTA program also has an 83.3% to 100% first-time pass rate on the National Occupational Therapy Assistant Certification Exam. Graduates have found jobs as close as the city of Augusta, Georgia and surrounding rural areas, Florida, South Carolina, and as far away as Hawaii, Illinois, and Oregon (Loar, 2007). Students who do graduate have multiple job sites waiting for them, allowing them to choose where they wish to enter the workforce, but the number of graduates is still not enough to satisfy the shortage of Occupational Therapy Assistants both in Georgia and nationwide (Genter, 2009; Miller, 2009; Kent, Mishoe, Taft, & Campbell, 2006).

In looking deeper at the required courses for the OTA program, it was found that the prerequisites are the same for not only the OTA program, but for the other four associate degree health programs as well at this large technical college in east Georgia. These are Respiratory

Care Technology (RT), Cardiovascular Technology (CVT), Pharmacy Technology (the associate level), and Radiologic Technology (RAD TECH) (Augusta Technical College Catalog, 2007 – 2008). The main course where attrition is highest for these programs is centered around Biology193 as well. The program directors from these four areas also report a shortage of program graduates to fill the myriad of vacancies in their respective health care areas each year (R. Waller, R. Peek, K. Searcy, and P. Thomas, personal communication April 15, 2005).

Even though the Biology 193 course is designed for the college level student, the retention rate is not acceptable if the OTA program is ever to be successful in helping to reduce the critical OTA shortage in the Augusta proper and surrounding area known as the Central Savannah River Area (CSRA).

The focus of this study is success in Biology 193 which ultimately will impact the associate degree OTA program causing retention rates to rise or fall accordingly among students entering it at this large technical college in east Georgia. If retention numbers are low, there will be a lack of qualified graduates available to fill the OTA worker shortage in the CSRA (Central Savannah River Area, 2005). The task is to use data that already exist, such as student high school biology grade, college entrance test scores, and level of college preparation by the student as denoted by college or non-college preparatory track, that could be used to determine student success in Biology 193, before students enroll in the course. These variables could be analyzed and used as advisory data for students who desire to enter the OTA program of study. The data could allow lower scoring students to enter a developmental anatomy and physiology class prior to taking the college level Biology193 class. Noel et al. (1985) noted the academically under prepared student pool to be large in all types of colleges. This pool of students was composed of diverse students in traits such as age, socioeconomic status, emotional health, previous academic performance,

and scores on standardized tests. No one trait stood out over another in determining which student would benefit most from college-level developmental courses. Success has been noted in institutions where developmental coursework has been offered to biology students. As far back a 1982, at the University of Missouri at Kansas City, Martin, Blanc, and DeBuhr (1982) found that 20 percent more freshmen students passed college biology after having taken a remedial course as compared to the previous year where no such course was offered. In 2006, the ACT (American College Test) test data showed that only 26% of high school students were prepared to enroll in college-level biology in Iowa and 23% in Oklahoma. A study performed by David T. Conley in 2007 found many students faltered in college biology because there was a gap between the students' experiences in science-based courses in high school and the higher expectations they encountered in college. College-level biology courses required the student to interpret and analyze information, support arguments with evidence, use higher level thinking skills, and work with other students to complete problems and projects. Beeber and Biermann (2007) found that taking a first semester general biology foundations (developmental) course resulted in favorable reports by students in their preparation for college-level biology and in the pass rates of college-level biology courses at Kingsborough Community College.

Statement of the Problem

The problem for this study was to determine if there was a relationship between student variables of high school biology grade, college preparatory or non-college preparatory track, and college entrance test scores in math, algebra, writing, and reading, and successful completion of Biology 193 for the OTA program at this large east Georgia technical college.

The research questions for this study were:

1. What is the correlation matrix of student variables for high school biology grade, college preparatory or non-college preparatory track, and college entrance test scores in math, algebra, writing, and reading as related to successful completion of Biology 193?
2. What combination of high school grade in biology; scores on college entrance test for math, algebra, writing, and reading; high school diploma track (college preparatory or non-college preparatory) provides the best model for predicting students' final end-of-course numerical grade for Biology 193?

Practical Framework

This study examined data readily available on student high school transcripts and college entrance test scores in math, algebra, writing, and reading. In educational settings today, a variety of intelligence and achievement tests are administered routinely to assess individual's accomplishments, abilities, and aptitudes. These assessments are also utilized to improve instruction and curriculum planning. Many colleges and universities use standardized tests. A variety of such tests have been designed to assess whether students are ready to succeed in college level courses (Creech, 1997). College admission assessments identify students needing remedial (developmental) classes to ensure success in college. The usefulness of any type of tests depends on their accuracy in predicting behavior. Standardized tests, which measure all students by a single standard, are one way of predicting how a student might perform in a given college. Since the 14th century, colleges and universities have utilized entrance exams as a method to assess the abilities and knowledge of students coming to them from diverse backgrounds (Linn, 1993). Throughout the years, a variety of tests have been administered to potential

students. According to research by Broome (1963), Harvard, the first college to be built in the United States in 1638, began admissions regulations in 1642:

> When any Schollar is able to read Tully or such like classical Latin Author *ex tempore*, and make and speake true Latin in verse and prose, *suo* (*ut aiunt*) *Marte*, and decline perfectly the paradigms of nouns and verbs in ye Greeke tongue, then may hee bee admitted into ye College, nor shall any claime admission before such qualifications. (p. 18)

Harvard's regulations set the standard for other newly developing colleges in the United States in the 17th century. Generally, it was the colleges' presidents that administered the tests. To the potential students (Pomfret, 1975), the diversity of entrance requirements has remained a source of perplexity and annoyance to secondary schools. In the 1800's, a student's entire curriculum revolved around the material that would be covered in the entrance test made by the university he wanted to attend. It was not until the middle of the 19th century that faculty became involved in the admissions process out of concern for the quality of their students. Faculty often admitted preferred students or those suggested by other prominent scholars (Lin, 1993).

The 20th century saw great changes in the college admissions process. For example, in November 1900, a grass roots organization known as the College Entrance Examination Board formed. The board, consisting of twelve colleges, was established to provide committees and review processes to oversee major factors in college entrance functions (Fuess, 1950). Some of the first tests utilized by the college board for admissions were designed to determine a student's understanding of a certain subject and were not trying to determine his/her scholastic aptitude. Essay examinations were common during the 1900's.

During World War I and World War II, the need for experience and cost-control lead to objective tests (Encarta Learning Zone, 2000). Objective testing entered the American educational arena via the need to classify soldiers during World War I. This resulted in the development of two-group intelligence tests, Army Alpha and Army Beta. During World War II, the need for improved methods of personnel selection led to the expansion of large-scale programs involving multiple methods of personality assessment. “The use of these tests to evaluate draftees did much to popularize objective tests in the United States” (Linn, 1993, p. 8). The quick convenience factor of objective testing originally utilized for soldier classification was here to stay. Despite ongoing controversy of essay verses objective testing, from 1926, multiple-choice tests were well on their way to becoming the standard in college admission requirements. For this study, the COMPASS (Computer Adaptive Placement Assessment and Support System) college entrance test scores, developed by the American College Testing program (ACT), was used. This test battery is given to all entering students and it is used to predict student readiness for college level mathematics, algebra, reading, and English. The COMPASS is a computerized version of the ASSET (Assessing Student Success Entry and Transfer) test. The COMPASS test is untimed, whereas the ASSET test is a paper and pencil, non-computerized, timed test. Both tests were developed by the ACT. The COMPASS test was introduced by ACT in January, 2002. Both tests are primarily used by technical and two-year college students (COMPASS Reference Manual, 2002).

Significance of the Problem

From the perspective of the students, Biology 193 is the first major hurdle they must overcome as they pursue their course of study in the OTA program. It is important to inform the students up front of their skills and preparation for the courses they will undertake. They should

be thoroughly screened to determine their potential academic achievement in the college science area if retention levels are to elevate beyond their present level. It would be helpful for the students to identify reasons why they chose this particular field of study over other fields, their expectations of the program, and their prior knowledge of the field. This information may help channel the individuals into other programs of study they can master at the technical college level or allow them to remediate areas of study, particularly biology, if they were not successful in that area during secondary education.

Students entering technical colleges are a composite of various ages and stages in life. Some are older students entering school to undertake a career change or vocational rehabilitation clients trying to find a program of study where they can learn job skills that will enable them to live independently. By far, the single largest group of students are those 18 – 25 year olds entering from high school, transferring from another higher education institution, or who delayed entering college for various reasons (Cohen & Brawer, 1996). These are the students who make up a clear two thirds of the students accepted into the associate degree OTA program at the technical college (D. Robinson, personal communication, April 15, 2005). These students have a beginning awareness of their conceptual identity and internal characteristics that will enable them to realistically focus on a career choice. They have an initial sense of their desired self, what they want to do and become, and what it will take to get there (Schuster, Cronk, & Reno, 1992). Students also bring with them an enormous sense of pressure from outside agents. Weidman (1989) found students who chose a particular area of study were influenced to enter that area due to pressure from parents, peers, employers, and their community. Often, the student's own personal goals did not match the goals of outside pressure agents, leading to low student retention levels.

Assumptions

The following assumptions are inherent to this study:

1. Success in college level classes at Georgia technical colleges is defined as making a "C" or above or 70 and above numerical points (Augusta Technical College Catalog, 2007-2008). According to the college catalog, the successful student meets this grade requirement and continues to take required classes until program completion.
2. It is assumed that secondary school biology grade and college entrance test scores are reliable and valid data and that these data will demonstrate a relationship with student success in college level biology based on the student's prior level of secondary educational preparation (college and/or technical college preparation).
3. It is also assumed that ASSET/COMPASS test scores will be used in this study as individual scores for reading, English, math, and algebra instead of a composite score as the individual scores will give more meaning as to how the student performed in each area. The ASSETT/COMPASS test battery does not report a composite score. A composite score would not tease out how the student performed and one area may test higher than another, giving a false high composite score.

Definition of Terms

To enhance comprehension of this study, the following definitions are provided:

Competitive Admission. A group of indicators suggesting readiness to enter the chosen program of study. These indicators include scores on the ASSET/COMPASS test or SAT/ACT scores if within the last five years, high school grade point average, and present college grade point average if applicable. (Augusta Technical College Catalog, 2007-2008, p. 14)

Developmental Studies. The same as remedial studies, and now known as learning support. These are classes taken before the student enters college level courses. (Augusta Technical College Catalog, 2007-2008, p. 12)

The ASSET/COMPASS college entrance test. This is given to all entering students. ASSET/COMPASS test battery scores usually predict readiness for college level math, algebra, reading, and English. For the associate degree level at the technical college used in this study, scores need to be at or above 41 for reading, 42 for writing, 35 for math, and 42 for algebra. (Augusta Technical College Catalog, 2007-2008, p.14)

Retention. The act of retaining or holding on to the student from matriculation until graduation. (http://www.dtae.org)

Relationship. A group of indicators for a certain phenomenon that have a connection. (http://www.dtae.org)

Under Prepared Students. Students lacking the skills or attributes necessary for success in a particular area. (http://www.dtae.org)

College Preparatory (CP) Program. A program of study requiring 22 units. Successful completion indicated by the College Preparatory seal on the high school diploma. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

College Preparatory with Distinction (CP+) Program. Completion of study requiring 24 units and a grade point average of 3.0 or above in core classes on a four-point scale or 80 numeric grade point average or above. Successful completion indicated by the College Preparatory Seal of Distinction on the high school diploma. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

Technology/Career-preparatory (TC) Program. A program of study requiring 22 units. Successful completion indicated by the Technology/Career-preparatory seal on the high school diploma. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

Technology/Career-preparatory with Distinction (TC+) Program. A program of study requiring 24 units and a grade point average of 3.0 or above in core classes on a four-point scale or 80 numeric grade point average or above. Successful completion indicated by the Technology/Career preparatory Seal of Distinction on the high school diploma. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

Biology. The science that studies the living organism and its environment. It can include the organism structure and function. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

Core Classes. Georgia required classes in order to graduate. This includes mathematics, English, science, and foreign language. (www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf)

CHAPTER 2

REVIEW OF THE LITERATURE

A review of the literature was undertaken to investigate issues pertaining to this study such as student retention and student success and to assist in determining the appropriate research methodology. This chapter contains seven sections: (a) The History of Post-Secondary Technical Education in Georgia, (b) History of the Technical College System of Georgia (TCSG), (c) History of Allied Health Programs in Career and Technical Education in Georgia, (d) Retention of Students in Educational Programs, (e) Use of College Entrance Exams, (f) Use of Predictive Tests in Science Based Courses, and (g) Correlation and Predictive Research.

The History of Post-Secondary Technical Education

In the early 1800's higher education was seen as a social right that only the wealthy were privileged to receive. The wealthy family paid large sums of money to private universities to have their children (typically the male children) educated. The general public perceived higher education as an avenue for upward mobility and felt it a social injustice that it was only a perk for the wealthy (Cohen & Brawer, 1996).

Rise of the Two-Year Educational Institution as a Social Responsibility

The rise of the community college came out of societal demands placed on schools at all levels (Cohen & Brawer, 1996). Whatever were the societal problems of the time, the schools were expected to solve or resolve them. The community college was a form of higher education centered in the physical community, usually offering two-year degrees of study. It was felt graduates of these community colleges would remain in that community to expand it

economically and socially. A big social issue of the late 1800's was how to offer this form of higher education to a more and more diverse community population with diverse goals.

In the late 1800's and early 1900's, these two-year community colleges were often known as junior colleges. They were part of a parent campus, often a major university. The colleges were physically housed in a separate facility away from the parent entity, but were required to offer courses that were on the same level as that same course offered at the parent entity (Eells, 1931). During the 1950's and 1960's, the junior college was often referred to as a lower division or branch of a private university or as a two-year college supported by a church or other independent source.

Rise of the Two-Year Educational Institution as an Economic Responsibility

As far back as the 1800's, public funds were seen as the answer to funding higher educational career opportunities in order to make higher education accessible to community members who were not born of wealth. The Morrill Acts of 1862 and 1890 allowed (1) public support for universities as a lower cost alternative to private universities, and (2) access for a wider range of community members with varied goals (Bogue, 1950). These two-year institutions were referred to as community colleges as they were funded by the general public via taxation. However, by the 1970's, both publicly funded community colleges and the more privately funded junior colleges were receiving funding through mixed public and private funds. Therefore, the terms community college and junior college came to refer to the same institution (Cohen & Brawer, 1996). The rise of the state funded two-year college not only allowed the state to fund the educational courses offered, but also allowed the college to be controlled by a state board, mandating it adhere to strict guidelines in order to continue to receive public funding (Bogue, 1950).

Rise of the Two-Year Technical Institution in Georgia

The Civil War left Georgia devastated, but agriculture was growing. Modern industry was on the rise in 1917 and thus, trades came about and were taught in this new vocational educational ideal. After World War II, the vocational educational system was replaced by the trade school system. By 1960, there were 19 schools within the system. In 1984, adult literacy programs were added to the curricula (Breeden, 2002).

The community and junior colleges, though allowing greater access for a diversity of community members at a lower cost than a four-year private university, still did not answer all societal problems with higher education. The community needed skilled technical trades workers in order to expand a heavily industrialized nation. Thus, the rise of the technical or vocational institution was seen. This type of institution offered courses comparable to four-year college-grade courses while providing specialized skill training. According to Bogue (1950), the mixture of general education and vocation training made the soundest and most stable progress toward meeting diverse population goals. Cohen and Brawer (1996) defined community colleges as any public or private institution which offered the Associate of Arts or Associate of Science as its terminal degree. This included vocational institutions, junior colleges, and any other adult educational center as well.

As the 20th Century continued to evolve, the public placed more emphasis on the growth of all higher educational post-secondary institutions. The number of students graduating from secondary schools was rising from 30% in 1924 to 75% by 1960 (Cohen & Brawer, 1996). It was felt that most states could accommodate their citizens seeking college attendance simply by expanding the universities' capacity and many states, including Georgia, had begun this process.

History of the Technical College System of Georgia (TCSG)

Under the leadership of then Georgia Governor Joe Frank Harris (1983 – 1991), The Regent System of Georgia was divided into two divisions. These were the Georgia Department of Technical and Adult Education (GDTAE) and the Board of Regents (BOR) of the University System of Georgia. Prior to this, the vocational/technical institutes in Georgia were loosely associated. With the creation of the GDTAE in 1984, a Commissioner was installed to spearhead and organize the technical education system. The BOR was to handle the organization of higher education at the community college and university level under direction of a Chancellor (Breeden, 2002).

As the needs of Georgia's businesses have evolved, the leaders of the GDTAE have had to develop new strategies to keep our economy growing and provide work opportunities for Georgia citizens. Georgia has been fortunate to have had visionary leadership like its first and now former Commissioner Dr. Kenneth Breeden for its technical education system. Dr. Breeden was committed to literacy, technical education, and economic development.

The mission of the Georgia Department of Technical and Adult Education (GDTAE), as delineated by Kenneth Breeden (2002), was " to contribute to the economic, educational, and community development of Georgia by providing quality technical education, adult literacy education, continuing education, and customized business and industry workforce training to the citizens of Georgia" (p. 14). According to the GDTAE 2005 Annual Report, there were 28,436 students that graduated in fiscal year 2005, a 2.9% increase over fiscal year 2004. In fiscal year 2005, 50% of Georgia's 25 year old and under population were enrolled in the technical education system in Georgia. No longer were these schools just teaching trades, they were teaching key components in economic and community development. By 2000, there were 34

technical institutes. With changing legislation, a funding formula allowed the name to be changed to technical colleges and provided accommodation for the growing enrollment (Breeden, 2002). According to Ron Jackson, Commissioner, the GDTAE was changed to the Technical College System of Georgia (TCSG) and signed into law by Governor Sonny Perdue on May 22, 2008, to keep up with an ever expanding need for a global technology workforce. The new name will better communicate to all Georgians the TCSG's important mission to provide the very best in technical education, adult education programs, and customized training for business and industry through 36 technical colleges. The TCSG is the source for people looking to get the kind of education that today's business and industry want and need (Jackson, 2008).

Student Body Composition in Technical Education

Cohen and Brawer (1996), found that students entering technical colleges are generally younger, just out of high school, students returning to learn a new career to enhance their socioeconomic status, or, as found by Dianne Robinson, (personal communication, April 15, 2005), older students who desire a change after retirement. Some of these students may have been excluded from higher education due to their preparation for technical college careers in high school, as opposed to college preparation. Others do not want to spend four years of time in additional study when they can finish in two and go to work. Students come to technical colleges not knowing what to expect, how to study, or may have a learning deficit that was undetected in secondary school (Mansfield, Pinto, Parente, & Wortman, 2004). Many of these factors can set the student up for failure, adding to the low retention rate of the college. Yet some students persist despite these factors.

The adult learner is diverse and complex. To be successful, programs need to meet the needs of individual learners with curricula focus that aims to foster greater autonomy and self-

direction (Kiely, Sandmann, & Truluck, 2004). Cohen and Brawer (1996) found the single largest group of students entering technical colleges were young post high school graduates, students who transferred from some other learning institution, or students who delayed entrance while working full-time to accumulate funds for college. Maehl (2004) found that many students in two-year and technical colleges were midlife, mid-career persons ranging in age from their mid 30's to mid 40's with considerable experience in their study area. These students had the financial resources to afford college. Black (2003) reported the April 2000 census figures which suggested some 30.2% of technical college students were in the 25 to 44 year old age range. Murdock and Hogue (1999) predicted the age range of students entering colleges will change. The 45 to 54 year old population will increase to 57.3% by 2050. The 55 year old population will increase to 36.1% and the 30 year old population will increase to 31.2%. This is attributed to the availability of retirement resources older students have access to. The younger student population is predicted to have a slowing in growth as more students will need to work to fund their own college tuition as HOPE (Helping Outstanding Pupils Educationally) and PELL award criteria continue to change, making access to post secondary education more difficult for this age group. HOPE is both a scholarship and a grant. Funds are awarded based on superior academic performance (GAcollege411, 2009). PELL is a state and federal grant award championed by Rhode Island Senator Claibourne Pell (1918-2009). Funds are awarded to students through a formula determined by Congress using criteria students submit via the Free Application for Federal Student Aid (FAFSA) (U.S. Department of Education, 2009).

Typically, technical college classes are smaller in size with lower ratios of students to instructors (Cohen & Brawer, 1996). Laws (1999) points out that faculty in technical colleges in the science based education areas feel they must work collaboratively with their students to

develop the students' oral and written communication skills and to help students "learn how to learn" science based concepts and terminology. Fiscor, Odziana, and Smith (1997) changed their lecture based genetic courses at a prominent university to a combined lecture and cooperative learning array. Students were placed in groups with peers and helped each other learn science concepts. The instructor was always present for guidance. These researchers found that class participation rose from 47% to 97% and class average on tests rose five points on average, from 76 to 81. Though an important study, the practicality of duplication in most colleges is questionable, especially in today's economy where staffing cut backs and budget cuts are common occurrences.

Larger institutions and research universities typically have a large student to instructor ratio with little ability for one-on-one interaction with the instructor. There may be one or more class or teaching assistants that are available to the student which even further alienates the student from the learning process. The professors are usually involved in research of their own and may teach a course or two as this fulfills their teaching obligations to the students (Noel, Levitz, & Saluri, 1985). With less emphasis on research in technical colleges, instructors have more time for teaching and for individual student needs. At the technical college used in this study, the teaching hour requirements are 25 hours per quarter (Augusta Technical College Policy and Procedure Manual, 2005). This leaves 15 hours for class preparation, meetings, committee work, planning, and addressing student needs. Instructors tend to be more accessible in smaller colleges, both inside and outside of the classroom. Cech (1999) found that students in science based courses tended to be more interactive with instructors, often stopping by their office or calling them at home. Additionally, labs are taught by the same instructor that teaches theory, again making instructors more accessible. Cech also found that at smaller colleges, peer

relationships were more supportive in nature. Students were not surrounded and intimidated by students who scored the highest on achievement tests. They simply had other students who were bright, shared their passion for science, and were excited about learning around them. Instructors tended to take their time and teach at a level understandable by all, not pressured to teach the next generation of Nobel researchers.

With the global economy of our world, more people come to the United States to follow jobs or train for jobs as training may not be available in their own country of origin. Students who enter college also have changing characteristics because of their globalization. Murdock and Hogue (1999) found student characteristics in colleges for the period 1990 – roughly 2050 will change dramatically. They predict Anglo enrollment to decline from 79.6% to 57.6%; Hispanic enrollment will increase from 6.0 % to 17.4%; African American enrollment will increase from 10.0% to 13.0%; and a group labeled as “other” will increase from 4.4% to 12.0%. Murdock and Hogue felt that education will need to be more aggressive and active in recruitment, retention, and remediation to keep funding levels for new programs high.

History of Allied Health Programs in Career and Technical Education in Georgia

As advances in health care came about, the need arose for technical workers to fill positions within the ever expanding health care system. Governor Harris (1983-1991) set up Blue Ribbon Commissions (The 1994 Strategic Plan), made up of educators and business leaders, to help speed into existence a Quality Basic Education program to strengthen the role of the Georgia University System (J. Miyskens, personal communication, September 13, 2002) .

By 1991, the Georgia P-16 reform came into being, whereby higher education’s influence on secondary schools was to be integral for students aspiring to a college education. The reform was known as the Pre-School-College (P-16) Policy Directive (1991). One of the decisions made

during this time included the movement to make the Georgia universities powerful entities (Georgia Department of Education, 1997-2005).

By 1994, the BOR had further identified a need to increase efficiency, decrease competition for students and among the educational facilities, and to decrease duplication of courses. The 1994 Strategic Plan was developed by then Chancellor Dr. Stephen Portch. It contained 34 Guiding Principles developed by each of the 34 system institutions. As a part of the Guiding Principles, large universities were to reorganize into major research and/or baccalaureate and higher degree granting universities. This reorganization would place Georgia's higher education role into a national pattern of academic excellence. The BOR wanted to state its distinctive mission in language that articulated the national terminology of the Carnegie System (Carnegie Classification of Institutions of Higher Education, 2000). Additionally, the BOR wanted to pay priority attention to underserved populations in regions of the state to manage access to needed academic programs and deliver needed educational services via collaboration with the community colleges and technical schools throughout the state. Part of the reorganization included the removal of the more technical level associate degree (such as the OTA program) and certificate programs of study in various disciplines which were placed in other educational facilities throughout the state. These facilities included community colleges and technical schools. The OTA program, which had been housed at the Medical College of Georgia in Augusta Georgia since the early 1970's, was placed at Augusta Technical College (then institute) in 1999. Its first graduating class was in 2001.

Among the various discipline programs that were relocated were the health related programs of study at the technical level. This included some 100+ health related programs granting certificates, diplomas, and associate degrees. Most programs are offered on-site at the

technical college, while other programs require the student to obtain their prerequisite classed at the technical college and their clinical education at the local hospital (partnership programs) (Lightsey, 2006). According to the GDTAE 2005 Annual Report, 69.95 percent of graduates from the technical college system in Georgia received awards in health care programs. Awards are defined as terminal degree completion for the enrolled student in the program of study and they include certificates, diplomas, and associate degrees.

The Technical College System of Georgia (TCSG) has been successful in supplying health care workers to Georgia's economy. However, according to Joseph Parker, President of the Georgia Hospital Association (as cited in Georgia Nursing, 2006), the health care industry is cyclic and health care worker shortages have come and gone within many 3 to 5 year periods. Parker stated there were currently eight thousand students on waiting lists for health programs within the technical college system in Georgia. Parker reported Georgia was at a point in the cycle where the number of graduates was severely limited compared to the number of vacancies and there appeared to be no end in sight. Parker further reported that in 5 to 10 years, there would be a major statewide crisis that would jeopardize access to health care services in Georgia. Furthermore, Parker recommended to now Governor Sonny Perdue that the healthcare worker shortage in the technical college system be a top priority.

In 2006, Commissioner Michael Vollmer (as cited in Lightsey, 2006) reported the number of students on waiting lists to enter health care programs of study in the Georgia technical college system to be closer to ten thousand. He reported this to be due to the growth of the aging population in Georgia, the aging health care workers delivering services now, and the mass movement of retirees moving away from Florida to smaller communities in Georgia, all of which put a demand on the economy and the health care industry in Georgia. Even small

community hospitals that were once slated to close 10 years ago had revived and were filled with patients. Vollmer reported that by 2010, Georgia would need 140,000 new and replacement health care workers. He further reported that even with increased graduation rates among students in health care studies, the demand would continue to outstrip the supply. Michael Thurmond, Georgia's Labor Commissioner (as cited in Lightsey, 2006) reported that employment growth in health care would double, and, in some cases, triple the state's projected 1.8% annual increase in new jobs among all occupations over the next 7 years. The Georgia Hospital Association Workforce Study performed in 2006 (as cited in Georgia Nursing, 2006) stated that among all of the health care professions measured, physical therapists, occupational therapists, and nuclear medicine technologists had the highest vacancy rates in Georgia.

Retention of Students in Educational Programs

The best possible ways in which college retention targets can be set are to make a clear link between qualifications the student has and those they need at the time of application. Channeling the student that lacks qualifications into developmental courses for enhanced foundation or channeling the student into other courses of study will have a big impact on retention levels. This can be done by the admissions department of the college as the first line of defense against low retention levels. The admissions department is the first line of contact the student has with the college. These employees need to be positive and supportive to students and determine what academic areas the students would best fit into based on their interests and abilities. Early and ongoing advisement is essential and is the best way to identify problems in learning the student may possess and target them before losing the student (Simpson, 2003).

Academic advisors need to help students assess their own interests, talents, strengths, and weaknesses. In advising students, the advisor should be keenly aware of employment

opportunities in the field, especially in the surrounding community. The advisor should be abreast of new advances within the field and assist the student with additional resources and learning opportunities as needed (Smith & Edmunds, 1995).

The concept of retention in the literature was extensive and offered a sound basis for justifying examination of student variables (data) mostly available on transcripts. Seidman (1996) observed that many retention strategies are implemented within the college as a whole. He suggested retention strategies be developed within the various programs at the college, even within individual classrooms. Instructors who take the time to get to know the strengths of the students they teach can spot trouble with subject material early on. Students then can be sent to counseling services or to be tested for learning problems not identified previously. Students can then learn various study methods that work best for them. Some students are visual learners, some auditory learners, and some learn best by doing or practicing (Clark, 2001). Merriam and Caffarella (1999) contend that adult learning does not take place in a vacuum, but is shaped by context, culture, and tools in the learning situation.

Use of Retention Data by Colleges

Data can be grouped by many variables. However, data on student retention are inconsistent because of the various methods of calculating the data and the differences in institutions even within the same system (McInnis, James, & Hartley, 2000; McInnis, Hartley, Polesel, & Teese, 2000). Retention data have been used by colleges historically for a variety of reasons. The Georgia Department of Technical and Adult Education (GDTAE), now the Technical College System of Georgia (TCSG) uses retention data as an indicator of quality to reference benchmarks that each program within each college must meet. If the programs meet

their benchmarks, the school gets funds for new equipment, improvements, new programs, and personnel hiring (Laanan, 2001).

In 2002, 30% of first year students did not return to American colleges for their second year (Smith, 2002), and only 40% actually completed their degree and graduated (Newby, 2002). The data are similar to that found in technical colleges. This data suggest that students encountered problems either in the social culture or the academic culture of the institution or both (Pascarella & Terenzini, 1991).

Attendance in post secondary education is voluntary. Despite the plethora of reasons why students leave college, voluntary withdrawal is around 23% (Rovai, 2002) and academic dismissal is around 50% (Leys, 1999). The financial cost for students who leave the institution is vast. Students have a significant monetary investment in their education by both resources distributed to them (HOPE, PEL) and time spent educating them (McCubbin, 2003). Learning institutions feel the need in their budgets to retain students. When students leave the institution, the numbers for attendance are affected which lowers money funneled to the college by both state and Federal mechanisms (Tinto, 1982). Armed with this information, college administrators are tasked with increasing retention rates at their schools so funding is not cut for essential programs.

Other Variables Used by Colleges to Predict Student Success

Kupermintz and Roeser (2002), proposed that affect and conation also influence high school student science course performance. Basic knowledge and reasoning, quantitative science reasoning, and spatial-mechanical reasoning are needed for science based courses. Students need to understand what their findings mean, how to problem solve, and how to manipulate data in their head. The brain has three domains for learning. The cognitive domain analyzes, interprets,

reasons, remembers, and manipulates symbols. The affective domain holds the key to our temperament and emotions. The conative domain is where our motivation and volition lie. Motivation, then, is the students' belief about their ability to master science content, the valuation and usefulness, as well as the importance of science information learned. This all means that a student could be a cognitively bright student, but if not motivated to learn, will fail. Additionally, if students were preoccupied with other emotions or problems, like finances, he/she would not perform well in cognitive tasks. The amount of attention paid in class, the student's mood, and energy level were all strongly correlated to science concept learning. Students who had no interest in science and did not value the subject matter performed poorly on cognitive science tasks (r=0.51). Cornot and Randi (1997) found that the collaborative relationship between the student and the instructor fostered motivation and achievement goals. Conflict occurred when the instructor's stated objectives differed from those the student sought to accomplish in the classroom. They found volition to be the predictor of student success. Their definition of volition included what the successful student did with their time in school, time management, skillful use of resources, conscientiousness, diligence, and ability to self-monitor. Bandura (1997) called this self-efficacy or the belief in one's capabilities to organize and execute the course of action required to produce a given goal's attainment.

[Anne] Sweet (1997) grouped motivation into intrinsic factors and extrinsic factors when looking at student persistence in secondary education. Intrinsic included the inner desires to engage in an activity regardless of whether the activity had an external value. Extrinsic included the person prompted by an outside agent to engage in an activity by an incentive or anticipated outcome that is external to the activity. Sweet found self-determination to accompany extrinsic

motivation and was tied to the holding or interest fact of the task. However, the student's own perceived control improved academic performance and was tied to intrinsic motivation.

In another study by Lau, Roeser, and Kuperminyz (2002), cognitive and motivational factors jointly contributed to science achievement, engagement, and choice of science-related majors and careers in a sample of 491 high school students. They found general ability to be the strongest predictor of achievement and motivational variables to be the strongest predictors of engagement and choice. The internal consistency of this study was .66. Data are both valid and reliable.

Terenzini, Springer, Yeager, Pascarella, and Nora (1996) found that students with low pre-college GPA's faired similarly to first generation college students and were often labeled "academically disadvantaged" by the college. These students were placed in remedial classes prior to being allowed to take college level courses. The barrier here was that even though students made improvements in academic achievement in college after remedial classes, they never were able to perform at the level of other more academically prepared students, thus ending their college endeavors early.

It is important to inform students up front of their skills and preparation for the courses they will undertake. Noel, Levitz, Saluri, and Associates (1985) noted that academic under preparedness in college students was a major concern and that students were frequently placed in classes they were not prepared to undertake. This view places the focus on the student as the problem and does not look at the environment or practices of the learning institution as the major "deficit". Students' needs are not central in this model and many students are plainly forgotten about. Karayan and Gathercoal, 2003, proposed a model where the learning needs of the student are the primary focus. The model was termed an "asset" model.

Roueche and Armes (1980) looked at entering students in colleges from local community to Ivy League. They found the fastest growing college programs in the nation to be in developmental education. Noel et al. found that 30 to 40% of entering college students were deficient in college-level reading and writing skills, requiring remedial education. Offering alternative courses such as developmental courses to students who are under-prepared for college level courses they wish to pursue can strengthen and reinforce students' academic skills and self-confidence.

Use of College Entrance Exams

"There is probably no aspect of higher education discussed as much, but understood as little as college entrance exams" (Linn, 1993, p. 7). Since the 14th Century, colleges have required entrance assessments for new students. What constitutes appropriate preparation and entrance for a particular college has drastically varied and changed over the subsequent centuries. The roots of college examinations in the United States evolved from a diverse and chaotic process to a more structured educational reform in evidence today. Prior to the establishment of college admission boards, admission decisions appeared to be left to instructors of programs or to colleges who merely "held entrance examinations to suit their conveniences . . ." (Fuess, 1950, p. 9).

Seventeenth and Eighteenth Century's College Entrance Requirements

In colonial times, university presidents usually tested all applicants for admissions (Pomfret, 1975). Because no other college was established before 1700, the terms for entrance in 1638 really began with Harvard University, where requirements for admission in 1642 made sure to include strict moral and religious adherence. "Regulations as to the religious and moral

conduct of the students and academic forms similar to what was obtained in English universities" were observed (Broome, 1963, p. 36).

Applicants for admissions in the colonial period were typically white, wealthy boys (Thut, 1957). These boys were prepared either by private tutors or by Latin grammar schools. schools. The tutors were almost always the parish ministers. As theology battles broke out among the first colleges, the need for more uniformity among college preparatory functions became greater. Potential students encountered chaotic entrance expectations driven by a college's own particular flavor of theology. Harvard had been the norm for all the first American universities to model. However, each college had its own set of rules regarding what was appropriate for admissions for their college and heated theological differences resulted in isolation from each other. Since the rise of universities in the 11th century, Latin was considered the common language of scholars and remained a big part of the admissions process in the United States wearing out its validity and purpose somewhere in the late eighteenth century (Broome, 1963).

During the 18th century, 21 colleges within the 13 original states were developed. Knowledge of math, one of today's most essential college requirements, was not even deemed worthwhile. Knowledge of Latin and Greek were viewed as more important (Linn, 1993). The subject of math appeared for the first time among the subjects for entrance to Yale College and came about by a revised code for entrance in 1745 (Broome, 1963).

By the late 1800's, faculty members who were concerned about the quality of their students became directly involved in the admissions process. Faculty or other prominent members of the scholarly community would often admit their preferred students (Linn, 1993).

Evolution of the SAT (Scholastic Aptitude Test) and the ACT (American College Testing Program)

In the 1900's, clear lines were drawn between religion and education. America took the time to reevaluate the process of admissions (Thut, 1957). Colleges dropped the focus of Latin as useless. In 1890, an educator named Nicholas Murray Butler was instrumental in forming the grass roots organization now known as the College Entrance Examination Board (Fuess, 1950). The first college entrance examinations given by the Board were essay type. Objective scoring, interpretation ease, expedience, and affordability initiated the change from essay testing to objective testing in America.

The first objective tests given by the College Entrance Examination Board were actually used to classify soldiers during World War I. These two-group intelligence tests were termed Army Alpha and Army Beta. By World War II, personality tests were part of these intelligence tests (Encarta Learning Zone, 2000). The use of these tests to evaluate draftees did much to popularize objective tests in the United States. Since 1926, multiple-choice tests have been the standard in college admission requirements (Linn, 1993).

In 1920, the College Entrance Examination Board appointed a committee to investigate the value of the objective test for entrance examinations. The committee recommended developing an aptitude test designed to measure a student's probable future level of ability to perform in college and to offer this examination to the public in June of 1926 (Fuess, 1950). This test was known as the Scholastic Aptitude Test (SAT). A standard score system based on standard deviation units was adopted for college use. The first set of scores from testing with the SAT indicated the one score from the test be divided into verbal and math scores as the two tests did not correlate (College Entrance Examination Board, 1992).

In 1959, the American College Testing Program (ACT), today's second major developer of college entrance examinations, was founded. While the SAT was designed to test aptitudes, the ACT was designed to measure students' educational progress in a number of academic fields (ACT Publications, 1973).

The SAT and ACT are used extensively by colleges and universities for admission. Each student's score is compared with a pool of other students' scores from across the country. Students can then be ranked on a national level. Even though a large percent of the world uses essay questions for college admissions, the United States still prefers the so-called objective tests such as the SAT and ACT (Linn, 1993).

The Technical College System of Georgia will accept SAT and ACT scores from students, but still administers the ASSET/COMPASS college entrance battery to all entering students. Scores on the ASSET/COMPASS test are used to determine a student's readiness for college level courses. Students must be able to read and comprehend at the college level, as well as to convey ideas clearly on paper, in order to successfully complete college level courses. The ASSET and COMPASS tests are written at the 8th grade level. According to White (2006), 53% of the American population comprehends the written and spoken word at the 8th grade level. This information was based on the 2003 findings of the National Assessment of Adult Literacy. The 8th grade level is a simple, easy to read and understand level that is a median level for all students. It sort of "levels the playing field" or allows students who may not comprehend directions at a higher level to understand with minimal difficulty, if any, and is simply enough written so that students who comprehend at a higher level should have little chance for error (White, 2006).

Use of Predictive Tests in Science-Based Courses

The use of predictive tests in general has been a practice for correct placement of students in college for generations (Grites, 1979). Early intervention is key to determine the program of study/student “best fit’. Understanding the ever changing student population of the technical college is also essential in order to explore various predictive tests that are used to channel students who show a need into developmental coursework prior to taking college level science courses, and to better understand the nature of the students attending these institutions. As far back as 1983, the National Science Foundation (NSF) felt it was a state responsibility to intervene in pre-college education (Review of Mathematics and Science Education Programs, 1983). The NSF felt well educated math and science students became well-educated citizens and were the backbone of democracy. The advances these students went on to make in secondary and even graduate education provided comforts the entire citizenry could partake of, providing a better quality of life for all. Haydel and Roeser (2002) felt science and mathematics courses were over-represented by male students who performed better on math and science based achievement tests than their female counterparts in high school (significance $<.05$). These male students had a tendency to go on to higher level math and science courses in college.

Short (1991) found that science curricula was the most difficult to present of all secondary school courses. If instructors presented science coursework in interesting and varied ways and the student had an affinity for the sciences, they would go on to request more science-based courses in later high school years and even college. Short felt instructors should present science information in ways that would allow students to progress at their own pace. Working in pairs or small groups fostered learning. She found that demonstrations and videos allowed students to see what their outcomes should look like, and their understanding of the material was

enhanced by the visual examples. She also requested students keep a journal about their research findings in descriptive language for better understanding.

Despite these suggestions, there will always be students that drop out of college due to a variety of reasons we cannot control, but that does not give us of our duty to intervene and assist whoever we can. Institutions of higher learning have a moral obligation to offer students as much assistance as possible to help them adjust to the college environment (Darlaston-Jones, Cohen, Drew, Haunold, Pike, & Young, 2001).

Taking a look at predictive tests that exist for students entering other professions, there is a Perceptual Ability Test (PAT) that dental students must take to determine their ability to see the mouth in various ways. In 2007, Curtis, Lind, Plesh, and Finzen performed a study looking at the correlation between admission criteria with academic performance in dental students. They hoped to use the admission criteria into dental school as predictors of dental school performance in underachieving and normal tracking dental students. Curtis et al. used variables such as college grade point average, college science grade point average, PAT scores, and academic load in college to determine a correlation and then to use that information to predict dental school success. They found a strong predictive nature between the variables used and were able to determine students that would succeed in dental school were at or near R=0.77 and those students that would probably need remediation at about R=0.58.

Another study done by Pelletier and Normore (2007) looked at the predictive power of homework assignments on student mathematics achievement and the Stanford Achievement Test (SAT-9). Homework has been viewed by educators as a way to use the effect of practice to increase pass rates in math. Pelletier and Normore looked at variables related to homework that appear the most related to achievement among different grade levels to determine a correlation

between these variables. They then looked at the ability to predict student success on the Florida Comprehensive Achievement Test (FCAT) norm referenced test (NRT) for mathematics assessment and that test's relationship to predictability to the SAT-9. The researchers wanted to know if an increase in homework assignments as fallout from the No Child Left Behind Act of 2002 were effective. With the No Child Left Behind Act, teachers and school administrators were tasked with developing homework policies that were successful, interacted with other goals of the school, and lead to enhanced achievement in academic areas. The researchers looked at 143 past high school students' data. The correlation between homework assignments and academic achievement was .85. The improvement on the FCAT NRT was significant ($r=.41$, $p<.01$) for the students studied. Those students all went on to pass the SAT-9. Therefore, there was a positive correlation between homework and student academic achievement and predictability on not only the FCAT NRT, but on the SAT-9 as well.

Correlation and Predictive Research

As far back as 1950, Ernest Burgess attempted to answer the question " can methods of predicting success and failure in marriage help in stabilizing the American family and, if so, under what conditions and to what extent" (p. 47)? In the decades that followed, many correlation studies were performed with variables believed to predict the success of a marriage, though no hard and fast "predictor" was ever established.

Abbott, Ploubidis, Huppert, Kuh, Wadswort, and Croudac (2006) conducted a study looking at life satisfaction independent variables which subjects had identified as contributing to their feeling of well-being. Abbott et al. wanted to know if there was a correlation or interconnectedness of these variables and the extent to which the subjects felt they were in

control of their lives. Abbott et al. concluded that the variables could be used with a >0.8 result to predict life satisfaction and psychological well-being in people taking the survey.

Another study performed by Fleischer (2007) for a well-known call center focused on external evaluations such as customer satisfaction surveys to enable the call center to find out what effect, if any, employee communication with customers had on whether customers wanted to continue to do business with the call center and repeat business with them in the future. Fleischer screened calls at the call center for over a year and determined phrases and words that call center employees used repeatedly with customers. Fleischer was looking for a correlation or interconnectedness between these words or phrases and the predictability of repeat customers with the call center. He was able to predict with a 75% accuracy rating which customers would have repeat business with the call center when employees used the key phrases or words, as opposed to a 10% predictability rating when employees did not use the phrases or words.

All of these studies were predictive in nature but a true predictive value was never derived. Burgess (1950) felt this was because no quantitative data were used, only subjective variables such as “happiness”. He further went on to speculate that subjective data should not be used as people’s interpretation of the variable changed not only from person to person, but over time as well.

In order to identify at a possible “predictor” variable, more objective measurable data needed to be used. Lee and Greene (2007) looked at relationships between graduate students’ placement test scores for English as a second language (ESL) and three other measures of academic performance. These were grade point average, faculty evaluations of the students, and student self-evaluations. The qualitative and quantitative data were collected from 100 students and 55 faculty members. The results brought to light student complex relationships between

English proficiencies and grade point average with the ability to predict graduate-level academic performance with a 55% ability. However, the qualitative data of faculty evaluations of the students and student self-evaluations had no bearing on the study at all.

McCall, Allen, and Fike (2006) looked at transcripts of pharmacy students to determine variables that could determine student success in the doctor of pharmacy program at Texas Tech. The variables they studied were overall grade point average, grade on college entrance test, and overall higher coursework in biology grade point average. Success for this study was defined as the student's ability to graduate on time. Of all variables studied, the grade point average in higher level biology coursework was the most significant predictor variable of student success ($p=0.044$).

In a 2004 study by Pugh and Lowther for Auburn University, secondary school Algebra grades were looked at as a predictor for student success in college-level Algebra. Other variables examined included secondary school grade point average, and college entrance test scores. Secondary school Algebra grades were a significant predictor of student success in college-level Algebra ($p<.01$).

In 2006, Henschler used COMPASS admissions test reading scores to predict student success in general education courses at Chippewa Valley Technical College, specifically in written communications. Using a Pearson's-r two-tailed correlation outcome found a coefficient of .137, or a finding of no linear relationship between the COMPASS test reading scores and academic success in written communication courses.

Hurlburt (2003) describes predictive research as the ability to test out the relationship of variables in an effort to determine strong positive interconnectedness. That interconnectedness or correlation can be replicated to determine reliability (the extent to which the test measuring

procedure yields the same results on repeated trials) and validity (grounded, justifiable, meaningful to a set of specific circumstances). The end result is information that can be used accurately to predict or forecast future success.

Use of Predictive Tests in College

Predictive research is used today to determine effectiveness of anything from successful use of certain drugs to combat certain types of cancers to how long a relationship will last between two people given parameters of behavior desirable to each other. In education, predictive research was used to assess the predictive nature of student success on many college entrance tests in use today such as the American College Test (ACT) and Standardized Aptitude Test (SAT). Time and time again, the reliability and validity of these tests hold up to the test of time and are used to place students into college-level courses or developmental courses.

There are advantages and disadvantages to using predictive tests that were derived from predictive research. Success has been noted in institutions where developmental coursework has been offered to biology students. In 1982 at the University of Missouri at Kansas City, Martin, Blanc, and DeBuhr found that 20% more freshmen students passed college biology after having taken a developmental course as compared to the previous year where no such course was offered.

Faulkner (2002) found that colleges tended to rely too heavily on predictive tests, going so far as to deny student admission because of low scores on such tests. This was due to the fact that colleges have a difficult time with subjective information such as the student's level of self-esteem, motivation, and moral character. Faulkner found colleges can increase retention rates if they use predictive tests in addition to other means to ensure students remain in college.

Placement tests serve as an interim step between the student and their enrollment in college courses. Should the student show a deficiency in an area as determined by the admission test, the student will need to take other courses which are designed to raise the student's academic level. These are often known as developmental courses. Merisotis and Phipps (2000) concluded that developmental courses often can increase graduation rates of academically weaker students. They give the student a firmer understanding of the material so they can succeed in college level courses in the same category (i.e. mathematics, English, etc). Cheek (2005) found admission type tests to be predictive in nature as without them, students tended to enroll in college level courses only to drop out because they were not able to academically handle the content challenge.

Once the Associate Degree programs were moved from the major universities and research universities, predictive tests were still used. These included ACT, SAT, and ASSET/COMPASS test scores. These test batteries identify student needs for developmental coursework prior to taking college level courses. If the student's college entrance test scores are low, the student can be placed in developmental courses that are targeted at preparing the student for college level courses (Augusta Technical College Catalog, 2007-2008).

Use of Predictive Tests in College Biology Courses

The literature revealed information on use of the ACT and AP biology (advanced placement biology) tests in determining college level course placement. There is a college entrance exam specifically for biology as well. With the exception of the ACT, the other tests are for student placement in higher educational arenas such as colleges and universities granting bachelor degrees and above (Greenstein, 2005). The ACT has an entire section called the Science Reasoning Test. Students are shown passages that describe science phenomenon and are asked to

reason out the answer. No specific knowledge of science is required (Florman, 2005). The technical colleges will accept ACT scores, but still require the student take the ASSET/COMPASS battery. No science based predictive test was found in the literature that could be used specifically for technical and community colleges where the highest degree granted was an associate or below. Some version of the general college entrance test for biology would need to be adapted for use by technical colleges or another test that was a predictor of student success in college biology in community and technical colleges would need to be used.

Therefore, with no real literature to support the existence of predictive tests for student readiness for college level biology, another method of showing an interconnectedness of variables needed to be developed in order to effectively complete this research. The methodology also needed to have as an end product, the ability to raise retention rates in the associate degree Occupational Therapy Assistant (OTA) program.

Georgia technical college students are tested using the ASSET/COMPASS test battery (developed by ACT). Their SAT or ACT scores are also examined if current within the last five years (Augusta Technical College Catalog, 2007-2008). This test battery identifies student needs for developmental coursework in English, math, algebra, and reading prior to taking college level courses. If the student's ASSET/COMPASS or SAT/ACT test scores are low, the student can be placed in developmental courses that are targeted at preparing the student for college level courses.

Although there were numerous studies found addressing retention, its characteristics, and implementation of retention strategies, and use of predictive tests for higher educational colleges and universities, there was no such predictive test found that addressed the science needs of students at technical and community colleges. Predictive tests have been around for years.

Examples are the SAT and ACT which are used by post secondary learning institutions. The ASSET/COMPASS battery used by the technical college does not address science knowledge. Standardized predictive tests insure fairness in the admission and placement process (Faulkner, 2002). Predictive tests of any nature follow a basic idea. If instructors and administrators can identify students who have potential for leaving their college earlier, they can also identify the reasons for struggle and give appropriate, efficient, and timely help to students earlier (Kim, 1998). Some of the factors Kim looked at were age, sex, socioeconomic level, and GPA. Kim did not look at GPA in terms of success in science based courses.

Predictive testing and retention strategies are not independent entities. Both need to be implemented simultaneously and backed by the Administrative staff in order for retention rates to rise sufficiently to meet Georgia TCSG benchmarks and to supply the never ending need for well prepared health care workers in the community and in Georgia as well.

Summary

The review of the research and literature yielded information on retention and correlation and/or predictive tests. Additional literature suggested reasons why students did not persist in college studies and why students were not successful. The literature gave a wealth of studies using college entrance test scores and science based course scores to show an interconnectedness between them and student success in college level courses. Therefore the methodology for this study will revolve around determining an interconnectedness of high school biology grade, college preparation from secondary school, and college entrance test scores with student success rate in Biology 193, a requirement for the associate degree in the OTA program. The retention rate for the OTA program is largely dependent upon the number of students successfully completing Biology 193.

CHAPTER 3

METHODS

This chapter contains five sections: (a) Statement of the Problem, (b) Research Design, (c) Population, (d) Data Sources and Coding of Variables, and (e) Data Analysis.

Statement of the Problem

The problem of this study was to determine if there was a relationship between student variables of high school biology grade, college preparatory or non-college preparatory track, and college entrance test scores in math, algebra, writing, and reading, and successful completion of Biology 193 for the OTA program at this large east Georgia technical college.

The research questions for this study were:

1. What was the correlation matrix of student variables for high school biology grade, college preparatory or non-college preparatory track, and college entrance test scores in math, algebra, writing, and reading as related to successful completion of Biology 193?
2. What combination of high school grade in biology; scores on college entrance test for math, algebra, writing, and reading; high school diploma track (college preparatory or non-college preparatory) provided the best model for predicting students' final end-of-course numerical grade for Biology 193?

Research Design

A correlational research design was used for this study to determine if there was an interconnectedness between student variables of high school biology grade, college preparatory

or non-college preparatory track, and college entrance test scores in math, algebra, writing, and reading, and student success in Biology 193 for first-time takers. Correlational studies are descriptive studies that determine the strength of the relationship between the independent variables and the dependent variable and use correlational statistics to describe the relationship. Correlational studies can be used to provide insights about which relationships should be further investigated to determine causality. This is due to the fact that correlational studies do not show cause and effect, only the degree of relatedness (Myers, Smith-Hansen, Hull, & Hill, 2003).

Correlational studies are carried out either to explain important human behavior or to predict likely outcomes. If a strong relationship exists between the variables, it may be possible to predict scores on either variable if one or the other score is known. The variables used in correlational studies are described as the predictor variables (the independent variables in this research) which are used to make the prediction, and the criterion variable (the dependent variable in this research), the variable about which the prediction can be made (Fraenkel & Wallen, 2003).

One technique used in correlational research, multiple regression, enables the researcher to determine the interconnectedness between the criterion (or dependent) variable and the best combination of two or more predictor (or independent) variables. More specifically, this is known as a multiple linear regression, where a sample partial slope of the regression line for Y as predicted by the independent variable (x) can be plotted on a graph. The plotted points can then be connected to show a strong or weak correlation between the two variables (Lomax, 2001).

This study was quasi experimental quantitative in that there was no manipulation of variables. The advantage of using the quantitative design was that it might render a numerical representation that could be used as a measure of student success in Biology193. The

disadvantage of using the quantitative design was there may be other factors that determine student success in Biology 193 that cannot be assigned a number and may have interpretative observations with underlying meanings and patterns of relationships which would make numbers irrelevant (Fraenkel & Wallen, 2003).

Population

Annually, the student admissions department at the technical college is responsible for identifying students who have designated OTA as their program of study and that information is then forwarded to this researcher. Those students were used as the population for this study. This population was comprised of 400 students who had designated the OTA program their program of study at the technical college in this study. Although these 400 students have been accepted into the OTA program at the technical college since its inception, data from only 202 students were used in this study. Data on 27 students could not be used as they were allowed to use SAT scores from their high school transcript. Another 18 students were allowed to use ACT scores. Another 23 students transferred into the technical college from local universities and no ASSETT/COMPASS test was given by the technical college admissions department. There were 15 students who had GED scores, so no high school biology grade was found for them. Lastly, there were 16 students who were older and had taken some college level courses previously, but no high school transcripts were available for them. The remaining 99 students were coded as entering other associate degree programs on campus, transferred to another institution, or dropped out of school, so, again, only incomplete data were available. The 202 student pool had taken Biology 193 as a requirement for the associate degree Occupational Therapy Assistant (OTA) program. These students had successfully completed the associate degree in OTA, were in the process of completing their degree in OTA, or had been accepted into the OTA program

and had completed the Biology 193 prerequisite. Biology 193 is a college-level, lab-based biology course required for associate degree programs such as OTA in the TCSG.

Data Sources and Coding of Variables

Student data used as variables in this study were:

1. high school grade in biology taken from the student's high school transcript on file in the admissions department at the technical college
2. scores on the ASSET/COMPASS college entrance test for math, algebra, writing, and reading individually. The COMPASS test is the computerized version of the ASSET test. These scores were obtained from the technical college testing department, which is part of the admissions department.
3. end-of-course grade in Biology 193 which was taken from the student transcript available in the admissions department at the technical college
4. high school diploma track (College Preparatory (CP) Program, College Preparatory with Distinction (CP+) Program, Technology/Career Preparatory (TC) Program, Technology/Career Preparatory with Distinction (TC+) Program or dual preparatory tracts (both College Preparatory and Technology/Career Preparatory Programs). This information was taken from the student high school transcript on file in the technical college admissions department.

Student High School Grade in Biology

The numerical grade (raw score) for high school biology was taken from the student high school transcript and used as an independent variable in this study. Since this grade is reported as a numerical grade, no conversion is needed.

Scores on the ASSET/COMPASS College Entrance Test

Specifically, student scores on the math, algebra, writing, and reading sections of the COMPASS/ASSET college entrance test battery were used as separate variables. The scores on the ASSET/COMPASS test are divided into four sections for the associate degree level. These sections are math, algebra, writing, and reading. A numerical grade is derived from each area and the actual numerical grade was used in this study. The ASSET/COMPASS is based on a 100 point scale for each of the above sections (Noel et al., 1985). The ASSET test is a 25 minute multiple choice, pen and paper test, whereas the COMPASS test is untimed, computer based, yet still multiple choice (ACT Publications COMPASS Manual, 1997).

According to Brian Roberts, Director of Student Services at Augusta Technical College, the ASSET test was replaced 2 years ago by the Technical College System of Georgia (TCSG). The COMPASS test was implemented at that time in an effort to provide standardization throughout DTAE. Mr. Roberts relayed that the TCSG had found students scored better when the time factor was eliminated (the ASSET test is timed). The ASSET test is still administered to high school students during 12^{th} grade who wish to enter a technical college in Georgia as it gives them an idea of how placement tests are administered (B. Roberts, personal communication, December 12, 2008). The TCSG provided a conversion chart for all technical colleges to use for converting ASSET test scores to COMPASS test score equivalents. This chart is provided in Table 3. All existing ASSET test scores were converted to equivalent COMPASS scores so that all scores to be entered in the statistical software for analysis were of the same type.

Table 3

Recommended ASSET/COMPASS Score Conversion Chart (DTAE)

ASSET Scale Score	Linked COMPASS Scale Score Value					
↓	Writing Skills (with ASSET Writing Skills)	Reading Skills (with ASSET Reading Skills)	Pre-Algebra (with ASSET Numerical Skills)	Algebra (with ASSET Elem. Algebra)	Algebra (with ASSET Intermediate Algebra)	College Algebra (with ASSET College Algebra)
55			99	94	98	96
54	99		97	86	94	83
53		99	94	81	90	79
52	98	98	91	77	87	77
51	96	96	89	74	85	73
50	94	95	85	69	81	68
49	92	94	82	63	75	66
48	90	92	78	57	71	65
47	87	91	73	53	68	64
46	83	89	66	50	63	60
45	77	87	61	45	57	28
44	71	85	58	41	55	56
43	65	83	53	39	53	54
42	62	81	50	37	50	52
41	54	79	46	36	47	51
40	48	76	43	34	44	49
39	45	73	39	32	40	48
38	38	70	36	29	37	46
37	32	67	32	28	34	43
36	28	65	29	27	32	41
35	23	60	26	26	29	38
34	18	53	24	25	27	36
33	15	49	22	23	25	32
32		46	21	21	23	29
31			19	20	21	27
30			18	19	20	24
29			17	18	17	23
28				17	17	22
27				17	17	20
26				16	16	19
25					16	17
24						17
23						16

S*tudent End of Course Grade in Biology 193*

For this study, the end of quarter grade for Biology 193 was used as the dependent variable. Since students were given a letter grade for Biology 193 instead of a numerical score, the grade was equated to its numerical counterpart in order to be used in the statistical software for data analysis in this study. In this case, the standard technical college grading system was used (Augusta Technical College Catalog, 2007-2008). This grading system is detailed in Table 4.

Since the score range was wide, this researcher equated each letter grade to a numerical score which fell in the center of that range. As an example, a letter grade of "A" was assigned a score of 95. The last column in Table 4 shows the numerical scores that were used in this study for each letter grade. These scores were known as the predicted scores in this study.

Table 4

Augusta Technical College Grading System

Letter Grade	Score Range	Score Used for This Study
A	90-100	95
B	80-89	85
C	70-79	75
D	60-69	65
F	50-59	55

Students who took Biology 193 more than once only had their first attempt grade score entered. The first attempt showed the student's true unaltered ability (achievement). This information was important in this study as students taking multiple attempts to pass a course could have a practice effect. This effect refers to gains in scores on tests that occur when a student is retested on the same material. The gains in numerical grades are due to the experience

of having taken the course previously and do not reflect growth or other improvement in the skills being assessed (Kaufman, 1990).

High School Diploma Track

College and/or Technology/Career Preparation track information was examined. In Georgia, high school students in college preparation track studies must take more mathematics and science courses than students enrolled in technology/career preparation track studies (Southern Regional Education Board, 2007). More courses in mathematics and science at the high school level could have a relationship to student success in these college level courses.

In a multiple regression equation, some qualitative data cannot be entered with a numerical value but are relevant to the equation. These are dichotomous qualitative variables and must be coded to represent group membership, and used to predict the dependent variable (Lomax, 2001). For this study, a concept known as dummy coding was employed. It was a way of false coding a set of variables so that their qualitative nature was assigned a numerical value. Once entered into the equation, these numerical representations of the qualitative data should not cause a major distortion of the predictive nature of the independent variables. Typically, whole numbers such as “0”, “1”, and “2” are used for numerical coding.

In coding the high school preparation tract, a “0” was entered for students who received a College Preparatory (CP) Program or a College Preparatory with Distinction (CP+) Program diploma. A “1” was entered for students who received a Technology/Career Preparatory (TC) or a Technology/Career Preparatory with Distinction (TC+) Program diploma. Some students earned a dual College and Technology/Career Preparatory Program diploma. Those students were coded as a “0” as they obtained the requirements for college preparation which required them to take and pass more mathematics and science courses than were required for the

technology/career tack (Southern Regional Education Board, 2007; Georgia High School Graduation Requirements, 2002-2003).

Data Analysis

Databases have been used for carrying out studies for many years. With a multitude of computer software on the market to choose from, researchers are faced with finding the software that will give them the dataset they need in a timely, cost efficient manner. Advanced statistical methods once took hand calculations to derive a list of data that were useful for comparison. Researchers today use software like Statistical Package for the Social Sciences (SPSS) as it converts a great deal of information into a clean dataset suitable for statistical analysis. The method for coding is usually up to the researcher. Using a coded database is repetitive and sometimes trivial, but once entered into the software, it can be password protected to avoid unwanted manipulation of data. Yet, the data in code form is available at will for ease in duplication of the study (Hoyland & Sircar, 2007).

For this study, a multiple regression analysis was used. Multiple regression can establish that a set of independent variables (explanatory or predictor variables) explains a portion of the variance in a dependent variable (response or criterion variable) at a significant level. It can establish the relative predictive importance of the independent variables (Garson, 2007). In this study, all data used as variables were taken from readily available student information on campus at the technical college. The independent variables were student grades in high school biology (bx_1), student scores on the COMPASS/ASSET college entrance test for math (bx_2), algebra (bx_3), writing (bx_4), and reading (bx_5). College preparatory diploma students, including dual college and technology/career preparatory diploma students, were coded with a “0” and technology/career preparatory diploma students were coded with a “1”. The dependent variable

in this study was the student's end-of-course grade in Biology 193 (y). The regression formula was represented by:

$$y = bx_1 + bx_2 + bx_3 + bx_4 + bx_5 + a$$

The "b's" in the above equation were the regression coefficients which represented the amount the dependent variable "y" changed when the corresponding independent variables changed one unit and the other independent variables were held constant (Garson, 2007). The "a" is known as the slope of the variable.

Another coefficient associated with the multiple regression formula was the multiple correlation coefficient "R", which was a biased estimate of the population multiple correlation due to sampling error in the standard deviations of "x" and "y" (Lomax, 2001). "R" is often overestimated, so an adjusted coefficient of multiple determination, "$R^{2"}$, has been devised. It accounts for sample size and the number of predictors in the equation. It allows us to compare equations fitted to the same set of data with differing numbers of predictors or with multiple samples of data. The coefficient of multiple determination is the percent of variance in the dependent variable "y" explained collectively by all of the independent variables (Garson, 2007). The dependent variable is modeled as a random variable because of the uncertainty as to its value and amount of variability it has, given only the value of each independent variable (Fox, 1997). The regression analysis estimates the value of the dependent variable for a given value of each respective independent variable (Allison, 1999). The coefficient of multiple determination tells us the proportion of total variation in "y" that is predictable when using a particular set of predictor variables in a linier regression equation (Lomax, 2001). Additionally "$R^{2"}$ refers to the effect size. The effect size is the measure of the strength of the relationship between two variables. It is useful to know if the variables have a statistically significant effect and the size of

those observable effects could be helpful in making decisions about variable relationships (Finch, Cumming, & Thomason, 2001).

Multiple regression analysis was used in this study as it has a predictive nature. Prediction of the dependent variable could be performed based on the close correlation of the independent variables. If variables were correlated, the scores would fall close to the regression line that had been plotted on a graph; therefore, the more accurate the prediction (Brace, Kemp, & Snelgar, 2006).

Additionally, this researcher used a model selection method, stepwise regression, which dealt directly with how the independent variables and the dependent variable were chosen (Lomax, 2001). In this study, all the variables had a relationship with each other, or shared a common ground. All were student prior scores and the researcher wanted to know if there was an interconnection of the independent variables with the dependent variable. All variables were selected prior to running the study and were analyzed in sequence as seen in Table 3. Each independent variable was compared with the dependent variable in the hope of finding one or more variables that, when used alone or when paired together, could be used as a predictor of student success in Biology 193.

A visual representation of the relationships between variables was created using a scatterplot diagram (Green & Salkind, 2003). This is a graph with typical; “x” and “y” coordinates that shows the relationship between the predictor variable and the criterion variable and is called a bivariate scatterplot. In this study, there were 5 predictor variables, so a matrix scatterplot was used. This visually represented the relationships between all pairs of variables.

As with any research, there may be threats to internal validity encountered. One threat, called an error in variable bias, can happen because we assume “x” was measured without error

(Stock & Watson, 2007). However, there may have been a data entry error made by the administrative professional that entered the student data in the first place. Another type of bias encountered can be a simple selection bias. Here, we assume there was a simple random sampling of the population performed. In some cases, simple random sampling was thwarted because the sample in effect "selects itself." This arises when a selection process influences the availability of data and that process was related to the dependent variable. This may, in effect, induce a correlation between the variables when one was not there. Lastly, simultaneous causality bias can occur. This happens when we assume "x" causes "y". Sometimes "y" can cause "x" as well. The researcher must establish a causal effect of interest and assume "x" causes "y", ignoring the effect "y" may have on "x".

Summary

Having more than one independent (predictor) variable is useful when predicting human behavior because our actions, thoughts, and even emotions are all likely to be influenced by a combination of factors. Using multiple regression analysis can tease out precisely which set of variables were influencing our behavior. Therefore, in a multiple regression analysis, we will not manipulate the independent variables but instead just measure the naturally occurring values of them to see if this helped with the predictive process of the dependent variable (Green & Sulkind, 2003). A visual representation was developed to show how close the predicted Biology 193 grades used in this study were to the actual scores from statistical calculation.

CHAPTER 4

RESULTS

The problem of this correlational study was to determine if there was interconnectedness between OTA program student variables of high school biology grade, college preparatory or non-college preparatory track, and COMPASS college entrance test scores in math, algebra, writing, and reading, and student success in Biology 193 for first-time takers. This chapter describes the sample and provides an analysis of data obtained for each of the two research questions.

Population Used in the Study

The population for this study consisted of students who had designated OTA as their program of study at the technical college used in this study. Although 400 students were accepted into the OTA program at the technical college since its inception, data from only 202 students were used in this study. Data on 27 students could not be used as they were allowed to use SAT scores from their high school transcript. Another 18 students were allowed to use ACT scores. Another 23 students transferred into the technical college from local universities and no ASSETT/COMPASS test was given by the technical college admissions department. There were 15 students who had GED scores, so no high school biology grade was found for them. Lastly, there were 16 students who were older and had taken some college level courses previously, but no high school transcripts were available for them. The remaining 99 students were coded as entering other associate degree programs on campus, transferred to another institution, or dropped out of school, so only incomplete data were available.

Analysis of the Research Questions

The independent variables used in this study were high school biology grade, college preparatory or non-college preparatory track, and ASSET/COMPASS college entrance test scores in math, algebra, writing, and reading individually. Since the technical college had converted to COMPASS testing, all ASSET test scores had to be converted to COMPASS scores using a table for the conversion provided by the technical college admissions department. Students who were college preparatory track in high school were dummy coded a "0" and those who were non-college preparatory track were coded a "1". These variables were identified in previous studies as factors that are used to predict student success in college level courses (Haydel & Roeser, 2002; Henschler, 2006; Hurlburt, 2003; Lee & Greene, 2007; McCall, Allen, & Fike, 2006; Pugh & Lowther, 2004; Short, 1991).

The dependent variable in this study was the student's end of course Biology 193 grade. Since the grade was reported in letter form, a numerical conversion was made according to the technical college grading scale. Since numerical grades varied widely, the researcher chose to use a numerical score from the middle of the scale. These grades were determined to be the predicted grades. All statistical calculations were performed using The Statistical Package for the Social Sciences (SPSS) version 14.0 for Windows.

The lowest high school biology grade on a student transcript was a 60 and the highest was a 97, with the average score at 79.2. For the COMPASS college entrance test, scores for algebra were reported at a minimum of 16 and a maximum of 57 with the average score at 28.17. For reading, scores were 39 for the low score and 99 for the maximum with the average score at 79.03. Writing scores were 15 for a low score and 98 for a maximum score with average score at 67.9. The math scores were at 55 for a low and 95 for a maximum with the average score at 76.

Research Question Number One

What is the correlation matrix of student variables for high school biology grade, college preparatory or non-college preparatory track, and COMPASS college entrance test scores in math, algebra, writing, and reading as related to successful completion of Biology 193?

The correlation matrix was determined by using a multiple regression analysis. This was used to determine a relationship among all of the independent variables and to delineate out which of them, if any, had the strongest relationship to the dependent variable, the end of course grade in Biology 193. In the research question, the researcher was not concerned with how well the independent variables could predict the end-of-course grade in Biology 193. The concern was to find if any interconnectedness between the 5 independent variables and the dependent variable existed. Therefore, the independent variables or predictors were unordered. Findings suggested there were significant relationships, or interconnectedness between each of the independent variables (high school biology grade, college preparatory or non-college preparatory track, and COMPASS college entrance entrance test scores in math, Algebra, writing, and reading) and the criterion variable (Biology 193). All correlation coefficients ranged between -1 and 1. A positive sign would indicate a direct relationship; a negative sign would indicate an inverse relationship (Green & Salkind, 2003). There were relationships between the independent variables but none that showed evidence of multicollinearity when the tolerance levels (>.1) and variance inflation factors (VIF) (<10) were evaluated. The correlation matrix is represented in Table 5.

There was an inverse relationship between college preparation and end-of-course grade in Biology 193 ($r=-.184$; $p=.004$). This relationship suggested that as the grade in Biology 193 increased, the number moved closer to zero signifying that students in this sample who earned higher grades in biology were also college prepared students. Therefore, sample students who

were college preparation track prepared scored higher in Biology 193 than students who were not. This inverse relationship was consistent between college preparation students and all other independent variables. Additionally, the higher the high school biology grade of the student, the better they scored on the COMPASS reading test (r=.152; p=.015). COMPASS writing test (r=.164; p=.01). COMPASS math test (r=.205; p=.002) and COMPASS Algebra test (r=.241; p=.000). Overall, students who were college prepared in high school tended to score higher on all COMPASS tests.

Table 5

Correlation Matrix

		biology 193 grade	college prep	hs biology grade	COMPASS algebra	COMPASS reading	COMPASS writing	COMPASS math
Pearson Correlation	eoc bio 193 grade	1.000						
	college prep	-.184*	1.000					
	hs biology grade	.687*	-.129*	1.000				
	COMPASS algebra	.321*	-.086	.241*	1.000			
	COMPASS reading	.276*	-.096	.152*	.183*	1.000		
	COMPASS writing	.233*	-.094	.164*	.250*	.613*	1.000	
	COMPASS math	.331*	-.089	.205*	.761*	.156*	.283*	1.000

Note:*p<.05

Research Question Number Two

What combination of high school grade in biology; scores on college entrance test for math, algebra, writing, and reading; high school diploma track (college preparatory or non-college preparatory) provides the best model for predicting students' final end-of-course grade in Biology 193?

A stepwise regression analysis was run to compare each independent variable to each other and to the dependent variable to determine the most desirable model for predicting the end-of-course grade in Biology 193. The model selected three independent variables, COMPASS math score, COMPASS reading score, and high school biology grade. The three variables, COMPASS reading and math scores and high school biology grade, were statistically significant (significance for the variables at the .05 level). The probability for high school biology was .000, COMPASS reading score was .010, and COMPASS math score was .029. When all three independent variables are considered together, they explain 52.4% of the variance in the end-of-course grade in Biology 193.

Multiple regression produces R values, R^2 values, and adjusted R^2 values. These are the coefficients of multiple correlation or determination which represent the percent of variance we see in the dependent variable that can be explained collectively by all of the independent variables. The variance is overestimated as variables are added, so it was adjusted (Garson, 2007). It was assumed that each variable followed a normal distribution pattern. R^2 is also known as the effect size or the measure of the strength of the interconnectedness of variables. The R^2 values and the adjusted R^2 values for all variables are reported in Table 6. The R value was .733, the R^2 value was.537, and the adjusted R^2 value was .523.

Table 6

R^2 and Adjusted R^2 Using All Independent Variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.733(a)	.537	.523	8.0646

Note: Predictors: (Constant), COMPASS math, college prep, COMPASS reading, hs biology grade, COMPASS writing, COMPASS algebra

The R value for the stepwise regression was .729, the R^2 value was .531, and the adjusted R^2 value was .524. The data showed that when the three independent variables (COMPASS math and reading scores and high school biology grade) were considered together, they could be considered predictors of the end of course grade in Biology 193. Table 7 reports the data for the model selected variables.

Table 7

R^2 and Adjusted R^2 Using Only COMPASS Math and Reading Scores and High School Biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.687(a)	.471	.469	8.51048
2	.713(b)	.509	.504	8.22372
3	.729(c)	.531	.524	8.05339

Note. a Predictors: (Constant), hs biology grade
b Predictors: (Constant), hs biology grade, COMPASS math
c Predictors: (Constant), hs biology grade, COMPASS math, COMPASS reading

Each time a variable was added, it improved the predictability of the model. It was noted that the adjusted R^2 value for all variables was .523 and for the three model selected variables was .524 indicating that the addition of any of the remaining variables did not provide for a significant increase in the R^2. Therefore, the stepwise regression did not add the independent variables, COMPASS Algebra score, COMPASS writing score, and high school preparation in the final regression model.

An F test was used to evaluate the significance of the overall regression model, testing the significance of the model's R and R^2. Here, the three model selected variables were analyzed in relation to Biology 193 end-of-course grade. A significant F for this model was calculated at $F=74.833$, $p<.000$. The data are reported in Table 8.

Table 8

ANOVA

ANOVA(d)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12916.322	1	12916.322	178.333	.000(a)
	Residual	14485.658	200	72.428		
	Total	27401.980	201			
2	Regression	13943.685	2	6971.843	103.089	.000(b)
	Residual	13458.295	199	67.630		
	Total	27401.980	201			
3	Regression	14560.289	3	4853.430	74.833	.000(c)
	Residual	12841.691	198	64.857		
	Total	27401.980	201			

a Predictors: (Constant), hs biology grade
b Predictors: (Constant), hs biology grade, COMPASS math
c Predictors: (Constant), hs biology grade, COMPASS math, COMPASS reading
d Dependent Variable: eoc bio 193 grade

The regression formula for this study was:

$$y = bx_1 + bx_2 + bx_3 + bx_4 + bx_5 + a$$

The “y” is the dependent variable, the end-of-course grade in Biology 193. The “b’s” are the regression coefficients representing the amount the dependent variable changed when the corresponding independent variable changed one unit (Garson, 2007). The “x’s” represent the value of the independent variables. Together, these represented the slopes. The constant “a” represented where the regression line intercepted the “y” axis.

Using the data from Table 9, the new regression formula became:

$$y = .931 + .175 + .153 + (-16.405)$$

The intercept “a” is represented by the constant coefficient -16.405. If we allow the “y” coefficient to be represented by .931 for the high school biology grade, then the assumption can be made that each time the high school biology grade rises by one point while keeping the other 2 independent variables constant (controlling), the student’s end-of-course grade in Biology 193

will rise by .931. If the "y" coefficient is .175, then each time the COMPASS math score is raised one point, the end-of-course grade in Biology 193 will rise by .175 if the other two independent variables are controlled. Lastly, if the "y" coefficient is .153, then each time the COMPASS reading score is raised one point, the end-of-course grade in Biology 193 will rise by .153 if we control for the other two independent variables.

The contribution of each independent variable was evaluated. The t-test was used to assess the significance of the individual "b" coefficients. The results are reported in Table 9. High school biology grade, COMPASS math score, and COMPASS reading score were found to be significant. According to the standardized estimates, (beta weights), the high school biology grade contributes the most to explaining the end-of-course grade in Biology 193.

Table 9

Final Stepwise Rotation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-4.768	6.077		-.785	.434		
	hs biology grade	1.020	.076	.687	13.354	.000	1.000	1.000
2	(Constant)	-7.302	5.908		-1.236	.218		
	hs biology grade	.959	.075	.646	12.725	.000	.958	1.044
	COMPASS math	.194	.050	.198	3.898	.000	.958	1.044
3	(Constant)	-16.405	6.495		-2.526	.012		
	hs biology grade	.931	.074	.627	12.510	.000	.943	1.060
	COMPASS math	.175	.049	.178	3.550	.000	.942	1.062
	COMPASS reading	.153	.050	.153	3.083	.002	.961	1.041

Note. a Dependent Variable: eoc bio 193 grade; p=<.05

It is noted that the researcher had to adjust the student's end-of-course grade in Biology 193 as the grade was originally reported as a letter grade on the student transcript at the technical college. This was determined to be the predicted end-of-course grade in Biology 193. Using the regression coefficient .931 the researcher adjusted student's predicted end-of-course Biology 193 grade and derived the computed end-of-course grade. The following equation was used to derive the student's computed Biology 193 grade:

computed grade = (.931 x student high school biology grade) + (.175 x student COMPASS math score) + (.153 x student COMPASS reading score) + (-16.405)

The student predicted end-of-course grade used in this study is displayed in Table 10 and the computed end-of-course grade is displayed in Table 11.

Table 10

Predicted Biology 193 Grade

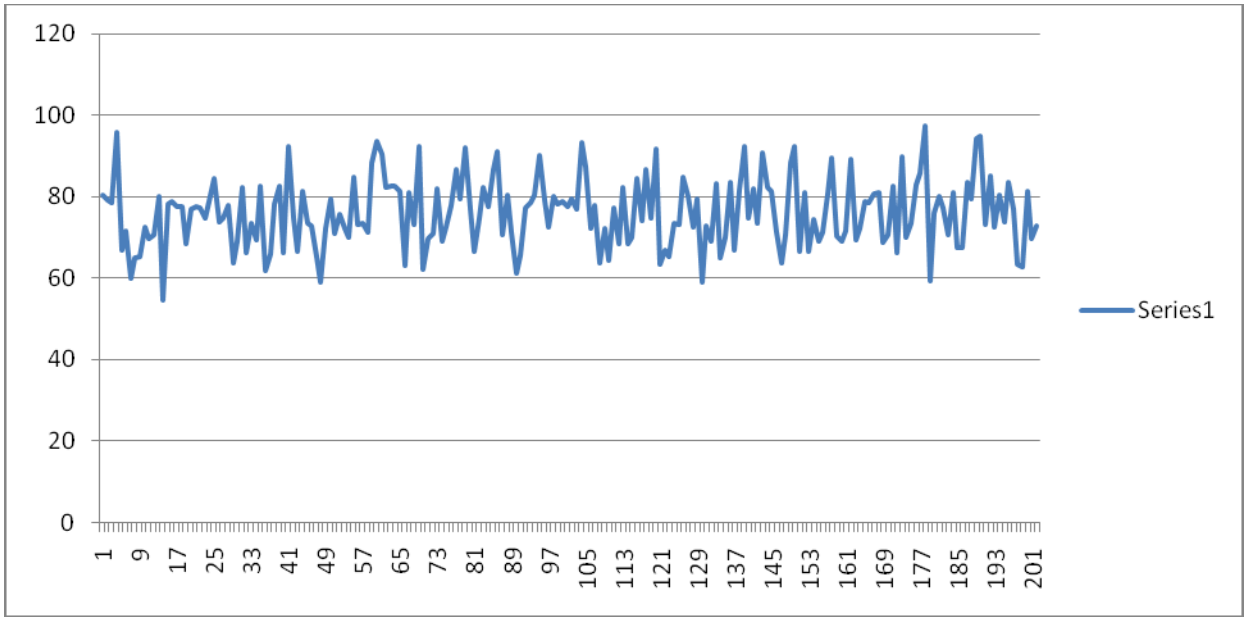
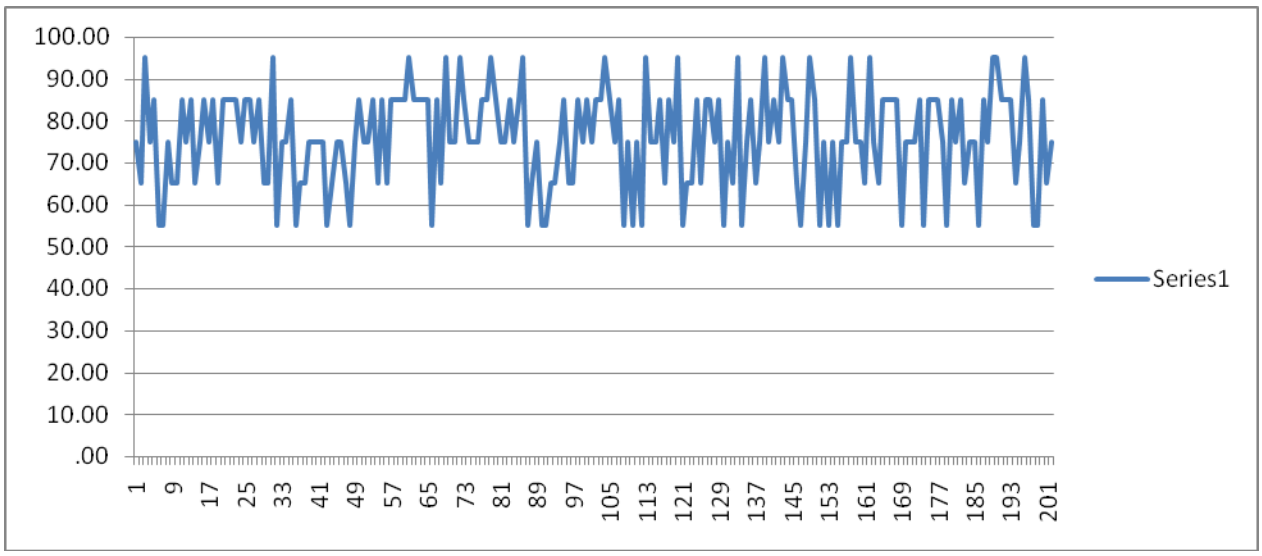


Table 11

Computed Biology 193 Grade



The two grades, predicted and computed, have a .73 or 73% correlation (one is preferred) at the .01 significance level. Therefore, the two scores were very close to each other, making the use of the predicted score in this research a reliable measure. The predicted and computed scores are displayed in Table 12. Table 13 reports the significance level.

Table 12

Predicted and Computed Biology 193 Grades

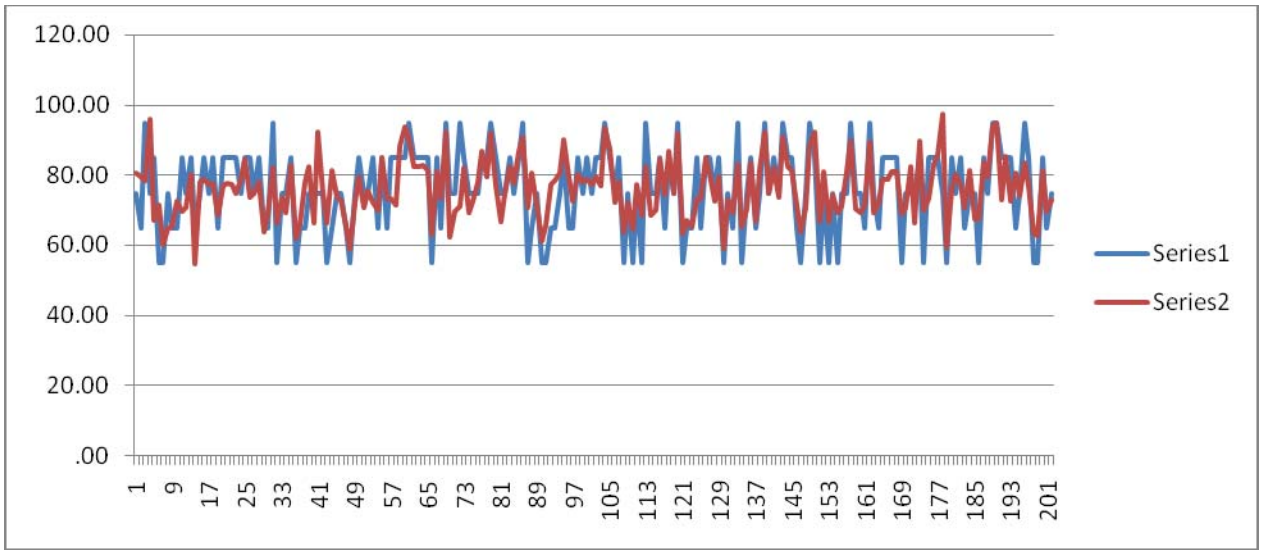


Table 13

Results of Predicted Scores on the Dependent Variable

		eoc bio 193 grade	predicted scores
eoc bio 193 grade	Pearson Correlation	1	.730(**)
	Sig. (2-tailed)	.	.000
	N	202	202
predicted scores	Pearson Correlation	.730(**)	1
	Sig. (2-tailed)	.000	.
	N	202	202

** Correlation is significant at the 0.01 level (2-tailed).

Summary

Examination of the use of high school biology grade, college track preparation or non-college track preparation, and COMPASS college entrance test scores for math, algebra, reading, and writing individually in a model to predict end-of-course grade in Biology 193 indicated three independent variables with statistical significance. These variables were high school biology grade, and COMPASS math and reading scores individually.

A multiple regression analysis was performed with one variable, high school biology grade, more statistically significant than any other. A model selection method, stepwise multiple regression analysis, was performed to compare the independent variables to each other and to the dependent variable yielding statistical significance for high school biology grade at .000, COMPASS reading score at .010, and COMPASS math score at .029.

The regression coefficient was determined to be .931 for high school biology grade, .175 for COMPASS math test score, and .153 for COMPASS reading test score. Using these coefficients, the computed Biology 193 grades were calculated. The predicted (adjusted) Biology

193 scores and computed scores were compared and found to have a .73 or 73% correlation, making use of the predicted scores a reliable measure in this study.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, RECOMMENDATIONS, AND DISCUSSION

This chapter begins with a summation of the research study including background of the problem, statement of the problem, research procedures, and analysis of the data. Secondly, the findings of the study are reported. Thirdly, conclusions for the study are presented based upon the findings. Fourthly, recommendations for further study are discussed. Finally, discussion for the use of the study are provided.

Summary

From the perspective of the students, Biology 193 is the first major hurdle they must overcome as they pursue their course of study in the OTA program. It is important to inform the students up front of their skills and preparation for the courses they will undertake. They should be thoroughly screened to determine their potential academic achievement in the college science area if retention levels are to elevate beyond their present level. This study was important as three variables were identified as predictors of student success in Biology 193. Students could be channeled into developmental biology courses should these three variables indicate a lack of student readiness for Biology 193. Ultimately, this could improve retention rates among OTA students, therefore filling the vast amount of vacancies for OTA jobs in Georgia.

Statement of the Problem

The problem of this study was to determine if there was a relationship between student variables of high school biology grade, college preparatory or non-college preparatory track, and

college entrance test scores in math, algebra, writing, and reading, and successful completion of Biology 193 for the OTA program at this large east Georgia technical college.

Research Procedure

The first step in the research procedure was to determine the population. The population used in this study consisted of students who had designated OTA as their program of study at the technical college used in this study. The total number of students used for the study was 400, but only 202 were used to run the statistical analysis as the remaining 198 were missing variables.

Data for this study were collected from student high school and technical college transcripts, all of which were readily available in the admissions department at a large east Georgia technical college.

Variables identified as possible predictors of student Biology 193 grade success were high school biology grade, college preparatory and non-college preparatory track, and COMPASS college entrance test scores for math, algebra, reading, and writing individually. These variables were identified in previous studies as factors that are used to predict student success in college level science courses (Haydel & Roeser, 2002; Henschler, 2006; Hurlburt, 2003; Lee & Greene, 2007; McCall, Allen, & Fike, 2006; Pugh & Lowther, 2004; Short, 1991).

The rationale for this study was rooted in the literature that supported use of predictive data to determine student placement in college level or developmental courses upon entrance to the college (Cheek, 2005; Faulkner, 2002; Greenstein, 2005; Martin, Blanc, & DeBuhr, 1982; Merisotis & Phipps, 2000).

Analysis of the Data

The data were analyzed using a multiple regression analysis. The Statistical Package for the Social Sciences (SPSS) version 14.0 for Windows was used to determine if any one

independent variable was statistically significant as a predictor of the dependent variable, student success in Biology 193. A stepwise multiple regression analysis was then performed to determine an interconnectedness of the independent variables with each other as predictors of the dependent variable.

A regression coefficient was determined and the regression formula was calculated yielding a comparison of the predicted Biology 193 student grades used in this study with actual grades. The predicted grades were given a numeric representation from a letter grade reported on the student transcript and the predicted grades were determined to be reliable in this study. Descriptive statistics, standard mean, standard deviation, minimum, and maximum were provided. Analysis was performed to determine which variable(s) most impacted R^2.

Findings

The following are the findings as analyzed from the two research questions formulated for this study:

Research Question Number One

What is the correlation matrix of student variables for high school biology grade, college preparatory or non-college preparatory track, and COMPASS college entrance test scores in math, algebra, writing, and reading as related to successful completion of Biology 193?

The correlation matrix showed that all independent variables used in this study had an interconnectedness with the criterion variable but not a strong one. The most successful predictor of the criterion variable was high school biology grade at .000.

The predictor variables had a wide range of representation. The lowest high school biology grade on a student transcript was a 60 and the highest was a 97, with the average score at 79.2. For the COMPASS college entrance test, scores for algebra were reported at a minimum of

16 and a maximum of 57 with the average score at 28.17. For reading, scores were 39 for the low score and 99 for the maximum with the average score at 79.03. Writing scores were 15 for a low score and 98 for a maximum score with average score at 67.9. The math scores were at 55 for a low and 95 for a maximum with the average score at 76.

Research Question Number Two

What combination of high school grade in biology; scores on college entrance test for math, algebra, writing, and reading; high school diploma track (college preparatory or non-college preparatory) provides the best model for predicting students' final end-of-course grade in Biology 193?

Since only one variable was statistically significant in the multiple regression analysis, a model selection stepwise multiple regression analysis was performed to determine an interconnectedness among the independent variables when compared to each other and to the criterion variable. The model showed three variables that when combined, were statistically significant in predicting student success in Biology 193. The R^2 value for the stepwise regression analysis was .531 and the adjusted R^2 value was .524. The data showed that when the three independent variables (COMPASS math and reading scores and high school biology grade) were considered together, they accounted for 73% of the variance in the Biology 193 end-of-course grade. The correlation R was .73.

Conclusions

Based upon the findings reported in this study, the following conclusions have been drawn:

1. A model selection, stepwise multiple regression analysis, yielded three independent variables that were closely related and could be used as predictors of the dependent

variable, end-of-course Biology 193 grade. The three variables were high school grade in biology, and COMPASS scores in reading and math individually. These three variables were statistically significant at .000 for high school biology grade, .010 for COMPASS reading score, and .029 for COMPASS math score. The R^2 was determined to be .531 and adjusted R^2 at .524. It can be concluded from this finding that these three variables are reliable predictors of student success in Biology 193 and could be used to advise future OTA program students about college-level course placement in college biology. Students who show a low interconnectedness of these three variables could be advised to take a lower level biology course prior to taking Biology 193 to help ensure success in it. The OTA program faculty could take student scores in high school biology and COMPASS reading and math test scores from a student's transcript, plug the data into the regression formula, and could possibly derive a score that student might make if he/she were to take Biology 193. That score would help OTA program faculty in student advisement of college level or non-college level biology course enrollment, helping to ensure student success in their education.

2. This researcher used 400 students who were accepted into the OTA program. Data were used on 202 students as the other 198 students were missing variables. Therefore, this study should be replicated in the future using data from more students. Tracking over time and/or replication of this study could determine if the three variables determined to be statistically significant in this study are reliable to use over time as predictors of student success in Biology 193 and to determine if OTA program student retention rates can be predicted.

3. For this study the researcher had to report end-of-course grade in Biology 193 in numerical form, but the grades were reported on student transcripts in letter form. The grades were converted to numerical form using the standard numerical range for the Technical College System of Georgia. Since end-of-course grades in Biology 193 were widely distributed throughout the score range, this researcher used a number that was in the middle of the score range. These grades were the predicted scores. The statistical regression coefficients were determined to be .163 for COMPASS reading, .175 for COMPASS math, and .931 for high school biology grade. The constant coefficient "a" was determined to be -16.405. The coefficients were interjected into the original regression formula and yielded a correlation of 73% between the predicted and computed end-of-course Biology 193 grades for the students used in this study. It can be concluded from this finding that the use of the predicted scores in this study was statistically reliable. This indicates that future use of the end-of-quarter grade in Biology 193, though reported in a letter grade form, could be reliably converted to a middle-of-the-score range numerical score. It would not be necessary to know the actual numerical end-of-quarter grade recorded by the Biology 193 instructor. This would also be beneficial in converting letter grades for students who transfer in to the technical college from another learning institution with a letter grade recorded on their transcript for Biology 193 or its equivalent. This, again, may aid in ease of replication of the study for future research.

Recommendations for Future Research

Based on the findings and conclusions drawn from this study, the following recommendations for additional study are presented:

1. A study should be conducted using OTA program students who transferred in from other institutions with letter grades in Biology 193 recorded on their transcripts. Since it was concluded that the predicted (converted) numerical grade was reliable in this study, the same method of conversion could be used in a future study and be considered reliable.
2. A study should be conducted to examine the retention rate for OTA program students and compare it to predictability of the three model selected variables with Biology 193 over time There may be a correlation between using the three variables to advise students on college level/non-college level biology course enrollment, student success in making a "C" or better in this biology requirement, and overall retention of students in the OTA program.

Discussion

Variables identified as possible predictors of student Biology 193 grade success in this study were high school biology grade, college preparatory and non-college preparatory track, and COMPASS college entrance test scores for math, algebra, reading, and writing individually. Variables such as these were identified in previous studies found in the literature and were successfully used to predict student success in college level courses. Henschler (2006) used COMPASS reading scores to predict student success in college general education courses. McCall, Allen, & Fike (2006) examined student grade point average in biology to predict success in a pharmacy degree program. Pugh & Lowther (2004) examined the use of last high school mathematics grade to predict student success in college mathematics. The study performed by this researcher supports and adds to the literature as it used three model selected variables, high

school biology grade, COMPASS reading test score, and COMPASS math test score to predict student success in a college level biology course, Biology 193.

The stepwise regression analysis model indicated three independent variables, student's high school biology grade, COMPASS college entrance test reading score, and COMPASS college entrance test math score, which were statistically significant in predicting student success in a college-level biology, Biology 193, at a large technical college in east Georgia. The results of studies found in the literature and this study are comparable. Student success in college-level courses can be successfully predicted using existing variables.

Although the model selected three independent variables that showed interconnectedness in predicting student success in Biology 193, in order to use these three variables as predictors, we would have to assume that all students entering the OTA associate degree program were from the same type of high school in Georgia and that all of their high school biology courses were taught the same way. However, we have no way to control for these conditions. Additionally, scores on Biology 193 varied widely. This would make using the three variables as predictors impossible and would not account for the variance.

Student grades for Biology 193 for first time takers were used for this study. However, it was noted that all of the students used in this study who did not make a "C" or better in Biology 193 the first time, took the course again, some took it 3 or more times before making a "C" or better. These students may have developed poor study habits in secondary school and brought those habits with them to college. These same students may have had low academic performance in secondary school or did just enough work in school to get by. They may have lacked grounded career goals or may have been under-challenged in areas where they showed real strength. They may have seen little to no value in school assignments as the assignment purpose may not have

been made clear to them by their instructor. These students may have even lacked basic reading and/or comprehension skills. They may have been promoted through the secondary school system because their instructor did not identify the problem or lacked the skills to address the problem (Gaither, 1999). Students who were successful in obtaining a "C" or better grade in Biology 193 and took it only one time may have had an innate ability in biology from high school. According to Ausubel (as cited in Grant & Gale, 1989), student learning is influenced by what they already know. If a student performed well in high school biology and derived a personal meaning from the content of the course, it can be assumed they will perform well in other similar courses in the future.

According to Table 5 in Chapter 4, it was noted that students who were college track prepared in high school tended to obtain higher end-of-course grades in Biology 193. Additionally, college track prepared students scored higher on all four COMPASS tests, math, Algebra, reading, and writing, than students who were non-college track prepared. This could be due to the fact that college track prepared students must take more science and math courses in high school than non-college track prepared students in Georgia (Georgia Department of Education, 1997-2005).

This study is significant in that it may assist the faculty of the OTA program to determine if a future student could be successful in Biology 193, a college level lab based anatomy and physiology prerequisite, or if the student should enter a developmental level biology course prior to taking Biology 193. Using the student transcript, scores in high school biology and COMPASS reading and math test scores could be entered into the regression formula from this study to derive a possible score the student might make in Biology 193. This could allow student biology course advisement by the OTA program faculty to be based on actual data. Ultimately,

this could improve retention levels in the OTA program which would, in turn, help to reduce the OTA worker shortage in east Georgia.

REFERENCES

Abbott, R. A., Ploubidis, G. P., Huppert, F. A., Kuh, D., Wadswort, M. E., & Croudac, T.J. (2006). Psychometric evaluation and predictive validity of Ryff's psychological well-being items in a UK birth cohort sample of women. *Health and Quality of Life Outcomes, 4*(76), 1-13.

ACT Publications. (1997). *COMPASS manual*. Iowa City, IA: ACT Publications.

ACT Publications. (1973). *Assessing students on the way to college.* Iowa City, IA: ACT Publications.

Allison, P. D. (1999). *Multiple regression: A primer*. Thousand Oaks, CA: Pine Forge.

American College Test. (2006). *Report of high school students in Iowa and Oklahoma 2003-2004*. Oklahoma City, OK: ACT, Inc.

Augusta Technical College Policy and Procedure Manual. (2005). Augusta, GA: Augusta Technical College.

Augusta Technical College Catalog, 2007-2008. (2007). Augusta, GA: Augusta Technical College.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.

Beeber, C., & Biermann, C. A. (2007). Building success out of at-risk students: The role of a biology foundations course. *American Biology Teacher, 69*(4), 48-53.

Black, J. (2003). *Gen xers return to college*. Washington, DC: American Association of Collegiate Registrars and Admissions Officers.

Bogue, J. P. (1950). The community college. In A. M. Cohen & F. B. Brawer (Eds.), *The American community college* (pp. 4, 32). San Francisco: Jossey-Bass.

Brace, N., Kemp, R., & Snelgar, R. (2006). *SPSS for psychologists: A guide to data analysis using SPSS for Windows* (3rd ed.). London: Palgrave.

Breeden, K. H. (2002). *Foundations and defining principles of Georgia's technical college system: Business partnerships, customer focus, quality, and innovations for the future.* Atlanta, GA: Georgia Department of Technical and Adult Education.

Broome, E. C. (1963). *A historical and critical discussion of college admission requirements.* Princeton, NJ: College Entrance Examination Board.

Burgess, E. W. (1950). Toward family stability. *Annals of the American Academy of Political and Social Science, 272*(1), 47-52.

Carnegie Classification of Institutions of Higher Education. (2000). *The Carnegie Foundation for the Advancement of Teaching. Classification for technical and junior colleges and major universities*. Retrieved November 08, 2002, from http://www.carnegiefoundation.org/classification

Cech, T. R. (1999). Science at liberal arts colleges: A better education? *Daedalus 128*(1), 195–217.

Central Savannah River Area. (2005). *Description of what is contained within the CSRA, including job classifications*. Retrieved April 24, 2005, from http://www.narc.org/cogs/georgia/csrardc.html

Cheek, J. (2005). *College placement tests really are important. Why we have college placement tests and how they are used*. Retrieved July 7, 2005, from http://testing.articleinsider.com/185969_college_placement_tests.html

Clark, M. C. (2001). Off the beaten path: Some creative approaches to adult learning. In S. B. Merriam (Ed.), *The new update on adult learning theory* (pp. 83-91). San Francisco: Jossey-Bass.

Cohen, A. M., & Brawer, F. B. (1996). *The American community college*. San Francisco, CA: Jossey-Bass.

College Entrance Examination Board. (1992). *1992 profile of SAT and achievement test takers,* Princeton, NJ: College Entrance Examination Board.

Computer Adaptive Placement Assessment and Support System (COMPASS), 2006. *COMPASS reference manual*. Albany, NY: ACT.

Conley, D. T. (2007). The challenge of college readiness. *Educational Leadership, 64*(7), 23-29. Alexandria, VA: Association of Supervision and Curriculum Development.

Cornot, L., & Randi, J. (1997). Motivation, volition, and collaborative innovation in classroom literacy. In J. T. Guthrie & A. Wigfield (Eds.), *Reading engagement: Motivating readers through integrated instruction* (pp. 226-227).Newark, DE: International Reading Association.

Creech, J. D. (1997). *Better preparation, less remediation: Challenging courses make a difference.* New York: Educational Benchmarks.

Curtis, D. A., Lind, S. L., Plesh, O., & Finzen, F. C. (2007). Correlation of admissions criteria with academic performance in dental students. *Journal of Dental Education, 71*(10), 1314-1321.

Darlaston-Jones, D., Cohen, L., Drew, N., Haunold, S., Pike, L., & Young, A. (2001). Addressing attrition: Why we need a unified approach to transition issues. In A. Herrmann

& M. M. Kulski (Eds.), *Expanding horizons in teaching and learning* (pp. 6-36). Perth, Australia: Curtain University of Technology.

Eells, W. C. (1931). Background: Evolving priorities and expectations of the community college. In A.M. Cohen & F. B. Brawer, *The American community college* (p. 3). San Francisco, CA: Jossey-Bass.

Encarta Learning Zone. (2000). *Psychological testing*. Retrieved April 25, 2000, from http://carta.msn.com/find/IQ.studies

Faulkner, L. R. (2002). *A review of the use of standardized test scores in the undergraduate admissions process.* Austin, TX: University of Texas.

Finch, S., Cumming, G., & Thomason, N. (2001). Reporting of statistical inferences in the Journal of Applied Psychology: Little evidence of reform. *Educational and Psychological Measurement, 61*, 181-210.

Fiscor, G., Odziana, D., & Smith, S. (1997). *Cooperative learning in an introductory Genetics lecture course*. Kalamazoo, MI: Western Michigan University.

Fleischer, J. (2007, August 14). New methods to measure performance. *Call center magazine 2002*, 24-25.

Florman, B. (2005). *ACT vs. SAT: Differences between the two.* Retrieved July 7, 2005, from http://collegeapps.about.com/od/act/a/actvssat.html

Fox, J. (1997). *Applied regression analysis, linear models, and related methods.* Thousand Oaks, CA: Sage.

Fraenkel, J. R., & Wallen, N. E. (2003). *Correlational research main points*. New York: McGraw-Hill.

Fuess, C. (1950). *The college board: Its first fifty years*. New York: Columbia University.

Gaither, G. H. (1999). Promising practices in recruitment, remediation, and retention. In G. H. Gaither (Ed), *New directions for higher education* (pp. 1-3). San Francisco: Jossey- Bass.

Garson, D. G. (2007). Discriminant functional analysis, *StatNotes: Topics in multivariate analysis* (p. 756). Examples of studies using multiple regression analysis. Retrieved January 12, 2008, from http://www.chass.ncsa.edu/garson/pa765/statnote.htm

GAcollege411. (2009). *Graduation requirements and college entrance*. Atlanta: Georgia Student Finance Commission.

Georgia High School Graduation Requirements. (2003-2003). *Requirements for all preparation tracks for college or technical college students*. Retrieved April 24, 2005, from www.public.doe.k12.ga.us/_documents/doe/legalservices/160-4-2-.47.pdf

Georgia Department of Education. (1997-2005). *Classification of college and career track groupings of students*. Retrieved April 24, 2005, from http://www.doe.k12.ga.us/

Georgia Department of Technical and Adult Education Annual Report. (2005). *Includes statistics of students who pass, drop-outs, leavers, returns.* Retrieved May 17, 2007, from http://www.dtae.org

Georgia Nursing. (2006). *Georgia Hospital Association Reports: Despite modest gains, Georgia's health care workforce shortage needs intensive care*. Retrieved May 17, 2007, from http://findarticles.com

Genter, T. (2009). Home sweet home: OT's help seniors age in place. *Today in OT, 4*(19), 21-22.

Grant, J. & Gale, R. (1989). Changing medical education. *Medical education, 23*(1), 252-257.

Green, S. B., & Salkind, N. J. (2003). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Greenstein, M. (2005). *Philosophies for the modern era of college admissions.* Retrieved July 7, 2005, from http://www.ivybound.net/aboutSAT.html

Grites, T. J. (1979). Academic advising: Getting us through the eighties. *AAHEC-ERIC High Education Research Report, 7*, Washington, DC: American Association of Higher Education.

Haydel, A. M., & Roeser, R. W. (2002). *On the links between students' motivational patterns and their perceptions, beliefs about, and performance on different types of science assessments: A multidimensional approach to achievement validation*. Los Angeles, CA: University of California, Los Angeles.

Henschler, M. J. (2006). *COMPASS reading scores as a predictor for success in the general education course, written communication*. Madison, WI: University of Wisconsin Graduate School.

Hoyland, B., & Sircar, I. (2007, May). *Coding without humans: A 'real-time' database of the European Parliament.* Paper presented at the biennial meeting of the European Union Studies Association, Montreal, Canada.

Hurlburt, R. T. (2003). *Comprehending behavioral statistics* (3rd ed.). Belmont, CA: Wadsworth/Thomson Learning.

Integrated Post-Secondary Education Data System. (2007). *Known as IPED, gives retention data per university and/or technical college.* Retrieved January 6, 2008, from http://www.nces.ed.gov/collegenavigator

Jackson, R. (2008). *Governor Sonny Perdue signed into law the change from DTAE to TCSG*. Retrieved May 24, 2008, from www.technicalcollegesystemofga.org

Karayan, S. & Gaithercoal, P. (2003). Service learning: Empowering students with special needs. *Academic Exchange, 7*(2), 151-157.

Kaufman, A. S. (1990). *Assessing adolescent and adult intelligence*. Boston: Allyn and Bacon.

Kent, G.W., Mishoe, S. C., Taft, A. A., & Campbell, C. A. (2006). Connecting allied health students to rural communities. *Journal of Rural Health, 22*(3), 260-263.

Kiely, R., Sandmann, L. R., & Truluck, J. (2004). Context of the adult. In J. P. Pappas & J. Jerman (Eds.), *New directions for adult and continuing education* (pp. 5-96). San Francisco, CA: Jossey-Bass.

Kim, H. J. (1998). *Predicting an individual retention rate using a statistical analysis*. Kirksville, MO: Truman University.

Knowledge Management System Database for Georgia Technical College Systems. (2007). *Known as KMS, gives enrollment numbers for technical colleges*. Retrieved January 6, 2008, from http://kms.dtae.org/portal/desktopdefault

Kupermintz, H., & Roeser, R. (2002). *Another look at cognitive abilities and motivational processing in science achievement: A multidimensional approach to achievement validation.* Los Angeles: University of California, Los Angeles.

Laanan, F. S. (2001). Accountability in community colleges: Looking toward the 21st century. In B. K. Townsend & S. B. Twombly (Eds.), *Community colleges*: *Policy in the future context* (pp. 57-76). Westport, CT: Ablex.

Lakeside High School Student Manual. (2005). Augusta, GA: Lakeside High School.

Lau, S., Roeser, R. W., & Kupermintz, H. (2002). *On cognitive abilities and motivational processes in students' science engagement and achievement: A multidimensional approach to achievement validation*. Los Angeles: University of California, Los Angeles.

Laws, P. W. (1999). New approaches to science and mathematics teaching at liberal arts colleges. *Daedalus, 128*(1), 217–241.

Lee, Y. J., & Greene, J. (2007). The predictive validity of an ESL placement test: A mixed method approach. *Journal of Mixed Methods Research, 1*(4), 366-389.

Leys, J. (1999, December). *Student retention: Everybody's business*. Paper presented at the annual meeting of the Educators and Planners: Symphony or Discord Conference, Auckland, New Zealand.

Lightsey, E. (2006). Spreading the job wealth. *Georgia Trend.* Retrieved May 17, 2007, from http://www.georgiatrend.com/features-economic-development/2006-01-jobwealtheconomy.shtml

Linn, M. R. (1993). College entrance examinations in the United States: A brief history for counselors. *Journal of College Admissions, 142,* 7-15.

Loar, C. L. (2007). *Biennial report of the occupational therapy assistant program.* American Occupational Therapy Association. Augusta, GA: Augusta Technical College.

Lomax, R. G. (2001). *Statistical concepts: A second course for education and the behavioral sciences.* Mahwah, NJ: Lawrence Erlbaum Associates.

Maehl, W. H. (2004). Developing and delivering adult degree programs. In J. P. Pappas & J. Jerman (Eds.), *New directions for adult and continuing education* (pp. 6-118). San Francisco, CA: Jossey-Bass.

Mansfield, P. M., Pinto, M. B., Parente, D. H., & Wortman, T. I. (2004). College students and academic performance: A case of taking control. *NASPA Journal, 41*(3), 551–567.

Martin, D., Blanc, R., & DeBuhr, L. (1982). Supplemental instruction: A model for increasing student performance and persistence. In L. Noel & R. Levitz (Eds.), *How to succeed with*

academically under prepared students (pp. 75-79). Iowa City, IA: American College Testing Program National Center for Advancement of Educational Practices.

McCall, K. L., Allen, D. D., & Fike, D. S. (2006). Predictors of academic success in a doctor of pharmacy program. *American Journal of Pharmaceutical Education, 70*(5), 106.

McCubbin, I. (2003). An examination of criticisms made of Tinto's 1975 Student Integration Model of Attrition. *Internet and Higher Education, 140,* 1-16.

McInnis, C., James, R., & Hartley, R. (2000). *Trends in the first year experience in Australian universities*. Canberra City, Australia: Department of Education, Training, and Youth Affairs, Higher Education Division.

McInnis, C., Hartley, R., Polesel, J., & Teese, R. (2000). *Non-completion in vocational education and training and higher education* (REB report 4/00). Melbourne: Centre for the Study of Higher Education, The University of Melbourne & Department of Education, Training, and Youth Affairs. Higher Education Division.

Merriam, S., & Caffarella, R. (1999). *Learning in adulthood* (2nd ed.). San Francisco, CA: Jossey-Bass.

Merisotis, J., & Phipps, R. (2000). Remedial education in colleges and universities: What's really going on? *The Review of Higher Education, 42*(1), 67-85.

Miller, G. (2009). *Support the school of allied health.* Augusta, GA: The Medical College of Georgia.

Murdock, S. H., & Hogue, N. (1999). Demographic factors affecting higher education in the United States in the twenty-first century. In G. Gaither (Ed.), *New directions for higher education: Promising practices in recruitment, remediation, and retention* (pp. 12-145). San Francisco: Jossey-Bass.

Myers, M., Smith-Hansen, L., Hull, S. H., & Hill, D. (2003). Making sense of research for improving education. *The Charles A. Dana Center Issue Brief,* April, 2003. Austin, TX: The University of Texas at Austin.

Newby, H. (2002). Higher education: Opinion: Wider participation in the U.S. must be looked at with its lower graduation rate. *The Guardian*, *12*(1), 133–141.

Noel, L., Levitz, R., & Saluri, D. (1985). *Increasing student retention.* San Francisco: Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (1991). *How college affects students: Findings and insights from twenty years of research.* San Francisco: Jossey-Bass.

Peel, M. (2000). Nobody cares: The challenge of isolation in school to university transition. *Journal of Institutional Research, 9*(1), 22-43.

Pelletier, R., & Normore, A. H. (2007). The predictive power of homework assignments on student achievement in mathematics. In S. M. Nielsen & M. S. Plakhotnik (Eds), *Proceedings of the sixth annual college of education research conference: Urban and international education section* (pp. 84-89). Miami, FL: Florida International Unviersity.

Pomfret, J. E. (1975). Colonial colleges. *Pennsylvania Gazzette*, pp. 1-26.

Portch, S. (1994). *Access to academic excellence: Thirty-four guiding principles for strategic action*. Retrieved September 19, 2002, from http://www.aug.edu/~khswww/pages/ncate/overview.html

Pugh, C. M., & Lowther, S. (2004). *College math performance and last high school math course.* Biloxi, MS: Southern Association for Institutional Research.

Review of mathematics and science education programs. (1983). *Hearing before the Committee on Labor and Human Resources, United States Senate,* 82nd Cong., 1.

Roueche, J. E., & Armes, N. R. (1980). Basic skills education: Point-counterpoint. *Community and Junior College Journal, 50*(6), 21-24.

Rovai, A. (2002). In search of higher persistence rates in distance education online programs. *Internet and Higher Education, 140*, 1-16.

Schumann, S. (1998-1999). *Occupational therapy assistant program self-study for new occupational therapy assistant programs.* Augusta, GA: Augusta Technical College.

Schuster, C., Cronk, R., & Reno, F.W. (1992). Social development during adolescence. In C. S. Schuster & S. S. Ashburn (Eds.), *The process of human development: A holistic life-span approach* (3rd ed., pp. 532-551). Philadelphia: Lippencott.

Seidman, A. (1996). Retention revisited. *College and University, 71*(4), 18-20.

Short, D. J. (1991). *Integrating language and content instruction: Strategies and techniques.* Washington: National Clearinghouse for Bilingual Education.

Simpson, O. (2003). *Student retention in online, open, and distance learning*. Sterling, VA: Kogan Page Publishers.

Smith, C. L., & Edmunds, N. A. (1995). *The vocational instructor's survival guide.* Alexandria, VA: American Vocational Association.

Smith, G. (2002). Survivor-college style. *Career World, 30*(6), 29–31.

Sonnert, G., & Holton, G. (1995). *Who succeeds in science?: The gender dimension*. New Brunswick, NJ: Rutgers University Press.

Southern Regional Education Board. (2007). Top 10 ways to improve science achievement: Action for school principles, assistant principles, department chairs, and school improvement consultants. *High Schools That Work, 30*(1), 1-6.

Stock, J. H., & Watson, M. W. (2007). *Introduction to econometrics*. Old Tappan, NJ: Pearson Education.

Sweet, A. P. (1997). Teacher perceptions of student motivation and the relation to literacy learning. In J. T. Guthrie & A. Wigfield (Eds.), *Reading engagement: Motivating readers through integrated instruction* (pp. 86-101). Newark, DE: International Reading Association.

Terenzini, P. T., Springer, L., Yeager, P., Pascarella, E. T., & Nora, A. (1996). First-generation college students: Characteristics, experiences, and cognitive development. *Research in Higher Education, 37*, 1-22.

The 1994 Strategic Plan of the Board of Regents of the University System of Georgia. (1994). Retrieved September 13, 2002, from http://usg.edu/admin/oc/directives/mission.html

The University System of Georgia Pre-School-College (P-16) Policy Directive (1991). Retrieved September 13, 2002, from http://usg.edu/admin/oc/directives/precol.html

Thut, L. N. (1957). *The story of education: Philosophical and historical foundations.* New York: McGraw-Hill.

Thirty-four Guiding Principles for Strategic Action. (1994). Retrieved September 13, 2002, from http://usg.edu/admin/oc/directives/facdev.html

Tinto, V. (1982). Limits of theory and practice in student attrition. *Journal of Higher Education, 53*(6), 687-700.

Tinto, V. (1997). Classrooms as communities: Exploring the educational character of student persistence. *Journal of Higher Education, 68*(6), 599-623.

U.S. Department of Education. (2009). Site gives information to students regarding available loans for college from the Federal government. Retrieved January 15, 2009, from http://www.studentaid.ed.gov/

Weidman, J. (1989). Undergraduate socialization: A conceptual approach. In J. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 5, pp. 289-232). New York City, NY: Agathon.

White, S. (2006). Adults with basic and below basic literacy levels: *Findings from the 2003 National assessment of adult literacy (NAAL).* Retrieved September 7, 2006, from http://nces.ed.gov/naal/

APPENDIX A

LETTER OF PERMISSION TO COLLECT DATA FROM

AUGUSTA TECHNICAL COLLEGE

AUGUSTA
TECHNICAL
COLLEGE
ESTABLISHED 1961

3200 Augusta Tech Drive
Augusta, Ga. 30906
706 771- 4000 tel.
706 771-4016 fax
www.augustatec.ga.us

To:
Mr. John Richardson Dean, Student Services

Mr. Brian Roberts
Director, Admissions and Counseling Services

From: Terry Elam
President, Augusta Technical College

Re: Doctoral research needs for Cindy Loar

Date 6/17/08

Please allow Cindy Loar access to student record information for all students entering health professions fields of study as part of her Doctoral research. She will need all transcript information and end-of-quarter grade information for all students who have taken, are taking, or will be taking BIO 193 since the inception of the OTA program at Augusta Technical College.. Please assist her as you are able. Understand that Ms. Loar will keep all student information confidential, and will assign a number to students in order to afford the anonymity to her University of Georgia Graduate Committee.

Cc: Cindy Loar

APPENDIX B

REQUIRED COURSE SEQUENCE FOR THE

OCCUPATIONAL THERAPY ASSISTANT PROGRAM

AUGUSTA TECHNICAL COLLEGE
ESTABLISHED 1961

Occupational Therapy Assistant
Associate of Applied Science

PROGRAM ACCEPTANCE:

Augusta Campus – Fall Quarter (October). Prospective students must complete BIO 193, BIO 194, ENG 191, SOC 191, AHS 109, MAT 190 or 191, and HUM 191 or its equivalent prior to program admission.

Program Description:

The occupational therapy assistant curriculum prepares students to provide services to individuals whose abilities to perform day-to-day activities are impaired by developmental deficits, the aging process, or physical and/or psycho-social disabilities. The program includes off-campus fieldwork in health care facilities. Successful completion of course work allows the student to sit for the National Certification Examination for Occupational Therapy Assistants. This is a 9 quarter program of study. The program is fully accredited by The Accreditation Council for Occupational Therapy Education (ACOTE), 4720 Montgomery Lane Bethesda, MD 20824-1220, **Telephone:** 301-652-2682, **TDD**: 1-800-377-8555, **Fax:** 301-652-7711

Program Objective:

The objective of the occupational therapy assistant program is to train occupational therapy assistants, under the direction of the occupational therapist, to screen and evaluate individuals, then plan and implement interventions for them to develop, maintain, or regain independence.

Employment Opportunities:

Occupational therapy assistants work in inpatient and outpatient hospitals and rehabilitation centers, transitional care facilities, prisons, home health care, nursing homes, industry, halfway houses, group homes, assisted living facilities, schools, sheltered workshops, community mental health centers, day care or early intervention centers, hospice programs, and wellness/fitness centers.

For information about the program please contact:

Program Or Courses	*Admission*	*Financial Aid*
Gwen Taylor, Dean Allied Health and Nursing 706-771-4175 gtaylor@augustatech.edu Cindy Loar, MHS, OTR/L OTA Program Director 706-771-4188 cloar@augustatech.edu	*Procedures* Mr. Brian Roberts, Director Admission Office 706-771-4028 bcrobert@augustatech.edu	Ms. Beverly Smyre-Hines Financial Aid Office 706-771-4156 bsmyre@augustatech.edu

Rev. 10/08

Sequence of Courses for Occupational Therapy Assistant Program

Total Credit Hours for Graduation: **135**

FALL (October)

BIO 193 Anatomy and Physiology	5
ENG 191 Composition and Rhetoric I	5
AHS 109 Medical Terminology	3
SOC 191 Introduction to Sociology	5

WINTER (January)

BIO 194 Anatomy and Physiology II	5
HUM 191 Introduction to Humanities	5
MAT 190 Mathematical Modeling	5
OR	
MAT 191 College Algebra	5

SPRING (March)

PSY 191 Introduction to Psychology	5
OTA 101 Introduction to OT	3
OTA 104 Conditions of OT	5
OTA 105 Analysis of Human Movement	6

SUMMER (July)

PSY 201 Abnormal Psychology	5
SCT 100 Introduction to Microcomputers	3
OTA 103 Developmental Tasks	3
OTA 102 Growth and Development	5

FALL (October)		
	ENG 195 Tech. Communications	5
	OR	
	SPC 191 Fundamentals of Speech	5
	OTA 206 Physical Dysfunction	7
	OTA 207 Physical Dysfunction Treatment Methods	3
WINTER (January)		
	OTA 201 Psychosocial Dysfunction	7
	OTA 202 Psychosocial Dysfunction Treatment Methods	3
	OTA 209 Geriatric Issues	5
SPRING (March)		
	OTA 204 Pediatric Issues	5
	OTA 212 Trends and Issues	3
	OTA 213 Therapeutic Adaptations	5
SUMMER (July)		
	OTA 221 Level II Fieldwork	12
FALL (September)		
	OTA 222 Level II Fieldwork	12