

ABSTRACT

Title of Dissertation:

**A COMPARATIVE STUDY OF
COGNITIVE AND NON-COGNITIVE
FACTORS RELATIONSHIP TO
ACADEMIC SUCCESS FOR FOREIGN
MASTER'S STUDENTS**

Lisa A. Stephenson, Doctor of Philosophy, 2004

Dissertation Directed By:

**Dr. Frank Schmidlein, Associate Professor of
Higher Education (Emeritus)**

This study examined ways to improve the predictability of academic success in the selection and admission procedures for foreign students, compared to U.S. citizens and permanent residents. The population consisted of students who enrolled in master's degree programs in the fall semesters of 1995, 1996 and 1997 at the University of Maryland, College Park. Of the 3,275 students, 595 were considered to be foreign students, 118 were permanent residents and 2,544 were U.S. citizens. The study examined literature dealing with academic success to determine the degree to which selected cognitive and noncognitive variables were related to academic success for foreign students. Ten predictor variables were selected to determine their relationship to four measures of academic success. The measures of academic success were graduate grade point average, total number of semesters taken to complete the degree, total number of credits completed by graduation, and the likelihood of completing the master's degree. Data were obtained from the Office of Institutional Research and Planning.

This study did not find a relationship between the GMAT and GRE scores and foreign student academic success. There also appeared to be no significant relationship between TOEFL total mean scores and academic success. There was a significant relationship between gender and academic success. Age did not appear to have a significant effect on academic success of foreign students, but there was a relationship between age and academic success for U.S. citizens and permanent residents. A number of differences were found in academic success related to field of study. There appeared to be relationships between students' country of origin and their academic achievement. In addition, a significantly positive effect was found between financial support from the University and academic success. Full-time enrollment also had a positive effect on academic success for permanent residents and U.S. citizens, but no effect on academic success for foreign students. No significant relationship was found between changing majors and academic success.

Additional studies are suggested to confirm the findings, and the research methodology should be expanded to include a qualitative approach to further understand factors contributing to foreign student academic success.

A COMPARATIVE STUDY OF COGNITIVE AND NON-COGNITIVE FACTORS
RELATIONSHIP TO ACADEMIC SUCCESS FOR FOREIGN MASTER'S
STUDENTS

By

Lisa A. Stephenson

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2004

Advisory Committee:

Associate Professor Emeritus Frank A. Schmidlein, Chair
Professor Emeritus Robert O. Berdahl
Professor Gregory R. Hancock
Professor Daniel Fallon
Assistant Research Professor Mark Hugo Lopez
Ms. Valerie Woolston

© Copyright by
Lisa A. Stephenson
2004

ACKNOWLEDGEMENTS

I wish to acknowledge all the members of my dissertation committee, Drs. Schmidlein, Berdahl, Fallon, Lopez, Hancock, and Ms. Woolston. I thank Frank Schmidlein, my advisor, for his constant support and insistence for excellence. I thank Bob Berdahl for helping me get through all my coursework and continual words of encouragement and his belief that I could complete my doctorate. I thank Dan Fallon for reminding me that I needed to finish and his willingness to come from far to hear my defense. I thank Mark Lopez and Greg Hancock for their statistical support and guidance. I was extremely impressed and appreciative of their patience and ability to walk me through the statistically challenging portions of this dissertation. I thank Valerie Woolston for her foreign student expertise and her input. This dissertation would not be what it is if it were not for these people.

I would like to thank Jennifer Hamilton for her data manipulation and statistical consulting. There is no way I could have gotten through the statistics if it wasn't for her assistance! Thank you, Jen! I would also like to thank Angela Hamlin of Institutional Research at the University of Maryland. Even when she thought she was done gathering data for me, she gathered her patience and spent her personal time, "just getting a few more variables."

I would like to thank the most important person in my life, Don Graves, who met me at the point where I was in the middle of the dissertation, and who has stuck by me throughout. He has provided me with the love, support and laughter I so very needed during this process. Without him, and our two dogs, Laura and Hokie, none of this would

have been worth what it is today. The joy they give me has given me the will to keep working on this until it was finished!

I also want to thank my friends and co-workers, especially Suzanne Lofhjelm, Tammy Wiles, Paul Binkley, Julie Nelson, Emily Waechter, Regina McCarthy, Barbara Miller, Jim Fry, and all other members of the Elliott School of International Affairs. I know this hasn't been easy for you!

And last, but definitely not least, I would like to thank my family. My mother, father, sister, brother, and all my other relatives who have made me feel special and believed in me when I had difficulty believing in myself. Your support and love means the world to me!

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	viii
CHAPTER 1. PURPOSE OF THE STUDY	1
Problem Statement	1
Importance of the Study	4
Research Questions	9
Background on Foreign Graduate Student Admissions	9
Academic Credentials	11
English Language Ability	11
Aptitude Tests	12
Noncognitive Factors Considered	15
Dissertation Outline	16
CHAPTER 2. LITERATURE REVIEW	17
Research Related to Growth and Impact of Educational Interchanges	17
Research Related to Foreign Students on United States Campuses	21
Research Related to Admissions of Foreign Graduate Students	24
Research Related to Independent Variables	25
Test of English as a Foreign Language (TOEFL)	25
Research Related to Aptitude Tests and Academic Success of Foreign Students	31
The Graduate Record Examination (GRE)	32
The Graduate Management Aptitude Test (GMAT)	35
The Relationship of Noncognitive Factors to Academic Success	38
Gender and Academic Success	38
Age and Academic Success	41
Academic Field and Academic Success	43
Country of Citizenship and Academic Success	45
Source of Financial Support	46
Summary of Literature Review	48
CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY	51
Design of the Study	51
Purpose of the Study	51
Theoretical Framework	51
Research Questions	52
Sources of Data	54
Methodology	56
Population	56
Nature of Student Sample	56
Data Collection	58
Organization and Administration of the Data	58
Data Analysis Methods	60
Protection of Subjects	62
Limitations of the Study Design and Methodology	63

CHAPTER 4. FINDINGS FROM THE DATA ANALYSIS.....	65
Participants.....	65
Analysis of Cognitive and Noncognitive Characteristics	66
Cognitive Characteristics	66
Noncognitive Characteristics	71
Summary of Cognitive and Noncognitive Characteristics.....	82
Analysis of Differences Between U.S. Citizens, Foreign Students, and Permanent Residents	84
Analysis of Differences in Final GPA	85
Analysis of Differences in Number of Credits Completed.....	85
Analysis of Differences in Number of Semesters.....	86
Summary of Analysis of Variance and Differences Between Means.....	86
Analysis of Cognitive and Noncognitive Factors in Predicting Academic Success....	87
Summary of the Analysis of Cognitive and Noncognitive Factors in Predicting Academic Success.....	117
CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS	126
Overview of the Study	126
Conclusions.....	127
Cognitive Variables and Academic Success.....	128
GRE- or GMAT-Verbal Percentile and Academic Success.....	128
GRE- or GMAT-Quantitative Percentile and Academic Success	129
TOEFL Total Mean Score and Academic Success.....	131
Noncognitive Variables and Academic Success	132
Gender and Academic Success	132
Age and Academic Success	134
Academic Field and Academic Success	135
Country of Citizenship and Academic Success	138
Financial Support and Academic Success	139
Full-Time/Part-Time Enrollment and Academic Success	141
Changed Majors and Academic Success	143
Recommendations for Future Research.....	144
Concluding Statement.....	148
REFERENCES	150

LIST OF TABLES

Table 1	Comparison of Verbal Percentile Mean Score for Completers and Non-Completers	66
Table 2	Comparison of Quantitative Percentile Mean Score for Completers and Non-Completers	68
Table 3	Comparison of TOEFL Total Mean Scores for Completers and Non-Completers	70
Table 4	Comparison of Mean Age for Completers and Non-Completers	72
Table 5	Comparison of Gender for Completers and Non-Completers	73
Table 6	Comparison of Country of Citizennships for Completers and Non-Completers	75
Table 7	Comparison of Financial Support From the University for Completers and Non-Completers	77
Table 8	Comparison of Full-Time or Part-Time Enrollment for Completers and Non-Completers	78
Table 9	Comparison of Whether or Not Students Changed Majors for Completers and Non-Completers.....	79
Table 10	Comparison of Academic Field for Completers and Non-Completers.....	81
Table 11	The Effects of Predictor Variables on Final GPA of Degree Completers	88
Table 12	The Effects of Predictor Variables on Final GPA of U.S. Citizen Degree Completers	90
Table 13	The Effects of Predictor Variables on Final GPA of Foreign Student Degree Completers.....	91
Table 14	The Effects of Predictor Variables on Final GPA of Permanent Resident Degree Completers.....	92
Table 15	The Effects of Predictor Variables on Total Number of Semesters	

	Taken to Complete the Degree	94
Table 16	The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by U.S. Citizens	96
Table 17	The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by Foreign Students	98
Table 18	The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by Permanent Residents.....	99
Table 19	The Effects of Predictor Variables on Total Number of Credits Completed.....	101
Table 20	The Effects of Predictor Variables on Total Number of Credits Completed at Graduation by U.S. Citizens	103
Table 21	The Effects of Predictor Variables on Total Number of Credits Completed at Graduation by Foreign Students	104
Table 22	The Effects of Predictor Variables on Total Number of Credits Completed at Graduation by Permanent Residents	106
Table 23	Analysis of Maximum Likelihood Estimates for Completing the Degree	109
Table 24	Predictive Odds Ratio Estimates for Completing the Degree.....	110
Table 25	Analysis of Maximum Likelihood Estimates for U.S. Citizens Completing the Degree	111
Table 26	Predictive Odds Ratio Estimates for Completing the Degree by U.S. Citizens	112
Table 27	Analysis of Maximum Likelihood Estimates for Completing the Degree by Foreign Students.....	113
Table 28	Predictive Odds Ratio Estimates for Completing the Degree by Foreign Students	114
Table 29	Analysis of Maximum Likelihood Estimates for Completing the Degree by Permanent Residents	115
Table 30	Predictive Odds Ratio Estimates for Permanent Residents	116

LIST OF FIGURES

Figure 1	Research questions for foreign graduate students.....	55
----------	---	----

CHAPTER 1

PURPOSE OF THE STUDY

This study sought to answer the general question: “To what extent are selected cognitive and noncognitive characteristics of foreign graduate students, compared to students who are United States citizens and students who are permanent residents, related to their academic achievement in master’s degree programs?”

Problem Statement

Universities and colleges in the United States typically are international institutions and have welcomed individuals from many nations to study and teach. As of 2000, the United States was the largest “host” country, with more than 514,000 foreign students (IIE, 2000). Foreign students are making, and will continue to make, a significant political, cultural, and economic impact upon United States higher education. According to *Open Doors: 1999/2000* (IIE, 2000), foreign students represented about 2.7% of all four-year undergraduate enrollments and 12% of graduate enrollments (p. 3).

In many leading institutions in the United States, foreign graduate students make up a significant percentage of the enrollments. In 1982–1983, there were 110,110 foreign graduate students studying in the United States. In 1983–1984, their number increased to 118,820 and, as of 1995–1996, there were 191,738 foreign students enrolled in graduate programs in the United States. As of 1999/2000, the number of foreign graduate students studying in the United States had increased to the largest number yet of 225,383 (IIE, 1986; IIE, 1996; IIE, 1998; IIE, 2000). In certain academic disciplines in the United States, foreign graduate students make a significant impact. For example, in the sciences and engineering areas, foreign graduate students made up more than 30% of the

enrollment at each of 18 universities at which they were most numerous in 1984 (National Science Foundation, 1985).

In the United States, foreign students are among the most noticeable examples of the internationalism of higher education and are a critical element in transporting knowledge internationally (Altbach, 1985). They are the “carriers” of knowledge between countries and people. Foreign students learn skills abroad and take them home. They also perform some very important roles during their time in the United States. They frequently constitute a key group of researchers and teachers for United States universities in their capacities as research and teaching assistants. The majority of the world’s foreign students are from developing nations, and they study in the advanced industrialized nations (IIE, 2000). Therefore, the enrollment and academic success of these students in United States higher education institutions has become an important issue in today’s world.

Because of this substantial presence of foreign students in United States graduate programs, the question of the obligation of United States graduate education to fulfill the special needs of foreign graduate students has become an issue. The Council of Graduate Schools in the United States (1980) stated that two different orientations are evident. Some educators believe that all students should be treated alike and no allowances should be made for students who come from different cultures and who speak English as a second language. These educators believe that “all students, American and foreign, are viewed alike and their immediate or ultimate needs are irrelevant” (p. 3). The opposing viewpoint is:

Graduate education is responsible for meeting the needs of its constituents and

programs should change in response to those needs. In this view, the job market or the needs of developing countries become prime considerations, and persuasive arguments can be advanced for the design of specialized programs for foreign students or American students, or any other constituency. In this case, the responsibility for translation to different systems rests with the program (p. 3). Educators who adhere to the first position would have foreign graduate students compete in all ways with their American peers while educators who follow the second position stress the importance of fostering graduate educational programs which are relevant and responsive to foreign students' needs.

Foreign students enrolled in graduate programs have always made up the largest portion of the total foreign student population in the United States. Walton (1971) stated:

Policy planners and administrators have tended to favor graduate over undergraduate students for many years... Emphasis on graduate level study coincided with emphasis on economic development as a goal of foreign student exchange. The major reasons cited for preferring graduates were that they were more likely to contribute to the economic growth of their home countries. They were less likely to remain permanently in the United States (since they were not as readily alienated as younger students), and that all students were better off if they completed the education offered at home before going abroad (p. 18).

Given the number of foreign graduate students currently studying in the United States, and the impact they are making both on the United States and other countries throughout the world, it is very important that colleges and universities enrolling foreign

students continuously evaluate their admissions process in order to assess their academic role and to ensure the academic success of these students.

This study used literature that focused on academic success to determine the degree to which selected cognitive and noncognitive variables, connected with foreign students' applications for admission to graduate schools in the United States, affect their later academic achievement at a large public eastern university. The foreign students were also compared to United States citizens and permanent residents to determine how foreign students are doing relative to the U.S. citizens and permanent residents.

The study was conducted at the University of Maryland, College Park, a large (total enrollment of 32,800) public Research I university. The population was students who enrolled in master's degree programs in fall 1995, 1996, and 1997, a total of 3,257. The number of U.S. citizens was 2,455 (78%), the number of foreign students was 595 (18.27%) and the number of permanent residents was 118 (3.62%). Measures of academic success were determined to be cumulative graduate GPA, number of credits earned at the time of graduation, total number of semesters it took to complete the degree, and whether or not the students completed their degree program by 2001. The year 2001 was chosen because this was when the data collection was completed, and the year 2001 gave all graduate students at least 3 years to complete their master's degree. Comparisons were also made between those students who completed the degree and those who did not.

Importance of the Study

The United States has an abundance and variety of educational resources that surpass those of many other countries, especially the developing nations. Given the educational needs in many countries and the resources in the United States, the United

States has the ability and “even a responsibility to serve in some ways as the education broker of the world” (Kaplan, 1983, p. 267).

There are multiple reasons why this role is both feasible and desirable for the United States. A primary reason is the need for foreign students to acquire technological knowledge not available in the universities in their home countries, as well as the inability of those universities to accommodate the many qualified candidates (Altbach, 1997b). The United States educational system is geared toward educating and training students in very sophisticated highly developed technology. Numerous other nations view such training as applicable and essential for the development of their countries and for developing the technology needed for modernization. Therefore, many of these countries encourage their students to further their education in the United States.

Another reason for the U.S. to offer graduate education to foreign students is to strengthen relationships between different nations. The cordial relations between the United States and some developing nations are to a certain extent related to the fact that individuals trained in the United States hold key positions in those countries (Kaplan, 1983). In addition, ties between returned foreign students, their former institutions, and their faculty members also constitute an important element in future United States relations with developing nations. Foreign students and scholars sometimes join the scientific community of the United States by remaining after completing their studies. In a much larger number of instances, they return home with the knowledge they have gained from their U.S. education and take up academic and research positions, often raising to positions of authority—in part because of their foreign qualifications.

A third reason is that academic institutions, by their very nature and structure, have the ability to do things that governments cannot do (Kaplan, 1983, p. 269). Academic institutions can become the vehicles for international cooperation, communication, and understanding because they are not constrained in the same ways that governments are and thus are not limited by political considerations.

One more major argument can be made: The United States is at a stage of development where its most viable product is service (Kaplan, 1983, p. 269; IIE, 1996). Although the United States continues to purchase and sell goods of all sorts in the international market, it is also interested in selling services. Therefore, at this stage in its economic and scientific development, the United States now finds it cost-effective to pursue scientific discovery and technological invention and to encourage mass production of technological innovations in societies with more labor-intensive economies. It is advantageous for the United States to become a producer and marketer of ideas and services rather than of products (Kaplan, 1983). One of the services the United States is already prepared to offer is education (p. 270). The United States is the leading exporter of educational services in the world. According to Open Doors: 1999/2000 (IIE, 2000), international education contributed over \$12.3 billion to the United States economy in the form of tuition, room, board, and other miscellaneous expenses.

Goodwin and Nacho (1983) summarized some of the reasons foreign students study in the United States:

International students came to study in the United States for various reasons: the quality of particular United States institutions, programs, and professors; the prestige of a United States degree in a foreign student's home country; the fact

that friends, relatives, or professional colleagues had studied in the United States; the desire for a “back door” entrance to the United States citizenship; and several others (p. 38).

Although there have been foreign students in the United States for many years, it was not until the 1980s that the number of foreign graduate students in the United States was significant and substantial enough to attract the attention of many administrators in higher educational institutions. Many institutions had established their own requirements for accepting foreign students to graduate programs. These requirements sometimes were established without any supporting studies or criteria. In the United States, there was no specific national policy or model foreign student program for all universities or colleges.

As Goodwin and Nacho (1983) noted,

A committee of the American Council on Education (ACE) observed that, “policies in the United States universities and colleges concerning the admissions, education, and social accommodation of foreign students vary from the comprehensive to the nonexistent; and programs, from the carefully designed and well administered to the ad hoc and expedient.”

The committee concluded, “Institutions that seek to serve foreign students should formulate sound policies to guide administrators, faculty, and students toward a constructive and productive relationship with and for foreign students. Such a formulation should include commitment to a program of self-regulation and self-study.” Moreover “Institutions should encourage faculty interest in, and attention to, international education, for faculty support and participation are vital to creating a receptive climate for foreign students” (p. iii).

Many universities have only a limited understanding of foreign students. As a result, they are not well prepared to accommodate foreign students, and foreign students may feel discriminated against because of nationality and religion (Sabine, 1975). In addition, foreign students' advisors consistently have perceived foreign students as having a greater degree of difficulty than United States students (Von Dorpowski, 1977).

To generate more understanding among administrators and faculty members towards foreign students, the study of foreign students in relationship to the specific institutions that they attend has been recommended. Waller (1964) suggested that it is important to study each institution individually because every institution has its own characteristics. Thus, the adoption of admissions policies suitable for a particular college should be made on the basis of individual college studies and institutional goals.

The academic success of foreign students is a complex issue for institutions of higher education. However, if specific personal and academic factors can be identified that directly affect the academic success of foreign graduate students, then institutional policies can be designed to address these factors. The creation of the right policies in admission for foreign graduate students is critical and should be precisely examined at each institution (Homan, 1973; Strommen, 1981). This study's findings could help to construct selection and admission policies appropriate for foreign graduate students and their academic success at the University of Maryland, College Park. In addition, it may also suggest factors other institutions might consider.

Research Questions

The major question that guided this study was: What characteristics of foreign graduate students, both cognitive and noncognitive, are related to and can be used to predict academic achievement as compared to U.S. citizens and permanent residents?

In addition, there were four specific questions on which the researcher focused:

Question One: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by graduate grade point average at the time of degree completion (FINLGPA)?

Question Two: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how long (the number of semesters) it took them to complete the degree?

Question Three: What cognitive and noncognitive characteristics were significantly related to and can predict academic achievement of these students as measured by how many credits the student completed at the time of graduation?

Question Four: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by whether or not they completed the degree (RECDMA)?

Background on Foreign Graduate Student Admissions

In U.S. universities and colleges, graduate student admissions are fundamentally decentralized, regardless of administrative organization. Quoting from the Council of Graduate Schools publication, *An Essential Guide to Graduate Admission*,

Graduate admissions policies follow a Federalist model: the graduate school defines the baseline academic admission standards and may set goals for the

desired general population mix of the graduate student body, while the individual programs may refine and strengthen these requirements to assure the entry of students who demonstrate the promise of completing their chosen educational programs successfully, and, indeed, with distinction (cited in the Milwaukee Symposium, 1997, p. 2).

As can be gleaned from this statement, college and university admission decisions are usually made based on selecting the best of those who might succeed academically (Stoyhoff, 1990).

Admissions requirements are what a student must do, or show, to qualify for admission. The most common purpose of admissions requirements is to assure the entry of students who have the capability, or promise, of completing their chosen educational program successfully. For moral, educational, and legal reasons, all higher education institutions should be able to justify their selection of requirements for admission—for example, relating the requirement to some criterion of success. Most commonly, the student's college grade point average and aptitude test scores have been used to predict academic success (Quann & Assoc., 1979). These criteria have been criticized as too narrow and momentary, and this criticism has been combined with a request for more long-range criteria, such as job success or community service. However, these are difficult to define and even more difficult to determine. Since grades do measure and control student progress and, ultimately, completion of the college program, they are, therefore, valid indicators of success in college (Quann & Assoc.). However, foreign graduate students who did not enroll in undergraduate studies in the United States usually

come from a completely different grading system. Therefore, it can be difficult to determine and compare foreign student's undergraduate grade point average.

There are three academic factors usually considered with foreign student admissions: (1) academic credentials, (2) English language ability, and (3) aptitude tests.

Academic Credentials

The evaluation of foreign educational credentials is in essence a matter of interpretation, entailing a complex and sensitive process (Haas, 1979). The foreign student admissions officer in a United States institution must acquire the primary resource materials and make contact with centers that specialize in the field of credentials evaluation. Fortunately, a great deal of work has been done in this field, and experts familiar with educational developments in different countries are constantly updating information across the world (Patrick, 1983). The Association of International Educators (known as NAFSA) and the American Association of Collegiate Registrars and Admissions Officers (AACRO) have produced a sizable library of information on the evaluation of foreign educational credentials.

English Language Ability

Numerous attempts to predict the academic success of foreign students have focused on the relationship between English-language proficiency and students' academic achievement. It is very important to determine the foreign candidates' English language ability, because even the best students cannot be expected to do well if they are unable to understand the lectures, answer questions, or write assignments. Furthermore, language problems can slow down lectures and disrupt classes, thus affecting native English-speaking students in the class (Meloni, 1986).

There are a variety of ways to determine a student's English language ability. One method is through standardized testing, the most common of which is the Test of English as a Foreign Language (TOEFL), which is written and distributed by the Educational Testing Service (ETS). The TOEFL is administered at test centers all over the world on dates specified annually by ETS. Most graduate schools in the United States require applicants to demonstrate proficiency in the English language through taking the TOEFL. A minimum score frequently is established and, along with other admissions factors, may qualify a foreign student for full admission into a graduate school. At the University of Maryland, College Park, for example, a score of 575 on the paper based test or 233 and above (with no sectional score below 50) on the computer based test (CBT) may qualify an applicant for full admission for graduate studies. The paper based TOEFL test is scaled from 200 to 677.

Aptitude Tests

As the TOEFL is specifically designed to measure English-language ability and not academic aptitude, foreign students applying to the majority of the graduate programs in the United States also are requested to submit official scores on an aptitude test. The Graduate Record Examination (GRE) is the most commonly required test (Thronel & McCoy, 1985). Foreign students applying to graduate management schools located in the United States are not required to take the GRE, but instead must take the Graduate Management Admission Test (GMAT). Similar to the GRE scores, GMAT scores are often used in conjunction with other variables in predicting students' future academic performance.

Admissions or fellowship panels generally use GRE and/or GMAT scores to supplement undergraduate records and other criteria for graduate study. The majority of the master's programs in the United States require students, both foreign and United States citizens, to take either the GRE or GMAT aptitude tests as part of the application process (ETS, 1996a). Such widespread usage of the GRE and GMAT is presumably based on the belief that these tests are valid predictors of academic success in graduate school (Willingham, 1976). However, differences in linguistic, cultural, and educational background between United States and foreign examinees, and between examinees from different countries, complicate the interpretation of scores presented by foreign applicants, especially those for whom English is not their native language (Wilson, 1982). The GRE and GMAT aptitude tests are oriented to citizens of the United States, the majority of whom share a common acculturation in the sense of having been born, raised, and formally schooled in the United States with English as their primary language.

As a result of validation studies conducted by ETS, educational institutions, and individual researchers, the GRE Board has recommended that institutions using the GRE and GMAT aptitude tests for selection purposes should conduct local validation studies to establish separate norms for minority groups, including foreign students (Willingham, 1976). Many of the schools that attract large numbers of foreign students have not conducted such validation studies and, therefore, lack data that would allow them to establish different policies or standards for foreign students (ETS, 1997). In the absence of information related to the nature and extent of differences, foreign students are directly compared with U.S. citizens and thus subjected to a biased selection procedure.

As indicated in the *TOEFL Test and Score Manual* (ETS, 1978b), interpreting the relationship between TOEFL scores and scores on other verbal aptitude and achievement tests (such as the GRE and GMAT) can be complicated. Conventional interpretations of admission test scores may be misleading for foreign students because foreign graduate students have generally lower proficiency in English than native speakers, and there is a variety of cultural and international differences among foreign candidates (Powers, 1980). Because the purpose of the TOEFL is different from that of admissions tests that measure aptitude for academic study, its characteristics are different from those of other tests used in the admissions process (Powers, 1980). While the TOEFL is an English-language proficiency test that is designed for, and normed on, non-native speakers, the GRE and GMAT are general aptitude or ability tests designed to predict future academic performance and contain verbal, quantitative, and qualitative components (Powers, 1980).

A considerable amount of importance is placed on the GRE, GMAT, and TOEFL scores in the admission of foreign students to graduate programs. University officials need to conduct institutional assessments of these tests and how they relate to the academic success of foreign students at their particular institution. Therefore, a major objective of this study is to investigate how GRE, GMAT, and TOEFL scores related to foreign students' academic success, compared to U.S. citizens and permanent residents, as measured by graduate grade point average (GGPA) at the time of graduation, the number of credits earned at the time of graduation, how many semesters it took the students to complete their degree, and whether or not the students completed their degree by 2001.

Even though the TOEFL, GRE, and GMAT tests are widely used and carefully researched, serious questions have been raised regarding their ability to predict foreign students' academic achievement. In particular, it has been noted that prediction studies using these tests do not consider various factors, such as noncognitive variables, which have important effects on the academic achievement of foreign students, and which are not measured by the TOEFL, GMAT, and GRE (Boyer & Sedlacek, 1988; Chai & Woehlke, 1979; Graham, 1987; Ho & Spinks, 1985; Light, Xu, & Mossop, 1987). This researcher therefore attempted to look at some of the noncognitive characteristics, in addition to the cognitive variables mentioned above, that may relate to the academic success of foreign students relative to students with U.S. citizenship and permanent residency.

Noncognitive Factors Considered

There are indications of noncognitive reasons why foreign students do not succeed academically despite having scored well on cognitive measurements and instruments. Conversely, there are indications of noncognitive reasons why foreign students who have not scored well on cognitive measurements and instruments still succeed academically. While the majority of the research on foreign student academic achievement has been based on cognitive predictive factors, a number of the researchers have found a relationship between foreign student academic success and noncognitive variables, such as gender and country of origin. However, research in the area of the effect of noncognitive elements on foreign students' academic achievement has been limited.

While all variables that are not cognitive or academic in nature could be considered noncognitive, researchers have generally studied socioeconomic background and biographical variables in their research on noncognitive factors that affect success. For the purposes of this study, seven variables (age, gender, academic major in graduate school, country of citizenship, full-time or part-time attendance, whether or not the student changed majors, and the presence or absence of financial support from the university) were selected for investigation. These variables were chosen for having been included in previous research and because of their relevancy to the purpose of this study.

Dissertation Outline

Chapter 2 provides a review of literature related to the growth and impact of educational interchanges, foreign students on United States campuses, admissions of foreign graduate students, and each variable (cognitive and noncognitive) examined in the study. Chapter 3 describes the research design and methodology and includes the purpose, structure, and rationale of the study; sources of data; and the method of analysis. Chapter 4 describes the findings from the data analysis and answers the research questions. Chapter 5 contains a description of the findings, as well as implications and recommendations for policy and future research.

CHAPTER 2

LITERATURE REVIEW

This chapter presents an overview of admissions and academic success of foreign students as well as a review of literature pertaining to the independent variables used in this study. The information gained from these specific areas of research provided theoretical insights and identified variables important in the design of the present study.

Research Related to Growth and Impact of Educational Interchanges

A large body of information exists on the subject of foreign students and educational interchange. As early as 1925, *The Foreign Student in America* (Wheeler, King, & Davidson) summarized the history of student migration and of the early foreign student population in the United States. More current information about the global foreign student enrollment and the current situation in the major host countries may be found in the UNESCO *Statistical Year Books*. These books contain studies made by various organizations (such as the United Kingdom on Overseas Student Affairs in Great Britain and the German Academic Exchange Service) and reports from various conferences on higher education reform sponsored by the Institute of International Education (IIE). Early insights into the experience of foreign students in the United States were reported in *Foreign Students and Higher Education in the United States* (Du Bois, 1965), while a later catalogue of research on foreign students in this country was provided in *The World's Students in the United States* (Spaulding & Flack, 1976). The statistics on foreign students enrolled in United States colleges and universities are presented and interpreted in the annual census *Open Doors*, produced each year by the IIE. In addition, there are commentaries, studies, and guidelines published by NAFSA:

Association of International Educators since its establishment in 1948. The many characteristics of worldwide higher education are recorded in *The International Encyclopedia of Higher Education*, first published by Knowles in 1977, which also includes a comprehensive account of international exchange.

Community and national interest in foreign students began as early as 1911, when the Committee on Friendly Relations Among Foreign Students was organized under the auspices of the YMCA and YWCA for the benefit of students from other countries studying in the United States. In 1919, the Institution of International Education (IIE) was established as a national organization concerned with student migration to and from the United States. Educational associations, such as the American Council on Education (ACE) and the Association of American Colleges (AAC), also were taking an increasing interest in the foreign students enrolled at their member institutions and in the newly developing exchange programs. These organizations continue to take an active role in the search for new and better ways of managing exchange activity, and the major national educational associations also devote considerable attention to this field. Additionally, private philanthropy made an early contribution when the first of the now famous International Houses, built through the generosity of Mr. and Mrs. John D. Rockefeller, Jr., was opened in New York in 1924.

On the national level, a significant number of organizations and associations are now involved in educational exchange either directly, through the administration of programs and services, or indirectly, by participation in the deliberations regarding policies and practices. For example, the American Association of Collegiate Registrars and Admissions Officers (AACRAO), the College Entrance Examination Board (CEEB;

more commonly known as the College Board), the Institute of International Education (IIE), and NAFSA: Association of International Educators together form the organization known as the National Liaison Committee on Foreign Student Admission (NLC).

AACRAO is a nonprofit, voluntary, professional association of more than 9,400 higher education administrators who represent nearly 2,500 institutions and agencies in 28 countries around the world. Its mission is to provide leadership in developing and implementing policy in the global educational community. The College Board is a national, nonprofit membership association dedicated to preparing, inspiring, and connecting students to college and opportunity. The IIE, which forges partnerships between the public and private sectors to design and implement international programs and to provide technical assistance in all countries and all fields, administers 240 programs through which almost 18,000 men and women from 170 nations benefit annually. NAFSA promotes the exchange of students and scholars to and from the United States. Its members share the belief that international educational exchange advances learning and scholarship, builds respect among different peoples, and encourages constructive leadership in a global community. The NLC has been responsible for the development of various programs in the field and is an example of public and private cooperation: The various activities are designed and operated by the NLC while the United States Information Agency provides the funding.

Jenkins (1983a) attributed two major factors to the growth of international educational exchanges. The first was the breakdown of cultural barriers that once isolated educational development and prevented the migration of students within their respective countries (p. 8). The second notable change was the persistent acceleration of the flow of

students in the post–World War II years. Many of these students came from underdeveloped countries in Africa and Asia, while others came from highly industrialized countries, which together accommodate roughly half of the current foreign student population.

Nowhere has the increase in the foreign student population been more apparent than in the United States. In an uninterrupted rising curve which began immediately following World War II, the numbers have leapt from some 15,000 in 1946, to over 30,000 in 1951, reaching 145,000 twenty years later. In 1980–1981, 311,882 foreign students were enrolled in colleges and universities in the United States, and as of 1997–1998 this number had increased to 481,280 (IIE, 1981b, p. 2; IIE, 1998), making the foreign student population in the United States the largest of any country in the world. The number of foreign students attending colleges and universities in the United States increased by 5% in the 1999–2000 academic year, marking a record total of 514,723 students according to *Open Doors: 1999/2000* (IIE, 2000).

In the years since 1941, a third force has contributed to an increase in international exchange: the drive for modernization and the acquisition of new technology. In response to the need for national and economic development and the concern for equal educational opportunity, developing countries have reached out to a wider section of their societies to find the necessary trained labor. Although students from the old and new elite and middle classes still constitute the bulk of the foreign student population, we now find increasing numbers of students from the rural areas and the poorer parts of society (IIE, 1996).

Research Related to Foreign Students on United States Campuses

A review of the distribution of foreign students at United States colleges and universities over the years shows that it has followed a very natural progression (Jenkins, 1983a). Before World War II, there were no extraordinary features in the pattern of enrollment; there was merely a steady, but by comparison with later years not extraordinary, growth. During that period, the noticeable factors influencing the attendance of foreign students at different institutions included personal acquaintances, the recommendations of foreign alumni upon their return to their home countries, the reputation of certain institutions through the activities or writings of faculty, religious affiliation, and the initiative taken by some institutions to enroll students from selected regions or countries of the world (Altbach, 1997b).

The first major development in the pattern of enrollment of foreign students in United States colleges and universities occurred in the 1950s (Jenkins, 1983a). By that time, the involvement of public and private sponsors in foreign student programs and the focus on certain fields of study resulted in a growing concentration of large numbers of foreign students in a relatively small number of institutions. "Half of the foreign student population was concentrated in only forty-seven colleges and universities, each of which reported an enrollment of four hundred or more foreign students" (IIE, 1996, p. 6). In the 1970s, however, this distribution of students began to change:

Foreign students are enrolling in the United States community and junior colleges in record numbers. Students from Third World countries are playing a dominant role in this increase. Community and junior colleges find themselves offering

studies appropriate to many foreign nationals—and many institutions are eager to render these services (Diener, 1977, p. 14).

As a result of the different forces that motivate international educational interchange today, foreign students and scholars are perceived in a variety of roles. During their period of study abroad, they appear to some simply as members of the campus community who happen to be foreign. To others they represent an educational resource for the enhancement of the institution's international educational activities, both on campus and in the community. In the world of commerce and industry, some are seen as the future workforce for international private enterprise. In their home countries, others are identified and awaited as the necessary national resource for economic, social, and political development (Altbach, 1997b).

At the graduate level the number of foreign students coming to the United States has increased steadily over the past 30 years. This increase has exhibited several noteworthy trends. During the last decade, though the countries of origin have varied in ways related to local political and economic conditions, the principal sending countries have been China, Taiwan, India, and South Korea. The students have been predominantly male; the fields chosen for advanced study have been mainly engineering, the sciences, mathematics, and business; and more than 50% of the students have been categorized as master's students (IIE, 1994). Graduate education in the United States, particularly in the fields of business and engineering, is considered to be of high quality and of great practical value in preparing people for careers. In addition, the U.S. system of higher education has enormous capacity, with many colleges and universities offering some form of graduate education.

According to *Open Doors: 1999/2000* (IIE, 2000), when examined by Carnegie Classification, most foreign students were enrolled in Research I universities, Master's I institutions, and community colleges. As of 1999–2000, the 342,986 students enrolled in these institutional types constituted 66.6% of all U.S. international enrollments. While the relatively small number of Research I institutions host the largest single share of foreign students studying in the United States, this country has a major resource in its number and variety of post-secondary institutions as well. Over 2,500 U.S. institutions host foreign students, meeting the diverse needs of this varied population. The international presence varies widely from institution to institution. With some exceptions, the leading institutions tend to be located in major metropolitan areas. As of 2000, New York University was the largest host institution, enrolling more than 4,800 foreign students. The University of Maryland was ranked 12th with 3,233 foreign students as of 1999–2000.

Colleges and universities in the United States have responded to the increased enrollment of foreign graduate students with heightened concern for the general well being of the individual foreign student (Altbach, 1997a). Administrators in United States colleges and universities have made efforts to improve the predictability of academic success in the selection and admission procedures for foreign students. Their efforts have been designed to assure their colleges and universities successful recruitment of foreign students while assuring the individual student of a greater opportunity to complete an academic program.

Research Related to Admissions of Foreign Graduate Students

Application and admission, the basis of any agreement between a student and an institution, assumes a special importance in international educational interchange because the risks are relatively high and the agreement requires a large investment of individual resources and a corresponding commitment on the part of the institution (Patrick, 1983).

In the United States, with its pattern of relative autonomy among the thousands of post-secondary education institutions, the foreign student admissions officer must deal directly with a very diverse collection of applications from across the world (Patrick, 1983).

Some applicants will provide recognizable evidence of academic qualifications; others may include credentials that are much more obscure and hard to evaluate; and many will indicate an obvious inadequacy for admission to any college or university, either abroad or in the applicant's home country.

Not only do admissions officers play a very important role in determining the distribution of foreign students in United States colleges and universities, they also make decisions affecting the personal plans of each individual applicant. In a statement reflecting the importance of these decisions, the 1970 edition of the NAFSA guidelines on responsibilities and standards defined the goal of the admissions process as an effort "to assure, insofar as possible, that foreign students are selected intelligently, placed appropriately, and provided with the bases for potential success" (NAFSA, 1970, p. 6).

The current study focused on what characteristics of foreign graduate students, compared to United States citizens and permanent residents, were related to, and able to predict, academic achievement. Guided by the literature and previous studies, it investigated both cognitive and noncognitive variables.

Research Related to Independent Variables

Test of English as a Foreign Language (TOEFL)

Many studies have professed the importance of English language proficiency for the successful academic performance of foreign students studying in United States colleges and universities. While educators have long recognized the importance of language proficiency as a prerequisite for successful academic performance in any university setting, it is especially true for foreign students attending United States colleges and universities (Dunnett, 1985). As the guideline on *English Language Proficiency* (NAFSA, 1977) notes, “Foreign students studying in colleges and universities in the United States need not only oral communication skills for daily activities but also highly developed listening, speaking, reading, and writing skills for academic purposes” (p. 1). The guideline also observes “proficiency in using the kind of English encountered in the college classroom is vital to students if they are to be successful in reaching their academic goals” (p. 1).

The most commonly used instrument for measuring proficiency is the Test of English as a Foreign Language (TOEFL), sponsored by the College Board and the Graduate Record Examination Board, which is offered by the Educational Testing Service in Princeton, New Jersey and administered in practically every country in the world. The present written format of the TOEFL is divided into three sections: Section I: Listening Comprehension (40 minutes self-paced by the audio recording of stimulus material), Section II: Structure and Written Expression (25 minutes), and Section III: Comprehension and Vocabulary (55 minutes) (ETS, 1997b, pp. 3–6).

Interpretation of the test scores can enable an institution to determine whether admission should be unconditional or subject to further improvement in English proficiency. Recognizing the common usage of TOEFL, the NAFSA guideline on *English Language Proficiency* (1977) provides a general interpretation of the TOEFL scores:

Everyone using TOEFL should be familiar with the *Manual for TOEFL Score Recipients* (now *TOEFL Test and Score Manual*) available from Educational Testing Service. The guidelines given below are not intended to be rigid. For example, a student with a test score slightly below 450 may be admitted if a good semi-intensive program is available, there are English support courses, and his/her other documents indicate that he/she would be a good risk.

Below 450: Admit only to an intensive English program. May give conditional admission.

450–500: Admit only if there is a semi-intensive program available. If none available, refer to a qualified intensive program.

500–550: Admit only if English support programs are available.

550 and above: Admit with no restriction. Exceptions: Graduate students in fields which require near native proficiency—such as journalism, literature, library science, and business administration—should have TOEFL scores of 600 or above (p. 4).

Although using the TOEFL test helps to assess foreign students' English language abilities, a review of the variety of academic prediction studies that have been conducted shows the difficulty of using TOEFL scores to generalize about the relationship of

English proficiency to academic success (Graham, 1987). Further research, which investigates the correlation between TOEFL tests and academic success, is needed.

A number of researchers have concluded that there is little relationship between English-language proficiency and academic success. Hwang and Dizney (1970) found that English language test scores were poor predictors of academic performance. They found no significant correlation between TOEFL scores and the first-term GPA for 63 Chinese graduate students at the University of Oregon ($r = .19$). Most of these students were specializing in areas requiring significant use of English: 21 were in education, 16 were in the social sciences, and 6 were in architecture. Interestingly, Hwang and Dizney found a correlation of .66 between ESL course grades and overall GPA, but this could be because the course grades most likely measured academic skills and nonacademic factors as well as English proficiency (Graham, 1987). Further, the small sample size of 63 makes it difficult to draw valid conclusions from these results. Finally, this study dealt only with Chinese students and therefore it cannot be concluded that students from other countries would have similar results.

Gue and Holdaway (1973) found a statistically significant but not strong correlation between TOEFL and GPA for 123 Thai education majors. These students were tested both before and after a summer language program. The correlation between the summer TOEFL scores and GPA was .49, and between the fall TOEFL scores and GPA the correlation was .59, both significant at the .01 levels. While some researchers might consider these correlations rather strong, Gue and Holdaway concluded that English proficiency was simply not a good predictor because a number of other factors, such as motivation and homesickness, may combine to “offset good language

proficiency, or to overcome initially lower proficiency” (p. 102). Their conclusion is limited in that it deals with a population of only 123 students, all of whom came from the same country and enrolled in programs in the area of education.

While the above studies reached negative conclusions regarding the relationship between English-language proficiency and academic success, a number of other studies have led researchers to mixed or qualified conclusions. With a sample of 154 freshman foreign students, a study of the predictive value of the TOEFL used in Oklahoma colleges and universities for freshman admissions (Bostic, 1981) found significant but not large positive correlations ($r = .17$) between TOEFL scores and overall GPA. Any conclusions that might be drawn from this study are limited in that a population of 154 students is quite small, and although the correlation is positive, it is not strong enough to have practical implications.

TOEFL scores and grades in a pre-university English program were used as the measures of English proficiency in a study of 159 undergraduates and graduates at the University of Arizona (Stover, 1982). “Conflicting outcomes” were found: Both undergraduates and graduates with TOEFL scores of less than 500 were able to achieve academically at “an acceptable level” in their first semester. However, while the TOEFL scores and the GPAs in the pre-university English program were significantly related to academic success in the case of the undergraduates ($r = .21, p = .05$), they were not significant in the case of the graduate students ($r = .13$). Like the previous study, any conclusions that might be drawn are limited in that a population of 159 students is relatively small, and although the correlation is significant, it is not strong enough to have practical implications.

Light, Xu, & Mossop (1987) conducted a study of the value of the TOEFL score as a predictor of academic success for 376 foreign graduate students at the State University of New York at Albany. These researchers found a statistically significant but weak correlation ($r = .14$) between TOEFL scores and GPA. The authors concluded that TOEFL scores were not effective predictors of academic success, as measured by GPA for this group of graduate students.

Although the above studies drew either negative or mixed conclusions about English-language proficiency as a useful predictor of academic success, a number of researchers appear to have reached a different conclusion. Burgess and Greis (1970), who used a sample of 17 college students, found that TOEFL did correlate significantly with grade point average, particularly when grades for courses requiring little English (such as art, music, and math) were deleted from the grades being averaged (TOEFL with GPA, $r = .53$; TOEFL with weighted GPA, $r = .56$). Writing was found to be a good predictor (with total GPA, $r = .64$; with weighted GPA, $r = .66$), while listening ability was not (.30 and .47). They concluded that proficiency in reading and writing English was important to college success. This conclusion may be inappropriate because of the extremely small sample size.

Ayers and Quattlebaum (1992) conducted a study looking at TOEFL performance and success in a master's program in engineering. A review of the literature at the time of their study did not reveal any previous studies that specifically examined the relationship of success in achieving a master's degree in engineering to scores on the TOEFL for Asian students. The subjects for this study consisted of 67 Asian students who received a master of science in engineering at Tennessee Technological University between 1986

and 1990. The students were either from India or were native Chinese speakers. All students completed the TOEFL prior to admission to the institution. The results of the study indicated that the TOEFL score was not an effective predictor of academic success, as measured by total GPA based on all courses required in the program of study ($r = .05$). Ayers and Quattlebaum concluded:

Although the findings of the study indicated that the TOEFL may be of questionable value in predicting the success of Asian students in engineering graduate programs, it is still considered to be a useful test as a preliminary screening device for determining if a potential student has the minimum communication skills needed to function in an American university (p. 975).

Again, any conclusions that might be drawn from this study are limited in that a small population of only 60 students was used.

Ho and Spinks (1985) studied the predictive value of English-language skills scores (obtained through reading, writing, listening, and speaking tests) for 230 university students in Hong Kong. The researchers conducted multiple correlation analyses, and concluded that scores on the English tests had the most predictive value, accounting for about 10% of the variance of the measures of academic success, in this case a combination of examination scores and course grades. According to Ho and Spinks,

It is quite certain that students who are deficient in English (excepting those concentrating on Chinese language or nonlinguistically dependent subjects [e.g., mathematics] would be handicapped in their learning at the University, and might avoid choosing subjects highly dependent on English proficiency (p. 258).

With scores on the English tests still accounting for only 10% of the variance of the measures of academic success, it is unclear whether this variance is large enough to have practical implications.

To summarize, a review of the studies of the relationship between English proficiency measured by the TOEFL examination and academic success did not reveal clear-cut answers for the admissions officer looking for guidance in making admissions recommendations. Achieving a greater understanding between this variable and academic success could assist colleges and universities in predicting the future academic success of foreign students. Accordingly, this variable was included in the current study. Because of the lack of consistently high correlations between English test scores and academic success, one can clearly conclude, “that English proficiency is only one among many factors that affect academic success” (Graham, 1987, p. 515). This researcher will therefore look at some of the other factors that may affect the academic success of foreign students.

Research Related to Aptitude Tests and Academic Success of Foreign Students

As indicated in chapter I of this study, because the TOEFL is designed to measure English-language ability and not academic aptitude, the majority of the graduate programs in the United States require foreign applicants to perform successfully on aptitude tests. The two most common graduate aptitude tests are the Graduate Record Examination (GRE) and the Graduate Management Aptitude Test (GMAT). This section takes a brief look at the relevant literature on these two examinations.

The Graduate Record Examination (GRE)

The most common aptitude test required for admission into a graduate school is the Graduate Record Examination (GRE) (Thronell & McCoy, 1985). According to ETS (1977) the GRE consists of three sections containing verbal, quantitative, and analytical items on which candidates' scores are based. Section I, the verbal section, is made up of analogies, antonyms, sentence completions, and paragraphs dealing with a range of subjects, each followed by sets of reading comprehension questions. Section II, the quantitative section, requires reasoning based on an understanding of arithmetic, algebra, and geometry, as well as the ability to interpret data presented in maps, graphs, charts, and tables. Section III measures analytical reasoning ability. Generally, the three aptitude tests—Verbal (V), Quantitative (Q), and Analytical (A)—are designed to measure mental capabilities thought to be important in graduate level study. They are not achievement or proficiency tests that require knowledge in any specific subject matter. Instead, they attempt to measure reading comprehension and logical reasoning with verbal, quantitative, and analytical material. Since English is the medium through which aptitude is evaluated on at least half of the GRE test, however, foreign students are often confused about the differences between the GRE and the TOEFL tests (Angelis, 1977).

Several studies have attempted to get a clearer idea of how GRE scores relate to the academic success of foreign students. Upon review of these studies it appears that no definite conclusions about the effectiveness of GRE scores in predicting the academic success of foreign students have been made.

Angelis (1977) compared the results of scores that 91 foreign students applying for admission to Texas A&M University achieved on both the TOEFL and the GRE

Aptitude tests. The correlation coefficient for the total scores on both tests was (.53.). The correlation between the TOEFL scores and the GRE–Verbal portion of the test (.55) was higher than that between the TOEFL and the GRE–Quantitative scores (.31). Angelis concluded that increased language proficiency seemed to have little effect on the GRE aptitude scores, at least for non-native speakers:

In general, the results of my study relating the TOEFL and GRE tests would seem to be that tests such as the GRE are inappropriate for non-native speakers.

Furthermore, the nature of such tests as aptitude measures render them as inadequate devices for determining language proficiency, particularly in a second language context (p. 103).

The limited scope of this study, based only on 91 students, makes it inappropriate to conclude that aptitude tests are inadequate devices for determining language proficiency.

Kaiser (1983) conducted a study on 148 foreign students who were enrolled at a midwestern university during the last 5 years and had GRE scores available from institutional records. Information about major, year of initial enrollment, graduate school GPA, and scores on verbal (GREV) and quantitative (GREQ) subscales of the GRE were collected on each subject. A composite of GRE scores (GRET) also was computed by adding the verbal and quantitative scores together. The GPA was used as a criterion variable, while the remaining variables were treated as predictors. Means and standard deviations on predictors and criterion variables were computed. This statistic was compared with a nationwide sample representing populations of U.S. citizens and foreign students. Kaiser found that the scores of the 148 foreign students on verbal and quantitative scales on the GRE (GREV = 329.53, GREQ = 513.11) were lower than the

scores of the nationwide U.S. citizen students ($\text{GREV} = 516$, $\text{GREQ} = 528$) and a nationwide sample of foreign students ($\text{GREV} = 417$, $\text{GREQ} = 523$). The standard deviation on GREV for the 148 foreign students ($SD = 97.43$) was smaller than the respective standard deviation on nationwide samples of American students ($SD = 115$) and nationwide samples of foreign students ($SD = 134$). The standard deviation of the 148 foreign students on GREQ ($SD = 173.53$) was, however, larger than nationwide samples of U.S. citizens ($SD = 132$) and foreign students ($SD = 142$). Kaiser concluded that the high discrepancy on mean GREQ scores between U.S. citizens and foreign students indicated that foreign students are at a disadvantage with the GRE Aptitude Test because of its language component.

The correlation coefficients between GRE scores and GPA were consistently lower for foreign students than the median coefficients obtained from validation studies conducted on American students. Though GREV was found to be the best single predictor of GPA, it explained only 3.2% of the total variance; therefore, this finding could be misleading. The statistical significance of the correlation coefficient between GREV and GPA ($r = .18$) was attributed to the restriction of range on the GREV because no foreign student with low GREV scores was admitted to the graduate school. According to Kaiser, the results "clearly indicated that GRE Aptitude Test is not a good measure of predicting graduate school GPA for foreign students" (p. 410).

Sharon (1972) attempted to determine whether the TOEFL added to the predictive value of the Verbal Ability section of the Graduate Record Examination (GREV). Unlike the smaller samples used in the previous studies reviewed, Sharon's sample consisted of 975 foreign graduate students from 24 schools. A relatively high correlation ($r = .70$) was

found between the GREV and the TOEFL, but not between the TOEFL and GPA ($r = .26$) or between the TOEFL combined with the GREV and GPA ($r = .27$). The Graduate Record Examination of Quantitative Ability (GREQ) turned out to be the best single predictor ($r = .32$). Based upon these results, Sharon concluded, "it appears that foreign students with low English verbal aptitude can succeed in American graduate schools" (p. 431).

As can be seen from a review of these studies, the relationship between GRE scores and the academic success of foreign students is unclear. Additional research is needed to examine whether this variable is a good predictor of foreign graduate students' academic success. For this reason, it was included in the design of this study.

The Graduate Management Aptitude Test (GMAT)

The GRE Aptitude Test is not the only standardized test that graduate schools require for admission. For business schools, the Graduate Management Aptitude Test (GMAT) scores are usually employed in combination with students' previous academic achievement (American Assembly of Collegiate Schools of Business, 1981). Similar to GRE scores, GMAT scores are often used in conjunction with other variables in predicting students' future academic performance.

This researcher was unable to find studies that separated foreign students from the majority student population when looking at GMAT scores and academic performance. Therefore, these studies were chosen as relevant examples for how GMAT scores have been used to predict all graduate students' (including foreign graduate students) academic performance.

Paolillo (1982) conducted a study to determine the relative importance of relationships between academic achievement and some selected variables, including GMAT scores. The sample was 220 graduates from the Master's of Business Administration (MBA) program at a medium-sized university. A zero-order Pearson product-moment correlation and regression analysis was used in analyzing the data.

Although Paolillo did not separate foreign from U.S. citizens, results showed that the GMAT score was significantly related to graduate GPA. The second highest significant relationship with academic performance was the GMAT total. However, both GMAT-Verbal and GMAT-Quantitative were significantly related to the criterion at the .0001 levels. In regression analysis, the GMAT score was also a significant variable. According to Paolillo, this study confirmed that the undergraduate GPA and aptitude test scores were important predictors of academic achievement. This conclusion may not be appropriate for foreign students because they were not compared to the majority student population.

Youngblood and Martin (1982) investigated MBA students (including foreign students) to ascertain what role GMAT scores served relative to other predictors of successful study and to validate the selection model of students for the MBA programs. The data were collected from a graduate school of business, which had changed design and administration of its MBA program. Before 1978, completion of 48 semester hours was required for graduation, and entry into the program was permitted at the start of any school term. During 1978, the MBA program was redesigned into a 54–69 credit hours program that would admit students during either the summer or fall semester. A major

objective for the new program was to improve the overall quality of students accepted into the new program.

The set of 406 applicants to the newly redesigned program composed the sample. All 433 students from the old design program were used to cross-validate the new admission model. The stepwise statistical procedure was performed with the undergraduate GPA, GMAT–Quantitative, GMAT–Verbal, GMAT–Total, and interaction terms of the undergraduate GPA by GMAT–Quantitative and the undergraduate GPA by GMAT–Verbal. Admission status (accept versus decline, first year GPA, and ending GPA) was used as the criterion measures of this study.

Students from old and new programs yielded substantial and statistically significant differences in academic performances. A non-additive, linear model consisting of both GMAT scores and undergraduate GPA influenced the decision-making process of the admissions officer of the master's program. The authors concluded that the GMAT scores were helpful for admission decisions. Again, foreign students were not separated from the majority population, and we do not know the number of foreign students included in this study. However, because the authors concluded that the GMAT scores were helpful for admission decisions, and most MBA programs enroll foreign students (IIE, 2000), this researcher chose to include this study.

As can be seen from the literature review, the majority of the above researchers who examined the GRE have concluded that the aptitude tests are not valid predictors of academic success, and some researchers have even gone as far to say they are inappropriate for non-native speakers of English. The only studies that concluded that aptitude test scores were important predictors for academic achievement were those

studies that used the GMAT, and these studies did not look at foreign students specifically. The conflicting findings regarding aptitude tests, as well as their potential significance, led to their inclusion in the research design. Only the verbal and quantitative scores were examined in this study because both GRE and GMAT tests have these two sections. All students included had at least one verbal and one quantitative score. These mixed results make it clear that English proficiency and aptitude tests are only several among many factors that affect the academic success of foreign students. This researcher, therefore, attempted to look at some of the noncognitive characteristics that may relate to the academic success of foreign students as compared to U.S. citizens and permanent residents.

The Relationship of Noncognitive Factors to Academic Success

Foreign students are a diverse group of people, and as such, the characteristics of the foreign student population require analysis (Altbach, 1997a). Gender, ethnicity, age, and other background characteristics can explain a considerable amount about roles, reactions, and the performance of foreign students (Sharon, 1972; Altbach, 1985, 1997).

Gender and Academic Success

Gender, for example, has recently become a variable of interest in determining the academic success of foreign students. This heightened interest results from the increasing number of female foreign students studying in the United States (IIE, 1996), and makes it particularly important to learn more about factors contributing to their academic success (Altbach, 1997b, p. 219).

In 1979, Tan-Ngarmtrong examined the relationship between the academic achievement of foreign students and specific characteristics: undergraduate GPA, English

proficiency, cultural region, gender, and major field of study. Academic achievement was represented by foreign students' first and second semester GPAs. The sample of the study was composed of 77 foreign graduate students who enrolled for a minimum of nine credit hours per semester for at least two semesters at Mississippi State University. Regression analysis, analysis of variance, and *t* tests were used to analyze the data. Tan-Ngarmtrong found no significant relationship between academic achievement and gender. Any conclusions drawn from this study were rather limited because of the small sample size.

Concerned only with noncognitive variables, Strommen (1981) studied the degree to which these variables affected foreign students' academic achievement as measured by the students' GPAs. The noncognitive variables were age, gender, level of study, geographic area of residence, source of financial support, marital status, residence of immediate family, and field of study. The study sample consisted of 299 foreign students enrolled at the University of Houston Central Campus for at least three consecutive semesters. The results of the study showed those important noncognitive variables that were related to the academic achievement of foreign students were level of study, region of origin, field of study, gender, and age. Strommen suggested,

A comprehensive list of noncognitive variables would, if included in formulas to predict the degree of academic success of foreign students, be valuable additions. Thus, some of the variations in performance of students with similar cognitive backgrounds would be explained (p. 70).

Strommen also recommended that institutions accommodating foreign students should gather noncognitive information, such as gender and age, and use it in making decisions on the admission of foreign students.

Given a sample of students classified by gender and undergraduate field of study, Angoff and Johnson (1988) studied how the rank order of these students on verbal and mathematical aptitude tests changed over the period of time in which they are enrolled in college. They were particularly interested in measuring the extent to which gender played a determining factor in these differences. The study sample consisted of 22,923 cases: 10,523 men and 12,400 women. It was found that women outscored the men in the humanities area; in all other fields the men outscored the women. On the GRE-Verbal, the men outscored the women in all fields. On the quantitative side, men scored substantially higher than did the women. The impact of curriculum and gender was found to be low on GRE-Verbal and GRE-Analytical scores, but relatively high for GRE-Quantitative. The authors observed that the means on the verbal tests—both within the field of study and across the entire sample—were, with one exception (in the humanities), higher for men than for women. According to these authors, it appeared that women of the same initial ability as men (as measured by the SAT) who studied the same general curriculum in college earned somewhat lower scores on the GRE-Quantitative test. Though the study did not separate foreign students from the majority population, its findings are relevant because of its focus on gender.

In Wilson (1982), the analysis included only International and Special Center testing program examinees that both designated their native countries and indicated that their reason for taking the TOEFL was to study at a university in the United States or Canada. A total of 235,738 examinees met these criteria. Interestingly, women outperformed men in this study (mean scores = 513 and 502, respectively).

Hughey and Hinson (1993) conducted a study of 168 foreign students enrolled at a private four-year religiously affiliated university using several variables: gender, general language background, major area of study, TOEFL score at the time of admission, and GPA at time of departure. Analysis of variance revealed no statistically significant difference when mean test scores were compared by gender ($F = .55, p = .46$). The mean score for men was 491.26 ($SD = 44.76$); for women it was 496.52 ($SD = 46.66$). Conversely, the analysis yielded a statistically significant difference in mean GPA of men (2.29, $SD = .98$) when compared with that of women (2.75, $SD = .85$; $F = 10.35, p = .0016$). The authors concluded that because there was a statistically significant difference between the mean GPAs attained by men and women, “gender seems to be a better predictor of academic success than does a score on the Test of English as a Foreign Language” (p. 191). Because of the possible significance of gender in predicting academic success, these researchers questioned if it should be used in making admissions decisions.

As the above literature indicates, no definitive conclusions have been reached regarding the relationship between gender and academic achievement. Although researchers offer different findings in this area, it appears that gender may be a valuable predictor of foreign students’ academic success. As a result, this study continues the investigation of this variable.

Age and Academic Success

Several studies have determined that the relationship between age and a student’s academic success is important. As mentioned previously, Strommen (1981) studied the degree to which noncognitive variables (age, gender, level of study, geographic area of

residence, source of financial support, marital status, residence of immediate family, and field of study) affected foreign students' academic achievement as measured by the students' GPAs. The study sample consisted of 299 foreign students enrolled at the University of Houston Central Campus for at least three consecutive semesters. The variable age showed a slight relationship to GPA ($r = .202$). This relationship indicated that 4% of variance in GPA was predictable from age. The youngest subgroup, 17- to 20-year olds, had the lowest GPA of 2.53. The subgroup in the age range of 30- to 34-year olds had the highest GPA of 3.06. Strommen concluded that age had significance on determining academic success.

Luthy (1983) investigated the validity and prediction bias of grade performance from GRE scores for graduate students at Northern Illinois University in nine academic programs. Scores from the verbal (GREV), quantitative (GREQ), and total of the verbal and quantitative (GRET) sections were used as predictor variables. Cumulative graduate grade point average (GGPA) was used as the criterion variable of graduate school success for 3,135 students grouped by gender and age. Correlation coefficients were used to examine predictive validity; differential validity analysis and analysis of mean error of prediction were used to examine gender bias and age bias. Five significant differences were found for age group correlations. Mean error of prediction analysis indicated the existence of gender bias and age bias in the prediction of GGPA from GRE scores. There were 15 instances in which significant age group differences in the prediction of GGPA were noted; in each case, GRE scores over-predicted grade performance of younger students and under-predicted grade performance of older students. Although this study did not specifically separate foreign students from the majority population, it is included

in this study because of its finding of significant differences for age group correlations. As the above literature indicates, age may be a valuable predictor of foreign students' academic success in graduate school and hence was an investigated variable in this study.

Academic Field and Academic Success

Studies have shown that there are differences in academic performance among foreign students enrolled in different academic fields. For example, Light, Xu, & Mossop (1987) conducted a study of 376 foreign graduate students at the State University of New York at Albany. The researchers grouped subjects into two broad categories: (1) humanities, fine arts, or social sciences and (2) science, math, or business. The authors found that the correlation between TOEFL score and GPA was significantly higher for humanities, fine arts, or social science students ($r = .24, p < .001$) than for science, math, or business students ($r = .04, \text{n.s.}$). Based upon these results, the researchers concluded that there might be non-language factors (such as academic field) that accounted for the academic success of foreign students.

Strommen's (1981) study of 299 foreign students enrolled at the University of Houston Central Campus for at least three consecutive semesters found that engineering students had significantly higher GPAs than all other students combined. Their mean GPA was 3.00 as compared to the mean GPA of 2.70 for all the other students. Basic regression statistics indicated that 5% of the variation in GPA was attributed to the field of study. Strommen concluded that field of study was a significant predictor of GPA.

Hughey and Hinson (1993) previously mentioned study of 168 foreign students enrolled at a private four-year religiously affiliated university used five categories of academic major: business, music, science and mathematics, humanities and education,

and undeclared. Foreign students majoring in the humanities and education had the highest means TOEFL test score (497.76, $SD = 48.57$). Their mean GPA (2.36, $SD = .99$), however, was significantly lower than the mean GPA for the entire group. Students majoring in music exhibited the highest mean GPA (3.13, $SD = .75$) of any major, although their mean TOEFL test score (495.70, $SD = 48.72$) was only slightly higher than the overall mean for the entire group. Science and mathematics majors had a mean TOEFL test score of 496.54 ($SD = 48.01$), which was non-significantly just above the overall mean, although their mean GPA (2.95, $SD = .82$) was significantly higher than that exhibited by the group as a whole. Students majoring in business had a mean TOEFL test score (492.89, $SD = 43.92$) slightly below the overall mean. Business majors also exhibited a slightly lower mean GPA (2.43, $SD = .87$) than the entire group. Foreign students with no declared major had the lowest mean TOEFL score (489.42, $SD = 45.48$) as well as the lowest GPA (2.25, $SD = 1.02$). The authors concluded that such differences in correlations may in part result from the distinct ways verbal and written communication skills are emphasized in different disciplines, and that major area of study may be relevant to the academic success of foreign students. The relatively small sample size makes valid conclusions questionable when based on this study alone.

Foreign students in United States graduate schools are enrolled in a variety of fields of graduate study and, as shown from the above studies, the program in which a student is enrolled may affect how well the student performs. This study will therefore investigate the relationship of academic field to foreign students' academic success.

Country of Citizenship and Academic Success

Research regarding the academic success of foreign students from specific areas of the world is rather limited. Most of the research has dealt with issues of foreign students' social and cultural adjustment to the United States. The relationship between academic success and country of citizenship needs to be examined more fully.

In Hosley (1979), the researcher studied the differences in TOEFL scores as a function of such variables as country of origin and gender among foreign students in an intensive English-language program. The subjects were 147 foreign students in the Center for English as a Second Language (CESL) at the University of Arizona. The subjects in the sample were comprised of 28% of the total number of students in the CESL program and were drawn from 19 different countries. For data analysis, the subjects were placed into six groups: Mexico, Saudi Arabia, Libya, Venezuela, and Japan (the five most common countries of origin). Analysis of variance of the TOEFL scores showed the effect of country to be significant, with scores of Mexican subjects being the highest and significantly different (via *post-hoc* tests) from those of Saudi Arabian and Libyan subjects, which were the lowest. The interaction between subtests and country of origin was also significant, with a *post-hoc* test showing that the Listening Comprehension and Vocabulary sections contributed most to the superior performance of Mexican subjects. Again, a relatively small sample size makes the validity of the conclusions questionable.

According to Strommen (1981), mentioned several times earlier, a significant portion of variance in GPA was explained by the students' geographic area of residence. The Latin American students mean GPAs of 2.38 were significantly lower than the mean

GPA of all other students combined, which were 2.88. Latin Americans accounted for 7.8% of the predictable variance in GPA. The mean GPA of all students from the Far East was 2.96, which was significantly higher than the combined mean GPA of all other students, which was 2.67. Strommen therefore concluded that there was a relationship between students' geographic area of residence and their academic achievement.

As can be seen from the above studies, understanding those factors, which may directly or indirectly correlate with foreign students' country of origin and academic success continues to be an important issue for institutions of higher learning. For this reason the foreign students' country of origin, based on citizenship, was included as a variable in this study.

Source of Financial Support

Over two thirds (67%) of all foreign students receive the majority of their funds from family and personal sources. Over 75% of all foreign students funding comes from sources outside the United States (IIE, 2000). Department of Commerce data describes U.S. higher education as the country's fifth largest service sector export as these students bring money into the national economy and provide revenue to their host states by paying for living expenses that include room and board, books and supplies, transportation, health insurance, support for accompanying family members, and other miscellaneous items. Some foreign governments select top students and sponsor their study in the United States, and a number of U.S. governmental agencies and foundations, such as Fulbright and Rotary, financially assist foreign students. In addition, some colleges and universities provide scholarship and fellowship aid to foreign students.

Based on the research on foreign students who received some form of financial support from their university, it would appear that there are mixed conclusions regarding the relationship of that aid to academic performance. In Strommen's study (1981), students receiving some form of financial scholarship made up 10.1% of the total sample of 299 foreign students. Their mean GPA of 3.09 was significantly higher than those who received no financial assistance, who had a mean GPA of 2.75. It should also be noted that those people who received funding from the university might be those who, for whatever reason, were thought to have more academic promise. If so, it would not be surprising to see those students obtain higher grades.

Deressa and Beavers (1988) conducted a study to identify the academic and nonacademic needs of 70 foreign students enrolled in a mid-western college of home economics. Personal data were obtained to determine general characteristics. A needs statement inventory included academic needs, housing needs, social and personal problems, cultural values, and financial needs. Data were analyzed from the 70 questionnaires and frequencies, percentages, mean scores, and standard deviations were computed. The highest possible mean score was 30. Financial need was the highest mean score, 15.50, indicating that finances were a concern for foreign students. The authors concluded that colleges and universities should assist foreign students to find part-time jobs or assistantships. This is a relatively small sample, and it only focused on one academic discipline, making it difficult to draw valid conclusions.

The literature does not demonstrate a clear relationship between financial aid and academic success. Achieving a greater understanding between this variable and academic success would assist colleges in predicting the academic success of foreign students.

Consequently, this variable was included in the current study. If a student received fellowships, scholarships, or grants from the university at any time during their master's degree, this student was considered to have received financial support.

Based upon the review of the above studies, which considered factors influencing academic success other than TOEFL, GRE, and GMAT scores, it can be concluded that noncognitive elements could affect the academic success of foreign students. Therefore, studies of the predictive qualities of noncognitive factors for academic success are appropriate.

The researchers also assumed that the amount of time it took the student to complete the degree might be affected by whether or not a student changed majors and whether or not the student enrolled full-time or part-time. Since length of time it took to complete the degree was considered to be one measure of academic success, this research used whether or not the student changed majors and whether or not the student was enrolled full-time during the academic year as independent variables in this study.

Summary of Literature Review

Over the past two decades, the presence of foreign students has been an important component of United States graduate education. Admissions officers and educational institutions must accept the challenge to provide a quality education for foreign students. The University of Maryland, with 3,233 foreign students, is faced with the challenge and problems of foreign student enrollment, just as other U.S. colleges and universities.

Administrators in United States colleges and universities have made efforts to improve the predictability of academic success in the selection and admission procedures for foreign students. Their efforts have been designed to assure their colleges and

universities of successful foreign student recruitment and to assure the individual student of a greater opportunity to complete an academic program. The literature suggests variables to consider when colleges and universities attempt to predict the academic success of students. However, a definitive profile of the “successful” student still eludes institutions of higher learning. Some studies have identified academic success of foreign students as being related to the English-language proficiency of the students (Bostic, 1981; Light, Xu, & Mossop, 1987; Burgess & Greis, 1970; Ho & Spinks, 1985), performance on aptitude tests (Paolillo, 1982; Youngblood & Martin, 1982), gender of the students (Strommen, 1981; Angoff & Johnson, 1988; Wilson, 1982; Hughey & Hinson, 1993), academic field (Meloni, 1986; Martin, 1971), country of citizenship (Hosley, 1978; Light, Xu, & Mossop, 1987; Hughey & Hinson, 1993; Hwang and Dizney, 1970), source of financial support (Ellakany, 1970; Hountra, 1957; Parakan, 1964; Sugimoto, 1966; Sellers & Yasin, 1994); and language of instruction of the students’ undergraduate education (Hughey & Hinson, 1993; Alderson & Holland, 1981; Ayers & Peters, 1977). Although United States educators have long recognized that there are a large number of elements that contribute to the academic achievement of foreign students, institutions of higher learning have been unable to agree on what variables are most important.

Given the number of foreign graduate students currently studying in the United States and the impact they are making both on the United States and other countries throughout the world, it is very important that colleges and universities enrolling foreign graduate students continuously evaluate their admissions process in order to ensure the academic success of these students. The creation of the right policies in admissions for

foreign graduate students is critical and should be examined at each institution (Homan, 1973; Strommen, 1981). Guided by the work of previous researchers, this study applied a quantitative analysis of specific variables that were associated with the academic success of foreign graduate students to the University of Maryland. This study's findings could serve as a valuable guide to understanding what factors contribute to the academic success of master's degree students and act as a guide in helping universities to construct policies that address and possibly improve the academic success of foreign graduate students as compared to U.S. citizens and permanent residents.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

This chapter discusses the design of the study and its methodology. The first section presents the study's design and includes its purpose, theoretical framework, research questions, selected variables, and sources of data. The following section on methodology describes the population and sample used in the study, methods of data collection, organization and administration of the database, data analysis methods, protection of subjects, and limitations of the design and methodology.

Design of the Study

Purpose of the Study

This study, drawing from literature that focused on the relationship of academic success to select cognitive and noncognitive variables, sought to determine the extent to which particular characteristics related to foreign graduate students' academic achievement in master's degree programs at the University of Maryland, College Park as compared to permanent residents and U.S. citizens. Specific personal and academic factors were investigated to determine their relationships to, and their abilities to predict, the academic success of foreign graduate students, U.S. citizens, and permanent residents.

Theoretical Framework

Ten cognitive and noncognitive variables were selected, based both on the reviewed literature dealing with the academic success of students in higher education, as well as the subjects' admissions data, official academic records, and financial aid information. In addition, despite the lack of literature discussing the relationship of academic success to a student's full-time or part-time enrollment and whether the student

changed majors, the researcher concluded that these two variables might affect how long it took the student to complete the degree and thus included these variables in the study.

Research Questions

Answers to the following research questions provided insight into the cognitive and noncognitive characteristics of students that were most likely to relate to and able to predict academic success: For foreign graduate students (compared to students who were U.S. citizens or permanent residents) enrolled as first year master's students in the university in the fall of 1995, 1996, and 1997, what cognitive characteristics (GRE-Verbal or GMAT-Verbal percentile, GRE-Quantitative or GMAT-Quantitative percentile, and total TOEFL score) and noncognitive characteristics (age, gender, academic field, county of citizenship, financial support from graduate school, part-time or full-time enrollment, and whether or not the student changed majors) were significantly related to and able to predict academic achievement as measured by (1) graduate grade point average (GGPA), (2) the total number of credits completed at the time of graduation, (3) the total number of semesters, and (4) whether or not the student completed the degree by 2001?

Variables selected to answer the research questions. Ten predictor variables and four dependent variables were selected based upon literature indicating that they might be related to the academic success of students enrolled in higher education institutions. According to the literature, the academic success of foreign students is a complex issue for institutions of higher education. However, if specific personal and academic factors can be identified that directly affect the academic success of foreign graduate students, then institutional policies can be designed to address these factors. The creation of the

right admission policies for foreign graduate students is critical and should be precisely examined at each institution (Homan, 1973; Strommen, 1981). The dependent variable, graduate grade point average (GGPA), was used because it often serves as a tangible measure of the students' academic ability and commitment to educational pursuits. Grades also provide the student with a visible reward indicating academic success in relation to his or her own criteria and to the success of his or her peers (Spady, 1970). In addition, persistence has been determined to be a measurement of academic success (Boyer and Sedlacek, 1987). The indicators used to measure persistence were number of credits earned at degree completion, whether the student completed the degree by 2001, and the actual number of semesters it took the student to complete the master's degree.

The following is a list of the 10 independent variables used in this study. A more complete review and analysis of these variables will follow.

I. Cognitive Variables

- A. GRE–Verbal Percentile or GMAT–Verbal Percentile
- B. GRE–Quantitative Percentile or GMAT–Quantitative Percentile
- C. TOEFL Score, Total (combination of the listening, written and vocabulary, and reading sections).

II. Noncognitive Variables

- A. Gender
- B. Age
- C. Academic field
- D. Country of citizenship

E. Presence or absence of financial support from the graduate school. This only included those students who received fellowships, scholarships or grants from the University. Teaching and research assistantships were not included.

F. Whether or not the student changed majors

G. Full-time or part-time enrollment when they began the program.

The relationships among the theoretical assumptions, research questions, data elements, and sources of data are show in Figure 1.

Sources of Data

Data used in this research were obtained from the Office of Institutional Research and Planning at the University of Maryland, College Park. Information concerning characteristics of master's degree students enrolled in the university has been stored in computer files in various campus offices. However, the Office of Institutional Research and Planning has access to the records of foreign students, permanent residents, and U.S. citizens from these campus offices. This researcher, therefore, obtained permission to access both the cognitive and noncognitive information on foreign graduate students, permanent residents, and U.S. citizens at the University of Maryland using data compiled by the Office of Institutional Research and Planning. To ensure confidentiality of the data, a staff member of the office retrieved all information relevant to foreign students, permanent residents, and U.S. citizens at the master's degree level and constructed the sample file needed for this study.

Research questions for foreign graduate students, compared to U.S. citizens or permanent residents, enrolled as master's students in Fall 1995, 1996 and 1997	Variables	Sources of Data
1. What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement as measured by the graduate grade point average (GGPA)?	GREV or GMATV, GREQ or GMATQ, TOEFL total score, age, gender, academic field, country of citizenship, financial support from graduate school, full-time or part-time enrollment, whether or not the student changed majors, and GGPA	Admissions and registration records from the Office of Institutional Research and Planning
2. What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement as measured by the number of credits earned?	GREV or GMATV, GREQ or GMATQ, TOEFL total score, age, gender, academic field, country of citizenship, financial support from graduate school, full-time or part-time enrollment, whether or not the student changed majors, and number of credits earned	Admissions and registration records from the Office of Institutional Research and Planning
3. What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement as measured by whether the student completed the degree?	GREV or GMATV, GREQ or GMATQ, TOEFL total score, age, gender, academic field, country of citizenship, financial support from graduate school, full-time or part-time enrollment, whether or not the student changed majors, and whether or not the student completed the degree	Admissions and registration records from the Office of Institutional Research and Planning
4. What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement as measured by the total number of terms it took to complete the master's degree?	GREV or GMATV, GREQ or GMATQ, TOEFL total score, age, gender, academic field, country of citizenship, financial support from graduate school, full-time or part-time enrollment, whether or not the student changed majors, and total number of semesters taken to complete the master's degree	Admissions and registration records from the Office of Institutional Research and Planning

Figure 1. Research questions for foreign graduate students.

Methodology

Population

The population of this study consisted of students who enrolled in master's degree programs in the fall semesters of 1995, 1996, and 1997 (3,275 students) at the University of Maryland, College Park. Citizenship code was collected to obtain visa status because students needed to be separated into foreign graduate students, U.S citizens, and permanent residents. There were two main visa types included in the foreign student group. The most frequently granted visa was a Student Visa (F-1). Students coming to the United States specifically for the purpose of university studies generally apply for this type of visa. Another commonly granted visa was the Exchange Visitor Visa (J-1), generally for students sponsored by agencies, foundations, or their home governments. Also considered foreign students and included in this study were those issued several other visa types that are granted to dependents of foreign nationals. These were IA (Journalist), G4 (International Organization Representative), F2 (Foreign Student Dependent), R1 (Alien/Religious Origin), B1 (Visitor Business), H1 (Temporary Special Occasion), B2 (Visitor/Pleasure), J2 (Dependent J1), and H4 (Dependent of H1 or H2).

Nature of Student Sample

The University of Maryland, College Park (UMCP) was chosen as the institution for this study because of its Research I status, the researcher's familiarity with the institution, and the number of enrolled foreign students. Research I institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctoral degrees each year. In addition, they receive at least \$40 million annually in federal support (IIE,

1998, p. 42). Research I institutions together host the largest number (116,410) of foreign students, just under a third of all foreign students (IIE, 2000). UMCP had a total population of 32,800 students and the 12th largest foreign student population for Research I universities in the United States (IIE, 2000).

The sample for the study consisted of all students enrolled in master's degree programs as of the fall of 1995, 1996, and 1997 ($N = 3,257$). Of these 3,257 graduate students (595 were considered foreign students, 118 permanent residents, and 2,544 U.S. citizens) who were working toward a master's degree and whose data were accessible from the Office of Institutional Research and Planning. Master's level students were chosen because many Ph.D. students completed their master's work in the United States and therefore were not required to take the TOEFL examination. For candidates with more than one GRE, GMAT and/or TOEFL score, only the most recent score or scores were used.

In summary, for each student selected for this study, there were measures of gender, age, academic field in graduate school, citizenship, institutional financial support, total score on the TOEFL (combined scores of Section I: Listening Comprehension, Section II: Written Expression, and Section III: Vocabulary and Reading), GRE-Verbal percentile or GMAT-Verbal percentile, GRE-Quantitative percentile or GMAT-Quantitative percentile (at the time of admission to the university), graduate grade point average (GGPA) at degree completion (if completed), number of credits earned at degree completion (if completed), whether or not the student completed the degree by 2001 (yes/no), and the actual number of semesters it took to complete the master's degree (if completed).

Data Collection

The sample of this study was composed of 3,257 master's degree students entering in the fall semesters of 1995, 1996, and 1997, of which 595 were foreign graduate students, 118 were permanent residents, and 2,544 were U.S. citizens. Data were obtained directly from the Office of Institutional Research and Planning. To ensure confidentiality of the data, a staff member of the Institutional Research and Planning office was assigned to retrieve all of the graduate student information.

Organization and Administration of the Data

While the emphasis of this study was on predicting the success of foreign master's degree students, comparisons also were made with those students who had U.S. citizenship or were permanent residents. This information was used to determine if these sets of data followed similar patterns. Permanent residents were separated from U.S. citizens and foreign students because of differences between the groups. For example, U.S. citizens tend to focus more on the arts and humanities, whereas foreign students tend to focus more on the business and engineering. Permanent residents tend to be relatively evenly distributed among the different academic fields. Another example is that some permanent residents may be required to take the TOEFL and some may not, depending upon where they studies, a relatively large percentage of permanent residents do not take the TOEFL (30% in this study took the examination). The majority of foreign students, on the other, take the TOEFL examination (86.39% in this study took the examination), and almost all U.S. citizens do not take the TOEFL examination (.01% in this study took the examination). Students were also categorized into areas of concentration (Academic Field) and region of origin (Citizenship).

Based upon the field of study categories found at the University of Maryland and the academic fields used in *Open Doors: 2000/2001* (IIE, 2001), the academic field variable was organized as follows:

Social Sciences: Master's degree students enrolled in Education, Health and Human Performance, Public Affairs, and Behavioral and Social Sciences

Arts and Humanities: Master's degree students enrolled in Architecture, Journalism, Arts and Humanities, and Library and Information Services

Sciences: Master's degree students enrolled in Agriculture and Natural Resources, Life Sciences, and Computer, Mathematical, and Physical Sciences

Business: Master's degree students enrolled in The Robert H. Smith School of Business

Engineering: Master's degree students enrolled in The A. James Clark School of Engineering.

Based upon only those countries represented in the data, categories used in *Open Doors 2000/2001* (IIE, 2001), and countries with very small numbers of students were included in the most appropriate regional area, the regions of origin (citizenship) were organized as follows:

Eastern Europe: Master's degree students from Bosnia, Bulgaria, Hungary, Romania, Latvia, Russia, Serbia, Ukraine, Yugoslavia, Georgia, Kazakhstan, Poland, Albania, Estonia, Lithuania, and Czechoslovakia

Western Europe: Master's degree students from Austria, Germany, France, Gibraltar, Belgium, Switzerland, Greece, Iceland, Ireland, Italy, Norway, Portugal, Spain, Sweden, the UK, and Denmark

South Asia: Master's degree students from Bangladesh, India, Pakistan, Nepal, Afghanistan, and Sri Lanka

East Asia: Master's degree students from China, Japan, Korea, and Taiwan

Southeast Asia: Master's degree students from Hong Kong, Indonesia, the Philippines, Singapore, Thailand, Malaysia, and Vietnam

Middle East: Master's degree students from Cyprus, Israel, Turkey, Iran, Kuwait, Lebanon, and Yemen

Latin and South America: Master's degree students from Mexico, Grenada, Nicaragua, Panama, Barbados, El Salvador, Guatemala, Suriname, Chile, Bolivia, Brazil, Colombia, Ecuador, Peru, Argentina, Uruguay, Venezuela, Honduras, and Guyana

Africa: Master's degree students from Mauritania, Tanzania, Egypt, Gambia, Mozambique, Sierra Leone, Tunisia, Uganda, Ghana, Kenya, Zimbabwe, Sudan, Zambia, Nigeria, Liberia, Ethiopia, and Cameroon

North America: Master's degree students from the Caribbean, Oceania, Jamaica, U.S., Canada, Bahamas, Australia, New Zealand, Haiti, Trinidad, and the Dominican Republic. Several of the countries include in "North America" were included here because they conduct university studies in English and this was the most appropriate region.

Data Analysis Methods

The research design was non-experimental because it did not use a control group. A pre-existing group of foreign, U.S citizen, and permanent resident graduate students

was studied rather than assigning students to research and control groups (Campbell & Stanley, 1963).

Descriptive statistics were computed to describe the total sample in terms of relevant characteristics. The statistics obtained on foreign students were compared with that of the U.S. citizens, and then those of permanent residents. Comparisons were also made between those students who finished the degree and those who did not. For the continuous variables (cognitive variables), number of cases, minimum and maximum values, means, standard deviation, normalcy of the distributions, and measures of associations were reviewed. For the categorical variables (noncognitive variables), number of cases, and the number and percent of individuals in each category were reviewed.

Inferential statistics were computed to further study the sample and to make generalizations about the population based on the sample. These included the differences between the groups using *t* tests, analysis of variance tests (ANOVA), and chi-square tests. Fisher's LSD was used to control for Type I error. To predict the outcomes, three multiple regressions were done for three of the dependent variables (graduate GPA at the time of graduation, number of credits earned at the time of graduation, and number of semesters taken to complete the graduate degree). In order to determine whether the cognitive and noncognitive variables related to whether or not the graduate students earned or did not earn a degree (dichotomous dependent variables) a binary logistic regression was used.

Following each regression and logistic regression, three regressions looked at U.S. citizens, foreign students, and permanent residents separately to evaluate differences

among the three groups in the predictor variables effect on the dependent variable measure of academic success. The slopes of the individual predictor variables were also examined to determine whether the affect of the predictor variables on the final GPA of the students differed across the three groups (permanent residents, U.S. citizens, and foreign students). This was done by conducting a *t* test for the differences between the two slopes of a predictor variable. If the *t* test was statistically significant at the .05 levels, this meant the predictor variable affected the final GPA of the students differently across the two groups.

In addition, including the year cohort as a dummy variable was tried to control for differences in year of admission, but this did not change any results, and therefore was left out of the study. Age and age squared was also tried to allow for the possibility of some curvature in the relation between age and an outcome variable. Again, this did not affect the overall result and therefore was left out of this study. Finally, logging GPA was tried but did not impact the results of the study and therefore was not included in this study.

Protection of Subjects

The University of Maryland Office of Institutional Research and Planning linked information (admissions database, university database, and, financial aid database) via identification numbers; the names of all specific subjects were confidential. Neither the identification numbers nor the names of subjects were given to the researcher. There is no way the researcher can link the data to specific people. Therefore, the findings of this study do not and will not affect, directly or indirectly, the subjects' status at their current university or any other institution of higher learning.

Limitations of the Study Design and Methodology

This study confined itself to U.S citizens, foreign students, and permanent residents enrolled in master's degree programs at the University of Maryland, College Park. The purposive sampling procedure decreased the generalization of findings. This study cannot be generalized to all universities or all foreign students studying in the United States.

In analyzing the relationships of the dependent and independent variables, some of the sample sizes were extremely small. This means these relationships may appear statistically insignificant when, if there was a larger sample, they might be important characteristics. In addition, as was seen with some of the studies in the literature review, extremely small sample sizes make it difficult to draw valid conclusions. According to James Stevens (1996),

There is not clear consensus on an exact answer to the question of sample size. We have heard and read answers ranging anywhere from 5 to 50 cases per predictor. Generally, the more cases per predictor you have, the better off you will be in terms of your ability to generalize your results to your population of interest (p. 72).

That said, Stevens recommended a nominal number of 15 data points per predictor for multiple regression analyses. Very few of the sample sizes were smaller than 15 data points. For those that were, the researcher recommends additional studies be done with larger sample sizes.

In addition, this researcher did not take into account the possibility that some graduate programs may require different numbers of credits to be completed in order to

obtain a degree. These different requirements might account for some of the differences found in this study related to academic field and academic success. It is therefore recommended that future studies take into account program differences when researching this variable.

Finally, this study only examined those students who were admitted to the university. It only looked at a small range of people and did not evaluate those people who were never admitted to the university.

CHAPTER 4

FINDINGS FROM THE DATA ANALYSIS

This chapter presents the findings from estimating models, including cognitive characteristics (GRE– or GMAT–Verbal percentile, GRE– or GMAT–Quantitative percentile, and TOEFL total score) and noncognitive characteristics (age, gender, academic field in graduate school, country of citizenship, financial support from graduate school, part-time or full time enrollment, and whether or not the student changed majors). The results of statistical analyses were used to determine relationships between selected predictors of academic success and four measures of academic success as the criterion variables: whether or not the student completed the degree by 2001, final graduate GPA at the time of graduation, total number of semesters it took to graduate, and total number of credits completed by graduation.

Participants

The study used data from the University of Maryland, College Park, a large (total enrollment of 32,800) public Research I university. The admissions records of the institution indicated that during the fall semesters of 1995, 1996, and 1997, a total of 3,257 master's degree students enrolled in the university. Of the sample, U.S. citizens represented 78.11%, foreign students represented 18.27%, and permanent residents represented 3.62%. Of the total 3,257, the majority of the students completed their degree (77.80%), and 723 (22.20%) did not graduate by 2001.

For the 2,534 who completed a degree, the mean final GPA was 3.64. The mean number of semesters enrolled prior to graduation was 5.03, and the mean number of credits completed was 43.33.

Analysis of Cognitive and Noncognitive Characteristics

A descriptive analysis was completed to examine the cognitive and noncognitive characteristics of the students enrolled in master's degrees included in this study.

Descriptive comparisons were made between U.S. citizens, foreign students, and permanent residents regarding whether or not the student completed the master's degree.

Cognitive Characteristics

GRE- or GMAT-Verbal Percentile. Completers had an overall mean Verbal percentile of 67.70% and non-completers had an overall mean verbal percentile of 66.16%. Further analysis indicated that there was not a statistically significant difference between the mean verbal percentile scores for completers and non-completers ($t = -2.23$, $p = .22$).

Table 1

Comparison of Verbal Percentile Mean Score for Completers and Non-Completers

<u>Verbal percentile</u>	<u>U.S. citizens</u>		<u>Foreign students</u>		<u>Permanent residents</u>	
	<u>N</u>	<u>Mean</u>	<u>N</u>	<u>Mean</u>	<u>N</u>	<u>Mean</u>
Completers	1601	71.17	394	55.48	69	56.86
Non-completers	428	69.34	56	47.36	16	46.89

As shown in Table 1, for U.S. citizens, foreign students, and permanent residents, those who completed the degree had higher verbal percentile scores than those students who did not complete the degree. An analysis of variance (ANOVA) was conducted to reveal if there were significant differences in verbal percentiles between U.S. citizens, foreign students and permanent residents who completed the degree. Results indicated a statistically significant difference between the three groups and verbal percentile ($F [2063] = 73.04, p <.0001$). Further examination found that the differences between

verbal percentile score for U.S. citizens, 71.17 ($SD=22.82$), and permanent residents, 56.86 ($SD = 28.50$), were statistically significant at the .05 levels. The analysis of differences between U.S. citizens' mean verbal percentile and foreign students mean verbal percentile, 55.48 ($SD = 28.87$), were also statistically significant at the .05 levels. The analysis of differences between permanent residents mean verbal percentile and foreign students mean verbal percentile were not statistically significant at the .05 levels.

An analysis of variance was also conducted to reveal if there were significant differences in verbal percentiles for non-completers between U.S. citizens, foreign students and permanent residents. Results from the analysis indicated a statistically significant difference between foreign students, U.S. citizens and permanent residents for non-completers and verbal percentile score, ($F [500] = 26.18, p <.0001$). Further examination found that the differences for non-completers between verbal percentile score for U.S. citizens, 69.34 ($SD = 22.25$), and foreign students, 47.36 ($SD = 33.15$), were statistically significant at .05 levels. The analysis of differences between U.S. citizens and permanent residents 46.89 ($SD = 30.19$) were also statistically significant at the .05 levels. There were no statistically significant differences between verbal percentiles for non-completers between foreign students and permanent residents.

An analysis was also conducted to evaluate the differences in verbal percentile scores between completers and non-completers for U.S. citizens, permanent residents and foreign students. The results of the analysis for U.S. citizens' verbal percentile scores showed there were not statistically significant differences between completers and non-completers ($t = -1.48, p = .14$). There were also not statistically significant differences between permanent resident completers and non-completers verbal percentile scores ($t = -$

1.25, $p = .23$). The results of the analysis for foreign students verbal percentile scores showed there were statistically significant differences between completers and non-completers ($t = -1.93, p < .05$).

GRE- or GMAT-Quantitative Percentile Completers had an overall mean quantitative percentile of 66.78 and non-completers had an overall quantitative percentile mean of 58.80. The results of the analysis of these differences indicated that the differences between completers and non-completers quantitative percentile mean were statistically significant ($t = -4.80, p < .0001$).

Table 2

Comparison of Quantitative Percentile Mean Score for Completers and Non-Completers

<u>Quantitative percentile</u>	<u>U.S. citizens</u>		<u>Foreign students</u>		<u>Permanent residents</u>	
	<u>N</u>	<u>Mean</u>	<u>N</u>	<u>Mean</u>	<u>N</u>	<u>Mean</u>
Completers	2029	61.76	450	85.95	85	73.86
Non-completers	428	58.23	56	80.23	16	67.31

Table 2 shows the differences in quantitative percentile means between completers and non-completers, and between U.S. citizens, foreign students and permanent residents. An analysis of variance was conducted to reveal if there were statistically significant differences in quantitative percentiles for completers between U.S. citizens, foreign students and permanent residents. Results from the analysis indicated a statistically significant difference between the three groups and quantitative percentile ($F [2063] = 193.66, p < .0001$). Further examination found that the differences between quantitative percentile mean of foreign students, 85.95 ($SD = 18.41$), and permanent residents, 73.86 ($SD = 20.74$) were statistically significant at .05 levels. The analysis of differences between quantitative percentile mean for foreign students and U.S. citizens, 61.76 ($SD = 22.93$) were also statistically significant at the .05 levels. The differences

between quantitative percentile mean for U.S. citizens and permanent residents were also statistically significant at the .05 levels.

An analysis of variance was also conducted to reveal if there were significant differences in quantitative percentile means for non-completers between U.S. citizens, foreign students and permanent residents. Results from the analysis indicated a statistically significant difference between foreign students, U.S. citizens and permanent residents who did not complete the degree, and quantitative percentile mean ($F [500] = 21.50, p < .0001$). Further examination found that the differences for non-completers quantitative percentile mean between U.S. citizens, $58.23 (SD = 24.39)$ and foreign students, $80.23 (SD = 19.05)$ were statistically significant at the .05 levels. Differences between permanent residents, $67.31, (SD = 26.79)$ and foreign students, and between permanent residents and U.S. citizens were not statistically significant at the .05 levels.

Results of differences in quantitative percentile mean between completers and non-completers for U.S. citizens showed a statistically significant difference between completers and non-completers ($t = -2.79, p < .0001$). The results of the analysis of differences in quantitative percentile mean between completers and non-completers for foreign students also revealed there were statistically significant differences ($t = -2.17, p < .05$). The results of the analysis of differences between completers and non-completers in quantitative percentile mean for permanent residents did not show a statistically significant difference between completers and non-completers ($t = -1.07, p = .29$).

TOEFL Total Mean Scores. Of all the students included in this study, the mean TOEFL total score was 602.52 for completers and 591.90 for non-completers. Results of the analysis of differences indicated there were no statistically significant differences

between the mean TOEFL scores for completers and non-completers ($t = -1.73, p=.08$).

Table 3

Comparison of TOEFL Total Mean Scores for Completers and Non-Completers

<u>TOEFL total mean Scores</u>	U.S. citizens		Foreign students		Permanent residents	
	N	Mean	N	Mean	N	Mean
Completers	12	601.67	414	602.78	27	598.99
Non-completers	4	600.00	50	594.20	4	555.00

U.S. citizens and permanent residents are not required to take the TOEFL examination to be considered for admission into graduate degree programs. As shown in Table 3, of the U.S. citizens who took the examination, those who completed the degree had a mean total score of 601.67 and those who did not complete the degree had a mean TOEFL total score of 600.00. The results of the analysis of differences between completers and non-completers in TOEFL total mean for U.S. citizens showed no statistically significant differences for completers and non-completers. Among foreign students, those who completed the degree had a mean TOEFL total score of 602.78 and non-completers had a mean TOEFL total score of 594.20. The results of the analysis of differences between foreign student completers and non-completers were not statistically significant ($t = -1.31, p = .19$). In comparing mean total TOEFL scores of the permanent residents who took the examination, permanent residents who completed the degree had a mean TOEFL total score of 598.99 and those who did not complete the degree had a mean TOEFL total score of 555.00. The results of the analysis of differences for permanent residents between completers and non-completers and TOEFL total mean score were not statistically significant ($t = -1.69, p = .10$).

An analysis of variance was conducted to reveal if there were statistically significant differences in TOEFL total mean scores for completers between U.S. citizens,

foreign students and permanent residents. Results from the analysis indicated there was no statistically significant differences between the three groups in TOEFL total mean score ($F [453] = .10, p = .90$).

Noncognitive Characteristics

Noncognitive characteristics for those students who completed the degree and those who did not were also reviewed to evaluate the differences between U.S. citizens, foreign students, and permanent residents. The noncognitive characteristics included age, gender, academic field, country of citizenship, financial support from the university, full-time enrollment, and changing majors.

Age. As shown in Table 4, mean age among foreign students who completed their degree was 25.45 and the mean age for those who did not complete was 25.83 years. The results of the analysis of foreign students indicated there were not statistically significant differences between the mean age of completers and non-completers, ($t = .85, p = .40$). Among U.S. citizens, non-completers had a mean age of 28.67 and completers had a mean age of 27.21. The analysis indicated that for U.S. citizens, completers had statistically significantly lower mean age than non-completers, ($t = 4.91, p < .0001$). Among permanent residents, non-completers had a mean age of 31.79 years and completers had a mean age of 29.82 years. The results of the analysis of permanent residents indicated there were not statistically significant differences between the mean age of completers and non-completers, ($t = 1.36, p = .18$).

Table 4

Comparison of Mean Age for Completers and Non-Completers

<u>Age</u>	<u>U.S. citizens</u>	<u>Foreign students</u>	<u>Permanent residents</u>
	Mean age	Mean age	Mean age
Completers	27.21	25.45	29.82
Non-completers	28.67	25.83	31.79

The overall results indicated that there were statistically significant differences between the mean age for completers and non-completers ($t = 5.93, p < .0001$). The results showed that completers had statistically significantly lower mean age than non-completers.

An analysis of variance was conducted to reveal if there were significant differences in age between U.S. citizens, foreign students and permanent residents who completed the degree. Results from this analysis indicated a statistically significant difference between foreign students, U.S. citizens and permanent residents and mean age of completers ($F [2530] = 31.01, p < .0001$). Further examination found that the differences between mean age for U.S. citizens, 27.21 ($SD = 5.96$), and permanent residents, 29.82 ($SD = 6.82$), between permanent residents and foreign students, 25.45 ($SD = 3.89$), and between U.S. citizens and foreign students were all statistically significant at the .05 levels.

An analysis of variance was also conducted to reveal if there were significant differences in age between U.S. citizens, foreign students and permanent residents who did not complete the degree. Results from the analysis indicated a statistically significant difference between foreign students, permanent residents and U.S. citizens in mean age for non-completers, ($F [723] = 9.49, p < .0001$). Further examination found that the differences between mean age for U.S. citizen non-completers, 28.67 ($SD = 7.60$), and

permanent resident non-completers, 31.79 ($SD = 7.64$), between permanent residents and foreign students, 25.82, ($SD = 3.58$), and between foreign students and U.S. citizens mean age of non-completers were all statistically significant at the .05 levels.

Gender. Overall, the distribution between males and females was similar. There were 1,619 (49.71%) female and 1,638 (50.29%) male students.

Table 5

Comparison of Gender for Completers and Non-Completers

<u>Gender</u>	<u>Total</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
U.S. citizens						
Male	1,183	46.50	294	24.94	889	75.15
Female	1,361	53.50	308	22.63	1,053	77.37
Foreign students						
Male	383	64.37	62	16.19	321	83.82
Female	212	35.63	25	11.79	187	88.21
Permanent residents						
Male	72	61.02	20	27.78	52	72.22
Female	46	38.98	13	28.26	33	71.74

As can be seen in Table 5, for U.S. citizens, there were more females (53.50%) than males (46.50%). However, for foreign students there were more males (64.37%) than females (35.63%). For permanent residents, there were more males (61.02%) than females (38.98%). A chi-square test was used to investigate the relationship between gender and degree completion. The results showed the relationship was not statistically significant (*chi-square* with one degree of freedom = 1.28, $p = .26$).

For both U.S. citizens and foreign students, the percentage of males who did not graduate was larger than the percentage of females who did not graduate. Permanent residents had the largest percentage of male students who did not graduate (27.78 %). A

chi-square test was used to investigate this relationship and the results showed that for permanent residents, the relationship between gender and degree completion was not statistically significant (*chi-square* with one degree of freedom = .00, $p = .95$). The percentage of male U.S. citizens who did not complete the degree (24.94 %) was larger than the percentage of male foreign students who did not complete the degree (16.19 %). A chi-square test was used to investigate this relationship and the results showed that for U.S. citizens, the relationship between gender and degree completion was not statistically significant (*chi-square* with one degree of freedom = 1.86, $p = .17$). The percentage of female foreign students who did not complete the degree (11.79%) was smaller than the percentage of females from the U.S. who did not complete the degree (22.63%). A chi-square test was used to investigate this relationship and the results showed that for foreign students, the relationship between gender and degree completion was not statistically significant (*chi-square* with one degree of freedom = 2.11, $p = .15$).

Permanent residents had the largest percentage of female students who did not graduate (28.26%). Of the students who did not complete the degree, more of the non-completers were males (52.1%) than females (47.9%). A chi-square test was used to investigate the relationship between gender and degree completion for U.S. citizens, foreign students and permanent residents. The results showed the relationship between gender and degree completion was not statistically significant (*chi-square* with one degree of freedom = 1.28, $p = .26$).

Country of citizenship. As can be seen in the below table comparing the country of citizenship, all U.S. citizens were considered to be from North America. Of the U.S. citizens, 23.70% did not complete the degree.

Table 6

Comparison of Country of Citizenships for Completers and Non-Completers

<u>Citizenship</u>	<u>Total</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
<i>U.S. citizens</i>						
North America	2,534	100	603	23.70	1,931	76.20
<i>Foreign students</i>						
Eastern Europe	27	4.55	5	18.52	22	81.48
Western Europe	52	8.75	13	25.00	39	75.00
South Asia	165	27.78	28	16.97	137	83.03
East Asia	208	35.02	22	10.58	186	89.42
Southeast Asia	54	9.09	9	16.67	45	83.33
Middle East	18	3.03	2	11.11	16	88.89
Latin and						
South America	43	7.24	3	6.98	40	93.02
Africa	13	2.19	3	23.08	10	76.92
North America	14	2.36	2	14.29	12	85.71
<i>Permanent residents</i>						
Eastern Europe	8	6.84	4	50.00	4	50.00
Western Europe	17	14.53	4	23.53	13	76.47
South Asia	24	20.51	4	16.67	20	83.33
East Asia	29	24.79	8	27.59	21	72.41
Southeast Asia	4	3.42	0	0	4	100.00
Middle East	8	6.84	4	50.00	4	50.00
Latin and						
South America	6	5.13	1	14.29	5	83.33
Africa	13	11.11	7	53.85	6	46.15
North America	8	6.84	1	12.50	7	87.50

The majority of foreign students came from East Asia (35.02%), of which 10.58% did not complete the degree. The second largest percentage of foreign students came from South Asia (27.78%), of which 16.67% did not graduate. The smallest number of foreign students came from Africa (2.19%), and 23.08% of these students did not graduate. A relatively small percentage of the foreign students came from Western Europe (8.75 %); however, this group had the largest percentage of foreign students who did not complete the degree (25.00%).

The largest number of permanent residents came from East Asia (24.79%), of which over a quarter did not complete the degree (27.59%). The second largest number came from South Asia (20.51%), and 16.67% of these students did not complete the degree. The smallest number of permanent residents came from Southeast Asia (3.42%), and all of these students completed the degree. A relatively small portion of the permanent residents came from Eastern Europe (6.84%) and the Middle East (6.84%); however, in both these groups, 50.00% of the students did not complete the master's degree. A chi-square test was used to investigate the relationship between country of citizenship and whether or not students completed the degree. The results showed there was a statistically significant relationship between country of citizenship and whether or not students completed the degree (*chi-square* with eight degrees of freedom =30.26, $p < .00$).

Financial support from the university. For the entire sample, 813 (24.96%) received financial support from the university in the form of scholarships, fellowships, assistantships, or grants, while 2,444 (75.04%) did not receive funding from the university.

Table 7 breaks down financial support between U.S. citizens, foreign students, and permanent residents, and compares completers with non-completers. Although the distribution of financial support from the university between U.S. citizens, foreign students, and permanent residents was nearly identical, U.S. citizens had the largest proportion of students receiving support (25.47%), foreign students had the second largest (23.53%), and permanent residents had the smallest proportion of students receiving financial support (21.19%).

Table 7

Comparison of Financial Support From the University for Completers and Non-Completers

<u>Financial Support</u>	<u>Total</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
U.S. citizens						
Yes	648	25.47	86	13.27	562	86.73
No	1,896	74.53	517	27.28	1,379	72.73
Foreign students						
Yes	140	23.53	13	9.29	127	90.71
No	455	76.47	74	16.26	381	83.74
Permanent residents						
Yes	25	21.19	6	24.00	19	76.00
No	93	78.81	27	29.00	66	70.97

Regardless of whether or not the students received financial support, the majority of all students—whether U.S. citizens, foreign students, or permanent residents—completed the degree. Foreign students had both the largest proportion of students who completed the degree without receiving financial support and the largest proportion of students who completed the degree with financial support. Permanent residents had the largest proportion of students who did not complete the degree between both the permanent residents who received financial support and those who did not. A chi-square test was used to investigate the relationship between financial support from the University and completion of the degree. The results showed there was a statistically significant relationship between financial support and degree completion (*chi-square* with one degree of freedom = 54.06, $p < .0001$).

Full-time or part-time enrollment. As can be seen in Table 8, which compares full-time and part-time enrollment at the beginning of graduate studies for U.S. citizens, foreign students, and permanent residents, foreign students had the largest proportion of

students enrolled full-time (81.68%). This is likely the result of immigration laws that require foreign students to be enrolled full-time to maintain their student status.

Table 8

Comparison of Full-Time or Part-Time Enrollment for Completers and Non-Completers

<u>Enrollment</u>	<u>Total</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
U.S. citizens						
Full-time	1,412	55.50	237	16.78	1,175	83.22
Part-time	1,132	44.50	366	32.33	766	67.67
Foreign students						
Full-time	486	81.68	51	10.49	435	89.51
Part-time	109	18.32	36	33.03	73	66.97
Permanent residents						
Full-time	64	54.24	16	25.00	48	75.00
Part-time	54	45.76	17	31.48	37	68.52

Of those foreign students enrolled full-time, the majority of them completed the degree (89.51%). Permanent residents had the smallest proportion of students enrolled full-time (54.24%) and yet of those, 25.00% did not graduate. U.S. citizens had 55.50% enrolled full-time and 83.22% of those students completed the degree. For all three groups, more students completed the degree than did not, regardless of whether they were enrolled full-time or part-time. A chi-square test was used to investigate the relationship between full-time or part-time enrollment and degree completion. The results showed there was a statistically significant relationship between full-time or part-time enrollment and degree completion (*chi-square* with one degree of freedom = 128.41, $p < .0001$).

Changed majors during degree program. For the overall population, 3,065 students (94.12%) did not change majors, and only 192 (5.88%) changed majors during their master's degree.

Table 9

Comparison of Whether or Not Students Changed Majors for Completers and Non-Completers

<u>Changed Majors</u>	<u>Total</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
U.S. citizens						
No	2,428	95.44	594	24.46	1,834	75.54
Yes	116	4.56	9	7.76	107	92.24
Foreign students						
No	525	88.24	86	16.38	439	83.62
Yes	70	11.76	1	1.43	69	98.57
Permanent residents						
No	112	94.92	33	29.46	79	70.54
Yes	6	5.08	0	0	6	100.00

As shown in Table 9, U.S. citizens had the smallest proportion of students change majors (4.56%), and 7.76% of those students did not complete the degree. Permanent residents had a similar proportion of students (94.92%) who did not change majors; however, this group had the largest proportion of students who did not complete the degree (29.46%). Foreign students had the largest proportion change majors (11.76%); however, this group was also the smallest proportion of the students who did not complete the degree (1.43%). A chi-square test was used to investigate the relationship between changing majors and degree completion. The results showed there was a statistically significant relationship between changing majors and degree completion (*chi-square* with one degree of freedom = 34.10, *p* < .0001).

Academic field. Of the 3, 257 students, the overall distribution of students among the different colleges was as follows: 20.00% were in the social sciences, 23.52% were in the arts and humanities, 7.09% were in the sciences, 29.81% were in business, and 17.50% were in engineering. The number of non-completers enrolled in each degree program

were: social sciences, 193 (26.69%); arts and humanities, 205 (28.35%), sciences, 69 (9.54%), business, 101 (13.97%), and engineering, 155 (21.44%).

As can be seen from Table 10, foreign students had the majority of their master's degree students concentrated in business (40.67%), of which 6.61% did not complete the degree and 94.49% completed the degree. Among the 32.77% of foreign student, enrolled in engineering, 18.46% did not complete the degree and 81.54% did. The distribution of foreign graduate students among the other three colleges was relatively equal with social sciences having 8.40% of foreign student enrollment of which 14.00% were non-completers and 86.00 were completers. Sciences had an enrollment of 8.40% of the foreign graduate student population, of which 26.00% were non-completers and 74.00% were completers. Finally, arts and humanities had 9.75% portion of total foreign student enrollment of which 25.86% did not complete the degree and 74.14% completed the degree.

The majority of U.S. citizens were divided between the social sciences (25.67%), business (27.24%,) and the arts and humanities (26.97%). For those U.S. citizens enrolled in business, 11.83% did not complete the degree and 88.17% did. The smallest proportion of U.S. citizens was enrolled in the sciences (6.56%), of which 30.54% did not complete the degree and 69.46% completed the degree. Engineering had a relatively small proportion of U.S. citizens (13.56%), of which 31.30% were non-completers and 68.70% were completers. For those U.S. citizens enrolled in the social sciences, 28.02% did not complete the degree and 71.98% completed it.

Among permanent residents, the majority of graduate students were in business (30.51%) and engineering (25.42%). The third largest number of permanent residents was

enrolled in the arts and humanities (18.64%), followed by the social sciences (13.56%), and the sciences (11.86%). Among permanent residents were completers or non-completers by discipline as follows: business, 8.33% non-completers and 91.67% completers; engineering, 33.33% non-completers and 63.33% completers; arts and humanities, 50.00% non-completers and 50.00% completers; and, sciences, 35.71% non-completers and 64.29% completers.

Table 10

Comparison of Academic Field for Completers and Non-Completers

<u>Academic field</u>	<u>All</u>		<u>Non-completers</u>		<u>Completers</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
U.S. citizens						
Social Sciences	653	25.67	183	28.02	470	71.98
Arts & Humanities	686	26.97	179	26.09	507	73.91
Sciences	167	6.56	51	30.54	116	69.46
Business	693	27.24	82	11.83	611	88.17
Engineering	345	13.56	108	31.30	237	68.70
Foreign students						
Social Sciences	50	8.40	7	14.00	43	86.00
Arts & Humanities	58	9.75	15	25.86	43	74.14
Sciences	50	8.40	13	26.00	37	74.00
Business	242	40.67	16	6.61	226	93.39
Engineering	195	32.77	36	18.46	159	81.54
Permanent residents						
Social Sciences	16	13.56	3	18.75	13	81.25
Arts & Humanities	22	18.64	11	50.00	11	50.00
Sciences	14	11.86	5	35.71	9	64.29
Business	36	30.51	3	8.33	33	91.67
Engineering	30	25.42	11	33.33	19	63.33

A chi-square test was used to see if there was a relationship between whether or not students received the degree and academic field. The results indicated that there were statistically significant relationships between academic field and degree completion (*chi-square* with four degrees of freedom = 112.57, $p < .0001$).

Summary of Cognitive and Noncognitive Characteristics

As can be seen in the analysis of the cognitive and noncognitive characteristics presented in this section, there were some differences between foreign students, permanent residents, and U.S. citizens. There were also some differences between graduate students who completed their degree and those who did not. Below is a brief summary of these characteristics.

For U.S. citizens, those students who completed the degree had a mean age of 27.21 and those who did not complete had a mean at of 28.87. For permanent residents, those who completed the degree had a mean age of 29.82 and those who did not complete the degree had a mean age of 31.79. The mean age for foreign students who completed the degree was 25.45 and the mean age for the non-completer foreign students was 25.83 year. These differences were statistically significant.

For both U.S. citizens and foreign students, the percentage of males who did not graduate was larger than the percentage of females who did not graduate. Permanent residents had the largest percentage of male students who did not graduate (27.78%). The percentage of male U.S. citizens who did not complete the degree (24.94%) was larger than the percentage of male foreign students who did not complete the degree (16.19%). The percentage of female foreign students who did not complete the degree (11.79%) was smaller than that of females from the U.S. who did not complete the degree (22.63%).

Permanent residents had the largest percentage of female students who did not graduate (28.26%). These differences were not statistically significant.

In looking at country of citizenship, among foreign students, those from Western Europe had the largest group of students who did not graduate (25.00%). For permanent residents, students from the Middle East and Eastern Europe both had a 50.00/50.00% split between those students who graduated and those who did not complete the degree. For permanent residents from Africa, more students did not complete (53.85%) the degree than graduated (46.15%). These differences were statistically significant.

The distribution of financial support from the university was relatively identical between each of the three groups of master's degree students. U.S. citizens had the largest proportion of students receiving support (25.47%), foreign students had the second largest (23.53%) and permanent residents had the smallest (21.19%). These results were statistically significant.

Foreign students had the largest proportion of students enrolled full-time while permanent residents had the smallest proportion. For permanent residents, foreign students, and U.S. citizens, more students completed the degree than did not, regardless of whether they were enrolled full-time or part-time. These results were statistically significant.

For the overall population, the majority of the students (94.12%) did not change majors during their master's degree. U.S. citizens had the smallest proportion of students change majors (4.56%) and foreign students had the largest proportion of students change majors (11.76%). The percentage of students who completed the degree was larger for those students who changed majors in all three groups of graduate students. These results

were statistically significant.

Foreign students had the majority of their master's degree students enrolled in business (40.67%) and engineering (32.77%). Permanent residents also had the majority of their master's degree students concentrated in business (30.51%) and engineering (25.42%). The majority of U.S. citizens were divided between the social sciences (25.67%), business (27.24%), and the arts and humanities (26.97%). These results were statistically significant.

U.S. citizens, permanent residents, and foreign students who completed the degree had higher verbal percentile scores, higher quantitative percentile scores, and higher total TOEFL scores than those who did not complete the degree. Further investigation showed the differences between completers and non-completers TOEFL scores were not statistically significant. The results of the analysis of differences between completers and non-completers and quantitative percentile mean were statistically significant. In addition, the results of the analysis of differences between completers and non-completers and verbal percentile mean were statistically significant.

Analysis of Differences between U.S. Citizens, Foreign Students, and Permanent Residents

The next section examines the results of a series of analysis of variance tests (ANOVA). Fisher's LSD multiple comparison procedure was used. These tests revealed whether there were significant differences among groups. The analysis of variance between U.S. citizens, permanent residents, and foreign students and the three measures of academic success were evaluated. Because the study included the measures of academic success at the time of degree completion, this section only examines those students who completed the degree.

Analysis of Differences in Final GPA

An analysis of variance was conducted to reveal if there were significant differences in final GPA between U.S. citizens, foreign students, and permanent residents. Results from this analysis indicated a statistically significant difference between foreign students, U.S. citizens, and permanent residents, and final GPA, ($F[2534] = 18.51, p < .0001$). Further examination found that the differences between final GPA for foreign students, 3.58 ($SD = .27$), and permanent residents, 3.59 ($SD = .28$), were not statistically significant at the .05 levels. The analysis of differences between U.S. citizens mean GPA 3.66 ($SD = .26$), compared to permanent residents mean GPA 3.59 ($SD = .28$) and U.S. citizens compared to foreign students' mean GPA of 3.58 ($SD = .27$), found they both were statistically significant at the .05 levels. This shows that there were statistically significant differences between final GPA for U.S. citizens and foreign students, and between final GPA for U.S. citizens and permanent residents. In both cases, U.S. citizens had higher average final GPAs than permanent residents and foreign students.

Analysis of Differences in Number of Credits Completed

An analysis of variance was conducted to examine if there were significant differences in the mean number of credits completed at graduation between U.S. citizens, foreign students, and permanent residents. U.S. citizens ($N = 1941$) on average completed 43.40 ($SD = 13.55$) total credits, foreign students ($N = 508$) on average completed 43.32 ($SD = 13.87$) total credits, and permanent residents ($N = 85$) on average completed the fewest final number of credits at 41.62 ($SD = 14.11$). Further examination of the

differences between means found none of the comparisons of total number of credits completed were statistically significant at the .05 level, $F(2534) = .70, p > .50$.

Analysis of Differences in Number of Semesters

An analysis of variance was conducted to reveal if there were significant differences in total number of semesters completed between U.S. citizens, foreign, students and permanent residents. Results from the one-way analysis of variance indicated there was a statistically significant difference between foreign students, U.S. citizens, and permanent residents and final number of semesters taken to complete the degree, $F(2534) = 20.14, p < .0001$. Further examination found U.S. citizens ($N = 1941$) on average had a final number of semesters of 5.14 ($SD = 1.69$), foreign students ($N = 508$) on average took the least number of semesters of 4.61 ($SD = 1.66$), and permanent residents ($N = 85$) on average took the most number of semesters of 5.16 ($SD = 1.68$). It was found that for foreign students and permanent residents, and for U.S. citizens and foreign students, the differences between means of total number of semesters taken to complete the degree were statistically significant at the .05 levels. In both of these cases, foreign students took fewer semesters to complete the degree. The difference between means for U.S. citizens and permanent residents for total number of semesters taken to complete the degree was not statistically significant at the .05 levels.

Summary of Analysis of Variance and Differences Between Means

Examination of differences between means found that differences between final GPA for foreign students and permanent residents were not statistically significant at the .05 levels. The comparisons between U.S. citizens and permanent residents mean GPAs and U.S. citizens and foreign students' mean GPAs were statistically significant. There

were no significant differences between the three groups in the total mean number of credits completed. In the analysis of variances and the differences between means for total number of semesters taken to complete the degree, it was found that foreign students completed the degree in fewer semesters (4.61) than permanent residents (5.16), and that foreign students completed the degree in fewer semesters (4.61) than U.S. citizens (5.14). These differences were both statistically significant at the .05 levels. The differences between means for U.S. citizens and permanent residents for total number of semesters taken to complete the degree were not statistically significant.

Analysis of Cognitive and Noncognitive Factors in Predicting Academic Success

The researcher used a series of multiple regression analyses to investigate the predictive effects of cognitive and noncognitive factors on the academic success of master's degree students, after controlling for differences in input characteristics. Because most of the independent variables were categorical, dummy variables were constructed for each categorical independent variable. Separate regressions were then run for permanent residents, foreign students, and U.S. citizens to compare differences in the predictor variables among the three groups.

Question One: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by graduate grade point average at the time of degree completion (FINLGPA)?

Table 11

The Effects of Predictor Variables on Final GPA of Degree Completers

Variable	Parameter estimate	Standard error	t value	pr > [t]
Permanent residents	.03	.07	.48	.63
Foreign students	.07	.06	1.09	.28
Gender (male)	-.04	.01	-3.07	.00**
Financial support	.01	.01	.46	.65
Enrolled full-time	-.00	.01	-.03	.97
Changed majors	.02	.02	.80	.42
Age	.00	.00	2.91	.00**
Africa	-.19	.11	-1.70	.09
Eastern Europe	-.07	.08	-.88	.38
Western Europe	-.04	.07	-.56	.57
South Asia	-.05	.06	-.70	.49
East Asia	-.12	.07	-1.81	.07
Southeast Asia	-.07	.08	-.85	.39
Middle East	.04	.09	.49	.62
South America	-.13	.08	-1.66	.10
Arts & Humanities	-.06	.02	-3.61	.00**
Sciences	-.13	.03	-5.21	<.00**
Business	-.15	.02	-8.42	<.00**
Engineering	-.17	.02	-7.67	<.00**
Verbal exam	.06	.01	5.83	<.00**
Quant. exam	.04	.01	3.41	.00**
<i>R</i> ²		.11		
Adjusted <i>R</i> ²		.10		
<i>F</i> for Change in <i>R</i> ²		11.50**		

Note: $p < .05 = **$

As shown in Table 11, the results of the analysis for all graduate students indicated that the model was statistically significant at the .05 levels ($F = 11.50, p < .05$), indicating that the variables included in the model explained a significant portion of the variance (adjusted $R^2 = .10$) in final GPA. Further analysis identified that gender; age; the verbal examination; the quantitative examination; and the academic fields of art and humanities, business, and engineering were all statistically significant at the .05 levels

and were associated with the variance in final GPA. Further analysis of those variables that were statistically significant showed that males appeared to have lower GPAs than females. Older students appeared to have higher GPAs at degree completion. Using social sciences as the comparison group, the results showed that arts and humanities students' GPAs were lower than those in the social sciences. Science students' GPAs were lower than social science GPAs. Business GPAs were lower than students in the social sciences, and engineering students' GPAs were lower than social sciences students' GPAs. Those students with higher verbal percentiles appeared to have higher GPAs, and those students with higher quantitative percentiles appeared to have higher GPAs by .04 points.

In summary, this multiple regression analyses model found that students' final master's degree GPAs were significantly affected by gender, age, the subject they studied, and their percentile ranking in both the quantitative and verbal scores. Approximately 10% of the variance in final GPA can be attributed to the variation in the combination of these predictor variables.

The next three regressions look at U.S. citizens, foreign students, and permanent residents separately to evaluate differences among the three groups in the predictor variables effect on final graduate GPA.

The results of the analysis of U.S. citizens who completed the degree included in the multiple regression (Table 22) indicated that the model was statistically significant at the .05 level ($F = 14.43, p < .05$), meaning the variables included in the model explained a significant portion (adjusted $R^2 = .08$) of the variance in final GPA for U.S. citizens. Further analysis identified that gender; age; the academic fields of arts and humanities, sciences, business, and engineering, and the verbal examination and the quantitative

examination were all statistically significant at the .05 levels and were associated with the variance in final GPA. The regression showed that males appeared to have lower GPAs than females; older students were more likely to have higher GPAs; those students in the social sciences were likely to have higher GPAs than those students in the arts and humanities, sciences, and engineering; and those students with higher verbal examination percentile rankings and those with higher quantitative percentile rankings appeared to have higher GPAs. The combination of predictor variables accounted for approximately 8% of the variance in final GPA.

Table 12

The Effects of Predictor Variables on Final GPA of U.S. Citizen Degree Completers

Variable	Parameter estimate	Standard error	t value	<i>pr > t </i>
Gender (male)	-0.03	0.01	- 2.54	0.01**
Financial support	0.00	0.01	0.20	0.84
Enrolled full-time	-0.00	0.01	0.24	0.81
Changed majors	0.02	0.03	.91	0.36
Age	0.00	0.00	3.35	0.00**
Arts & Humanities	-0.06	0.02	- 3.26	0.00**
Sciences	-0.14	0.02	- 5.12	<.00**
Business	-0.15	0.02	- 8.29	<.00**
Engineering	-0.20	0.03	- 7.63	<.00**
Verbal exam	0.03	0.01	2.56	0.01**
Quantitative exam	0.05	0.01	4.14	<.00**
<i>R</i> ²		.09		
Adjusted <i>R</i> ²		.08		
<i>F</i> for Change in <i>R</i> ²		14.43**		

Note: *p* < .05 = **

The next multiple regression examines the effects of the predictor variables on the final GPA for foreign students. As shown in Table 13, the results of the analysis of the multiple regression for the foreign students who completed their degree indicated that the

model was statistically significant at the .05 level ($F = 3.58, p < .05$), meaning the variables included in the model explained a significant portion of the variance in final GPA for foreign students (adjusted $R^2 = .09$)

Table 13

The Effects of Predictor Variables on Final GPA of Foreign Student Degree Completers

Variable	Parameter estimate	Standard error	t value	$pr > t $
Gender	-0.07	0.03	- 2.04	0.04**
Financial support	0.03	0.04	0.73	0.47
Full-time enrollment	-0.03	0.05	- 0.56	0.58
Changed majors	0.01	0.04	0.27	0.79
Age	0.00	0.01	0.56	0.58
Arts & Humanities	- 0.17	0.09	- 1.90	0.06
Sciences	- 0.19	0.08	- 2.31	0.02**
Business	- 0.17	0.06	- 2.60	0.01**
Engineering	- 0.13	0.06	- 1.99	0.05**
Verbal exam	0.05	0.03	1.75	0.08
Quant. exam	0.06	0.05	1.06	0.29
R^2	.14			
Adjusted R^2	.09			
F for Change in R^2	3.58**			

Note: $p < .05 = **$

Further analysis identified that gender and the academic fields of the sciences, business, and engineering were all statistically significant at the .05 levels and were associated with the variance in final GPA. This analysis showed that men appeared to have lower GPAs than women, and those foreign students enrolled in the sciences, business, and engineering all appeared to have lower final GPAs than those foreign students enrolled in the social sciences (the comparison group). This combination of predictor variables accounted for approximately 9% of the variance in final GPA for foreign students.

The next multiple regression examined the effects of the predictor variables on the final GPA of permanent resident degree completers.

Table 14

<i>The Effects of Predictor Variables on Final GPA of Permanent Resident Degree Completers</i>				
Variable	Parameter estimate	Standard error	t value	pr > t
Gender	-0.09	0.08	-1.10	0.28
Financial support	0.01	0.09	0.09	0.93
Full-time enrollment	0.12	0.07	1.56	0.12
Changed majors	0.03	0.11	0.27	0.79
Age	-0.00	0.01	-0.14	0.89
Arts & Humanities	-0.09	0.13	-0.66	0.51
Sciences	0.04	0.13	0.29	0.77
Business	0.13	0.12	1.08	0.28
Engineering	-0.16	0.13	-1.29	0.20
Verbal exam	0.06	0.04	1.44	0.16
Quantitative exam	0.02	0.12	0.18	0.86
<i>R</i> ²	.29			
Adjusted <i>R</i> ²	.15			
<i>F</i> for Change in <i>R</i> ²	2.10**			

Note: $p < .05 = **$

The results of the above analysis of permanent residents included in the multiple regression indicated that the model was statistically significant at the .05 level ($F = 2.10$, $p < .05$), meaning the variables included in the model explained a significant portion of the variance in final GPA (adjusted $R^2 = .15$). Further analysis did not identify any of the individual predictor variables to be statistically significant at the .05 levels and were not associated with the variance in final GPA. The combination of the predictor variables accounted for approximately 15% of the variance in final GPA for permanent residents. In the regressions the slopes are partial slopes that look at the predictive value of each variable above and beyond all others in the regression model. For this reason it is possible to obtain a result where the overall regression is significant but no one variable stands out

above the rest.

The researcher then examined the slopes of the individual predictor variables to determine whether the affect of the predictor variables on the final GPA of the students differed across the three groups (permanent residents, U.S. citizens, and foreign students). This was done by conducting a *t* test for the differences between the two slopes of a predictor variable. If the *t* test was statistically significant at the .05 levels, this meant the predictor variable affected the final GPA of the students differently across the two groups.

In comparing foreign students and permanent residents the only predictor that was statistically significant at the .05 levels was the variable academic field of study in business. Since this is a dummy variable, the difference in slope means that the difference in average final GPA between business and social sciences (reference group) was bigger for one group than the other. Based upon this analysis, the difference between business and social sciences average final GPA was larger for foreign students (slope = -.17) than it was for permanent residents (slope = .13), after controlling for all other variables in the model. Because of the difference in sign of slopes, foreign business students had lower average final GPAs than foreign social science students, whereas permanent resident business students had higher GPAs than permanent resident social sciences students.

Based upon the analysis of U.S. citizens and permanent residents, the difference between business and social science average final GPA was larger for U.S. citizens (slope = .15) than it was for permanent residents (slope = .13) after controlling for all other variables in the model. There was no difference in sign of the slopes indicating that U.S. citizen business students and permanent resident business students both had higher GPAs

than U.S. citizen social science students and permanent resident social sciences students.

Question Two: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how long (the number of semesters) it took them to complete the degree?

Table 15

The Effects of Predictor Variables on Total Number of Semesters Taken to Complete the Degree

Variable	Parameter estimate	Standard error	t value	pr > t
Permanent residents	0.09	0.40	0.22	.83
Foreign students	- 0.08	0.37	- 0.21	.83
Gender	0.16	0.07	2.21	.03**
Financial support	0.18	0.08	2.30	.02**
Full-time enrollment	-1.51	0.08	-19.50	<.00**
Changed majors	0.21	0.13	1.65	.10
Age	0.00	0.01	0.28	.78
Africa	0.27	0.68	0.40	.69
Eastern Europe	- 0.01	0.48	- 0.02	.98
Western Europe	- 0.17	0.44	- 0.39	.69
South Asia	0.09	0.39	0.23	.82
East Asia	- 0.04	0.39	- 0.09	.93
Southeast Asia	- 0.46	0.45	- 1.02	.31
Middle East	0.73	0.54	1.36	.17
South America	-0.01	0.48	- 0.02	.99
Arts & Humanities	- 0.35	0.11	- 3.27	.00**
Sciences	0.43	0.15	2.86	.00**
Business	-0.40	0.11	- 3.79	.00*
Engineering	-0.44	0.13	- 3.28	.00*
Verbal exam	0.10	0.07	1.43	.15
Quant. exam	- 0.06	0.07	- 0.86	.39
<i>R</i> ²	0.20			
Adjusted <i>R</i> ²	0.19			
<i>F</i> for Change in <i>R</i> ²	23.64**			

Note: $p < .05 = **$

As shown in Table 15, the results of the analysis for all students indicated that the model was statistically significant at the .05 levels ($F = 23.64, p < .05$), meaning the variables included in the model explained a significant portion of the variance (adjusted $R^2 = .19$) in total number of semesters taken to complete the degree. The analysis

identified that gender; financial support from the university; full-time enrollment; and arts and humanities, sciences, business, and engineering were statistically significant at the .05 levels and associated with the variance in total number of semesters taken to complete the degree. The statistically significant predictor variables in Table 15 shows that males appeared to take longer to complete their degree than females. Those students who received financial support from the university appeared to take longer to complete their degree than those students who did not receive financial support. Those students who went full-time completed their degree in less time than those who did not attend full-time. Students in the arts and humanities took less time than those in the social sciences. Students in the sciences took more time to complete their degrees than those in the social sciences. Those students studying business took fewer semesters to complete the degree than those students in the social sciences, and those students in engineering took fewer semesters to complete the degree than those in the social sciences. This combination of predictor variables accounted for approximately 19% of the variance in the total number of semesters it took to complete the degree.

The next three regressions look at U.S. citizens, permanent residents, and foreign students separately to evaluate differences among the three groups. Table 16 shows the results for the multiple regression analysis conducted to determine the effects of the predictor variables in the academic success of U.S. citizens as measured by total number of semesters taken to complete the degree.

Table 16

The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by U.S. Citizens

Variable	estimate	Parameter error	Standard t value	pr > t
Gender	0.15	0.08	1.84	0.07
Financial support	0.22	0.09	2.45	0.01**
Full-time enrollment	-1.59	0.08	-18.82	<.00**
Changed majors	0.25	0.16	1.54	0.12
Age	0.01	0.01	1.12	0.26
Arts & Humanities	-0.32	0.11	-2.95	0.00**
Sciences	0.38	0.17	2.29	0.02**
Business	-0.32	0.11	-2.81	0.01**
Engineering	-0.56	0.16	-3.47	0.00**
Verbal exam	0.11	0.08	1.32	0.19
Quantitative exam	-0.06	0.08	-0.75	0.45
<i>R</i> ²	.21			
Adjusted <i>R</i> ²	.20			
<i>F</i> for Change in <i>R</i> ²	38.36**			

Note: $p < .05 = **$

The results of the analysis for the U.S. citizens was statistically significant at the .05 level ($F = 38.36, p < .05$), indicating that the variables included in the model explained a significant portion of the variance (adjusted $R^2 = .20$) in total number of semesters taken to complete the degree. Further analysis identified that financial support from the university, full-time enrollment, academic field of arts and humanities, academic field of sciences, academic field of business, and academic field of engineering were all statistically significant and were associated with the variance in total number of semesters taken to complete the degree.

In other words, U.S. citizens who received financial support took more semesters to complete the degree than those students who did not receive financial support. U.S. citizens enrolled full-time at the beginning of their studies took fewer semesters to

complete their degree than those students who began part-time. U.S. citizens enrolled in arts and humanities took fewer semesters to complete the degree than those enrolled in the social sciences. U.S. citizens enrolled in the sciences took more semesters to complete the degree than those enrolled in the Social Sciences. Students enrolled in business took fewer semesters to complete the degree than those enrolled in the social sciences, and U.S. citizens enrolled in engineering took fewer semesters to complete their degree than those enrolled in the social sciences. This combination of predictor variables accounted for approximately 20% of the variance in the total number of semesters taken to complete the degree.

The next regression examined foreign students to evaluate the effects of the predictor variables on total number of semesters taken to complete the degree. As shown in Table 17, the results of the analysis for the foreign students who completed their degree was statistically significant at the .05 level ($F = 4.43, p < .05$), indicating that the variables included in the model explained a significant portion of the variance (adjusted $R^2 = .11$) in total number of semesters taken to complete the degree. Further analysis identified that foreign students enrolled in business took 1.12 fewer semesters than those enrolled in the social sciences. This combination of predictor variables accounted for 11% of the variance in total number of semesters taken to complete the degree.

Table 17

The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by Foreign Students

Variable	Parameter estimate	Standard error	t value	pr > t
Gender	-0.06	0.19	-0.31	0.76
Financial support	0.27	0.20	1.36	0.18
Full-time enrollment	0.10	0.28	0.36	0.72
Changed Majors	0.26	0.25	1.08	0.28
Age	-0.04	0.03	-1.46	0.15
Arts & Humanities	-0.30	0.50	-0.60	0.55
Sciences	0.57	0.43	1.31	0.19
Business	-1.16	0.36	-3.20	0.00**
Engineering	-0.37	0.37	-1.01	0.31
Verbal exam	-0.02	0.17	-0.09	0.93
Quant. exam	0.05	0.27	1.20	0.84
<i>R</i> ²	.14			
Adjusted <i>R</i> ²	.11			
<i>F</i> for change <i>R</i> ²	4.43**			

Note: $p < .05 = **$

The next regression examined the effects of the predictor variables on the total number of semesters taken to complete the degree by permanent residents.

As shown in Table 18, the results of the analysis of permanent residents who completed the degree was statistically significant at the .05 level ($F = 16.87, p < .05$), indicating that the variables included in the model explained a significant portion of the variance ($\text{adjusted } R^2 = .53$) in total number of semesters taken to complete the degree. Further analysis identified that only full-time enrollment was statistically significant and was associated with the variance in total number of semesters taken to complete the degree by permanent residents. Specifically, those permanent residents who enrolled full-time in their first semester took 2.70 semesters less to complete the degree than those permanent residents who enrolled part-time during their first semester. This combination of the predictor variables accounted for approximately 53% of the variance in total number of

semesters taken to complete the degree for permanent residents.

Table 18

The Effects of Predictor Variables on Total Number of Semesters to Complete the Degree by Permanent Residents

Variable	Parameter Estimate	Standard error	t value	pr > t
Gender	0.03	0.37	0.08	0.93
Financial support	0.13	0.44	0.29	0.77
Full-time enrollment	-2.70	0.35	-7.71	<.00**
Changed majors	0.06	0.54	0.10	0.92
Age	-0.03	0.03	-1.31	0.20
Arts & Humanities	0.69	0.61	1.13	0.26
Sciences	-0.11	0.60	-0.18	0.85
Business	0.11	0.57	0.19	0.85
Engineering	-0.46	0.60	-0.77	0.44
Verbal exam	0.03	0.20	0.13	0.90
Quant. exam	0.76	0.56	1.37	0.18
<i>R</i> ²		.61		
Adjusted <i>R</i> ²		.53		
<i>F</i> for Change in <i>R</i> ²		16.87**		

Note: $p < .05 = **$

The slopes of the individual predictor variables were examined to determine whether the affect of the predictor variables on total number of semesters taken to complete the degree differed across the three groups (permanent residents, U.S. citizens, and foreign students). This was done by conducting a *t* test for the differences between the two slopes of a predictor variable. If the *t* test was statistically significant at the .05 levels, this meant the predictor variable affected the total number of semesters taken to complete the degree differently across the groups, after controlling for all other variables in the model.

In comparing U.S. citizens and foreign students, the predictor variable full-time enrollment had a slope that differed statistically significantly at the .05 levels. The difference in slope means that the difference in total number of semesters taken to

complete the degree between full-time enrolled and part-time enrolled was bigger for one group than it was for another. Based upon the analysis, the difference between full-time enrolled and part-time enrolled total number of semesters taken to complete the degree was larger for U.S. citizens (slope = -1.59) than it was for foreign students (slope = .08), after controlling for all other variables in the model. Because of the difference in the sign of slopes, U.S. citizens enrolled full-time took less time to complete the degree than U.S. citizens enrolled part-time, whereas foreign students enrolled full-time took slightly longer to complete degree than foreign students enrolled part-time at the beginning of their program.

In comparing foreign students and U.S. citizens, the predictor variable *business* had a slope that differed statistically significantly at the .05 levels. Because this is a dummy variable, the difference in slope means that the difference in total number of semesters taken to complete the degree between business and social sciences (reference group) was bigger for one group than the other. Based upon this analysis, the difference between business and social sciences total number of semesters taken to complete the degree was larger for foreign students (slope = -1.12) than it was for U.S. citizens (slope = -.32), after controlling for all other variables in the model. As indicated by the negative sign of the slopes, foreign business students took fewer semesters to complete the degree than foreign social science students. U.S. citizen business students also took fewer semesters to complete the degree than U.S. social science students.

Question Three: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how many credits the student completed at the time of graduation?

Table 19

The Effects of Predictor Variables on Total Number of Credits Completed

Variable	Parameter estimate	Standard error	t value	pr > t
Permanent resident	2.98	2.93	1.00	.32
Foreign students	3.84	2.78	1.41	.16
Gender (male)	1.63	0.55	2.91	.00**
Financial support	4.44	0.58	7.81	<.00**
Full-time enrollment	2.54	0.58	4.22	<.00**
Changed Majors	3.87	0.95	4.09	<.00**
Age	-0.04	0.05	-0.71	.48
Africa	1.35	5.08	0.24	.81
Eastern Europe	-3.62	3.58	-1.04	.30
Western Europe	-2.76	3.30	-0.86	.39
South Asia	-4.80	2.90	-1.66	.10
East Asia	-7.25	2.92	-2.45	.01**
Southeast Asia	-7.73	3.37	-2.35	.02**
Middle East	-2.57	4.00	-0.66	.51
South America	-3.47	3.56	-0.99	.32
Arts & Humanities	-1.76	0.78	-2.34	.02**
Sciences	-6.43	1.12	-5.92	<.00**
Business	11.36	0.78	14.37	<.00**
Engineering	-11.72	0.10	-11.98	<.00**
Verbal exam	-1.01	0.49	-2.34	.02**
Quant. exam	0.33	0.55	0.83	.41
R ²	.36			
Adjusted R ²	.35			
F for Change in R ²	53.68**			

Note: $p < .05 = **$

As seen in Table 19, the results of the multiple regression analysis for all students indicated that the model was statistically significant at the .05 levels ($F = 53.68, p < .05$), indicating that the variables included in the model explained a significant portion of the variance in total number of credits completed (adjusted $R^2 = .35$). Further analysis

identified that gender; financial support; full-time enrollment; changing majors; country of origin East Asia or Southeast Asia; academic field arts and humanities, sciences, business, or engineering; and the Verbal Exam were all statistically significant and associated with the variance in the total number of credits completed at the time of graduation.

These results showed males completed 1.63 more credits than females. Those students who received financial support from the university completed 4.44 more credits than those who did not receive financial support. Students who attended full-time completed 2.54 more credits by graduation than those who attended part-time. Those students who changed their majors completed 3.87 credits more than those who did not change majors. Students from East Asia completed 7.25 credits fewer than those from North America, while students from Southeast Asia completed 7.73 credits fewer than students from North America. Arts and humanities students completed 1.76 credits fewer than social science students. Students enrolled in the sciences completed 6.43 credits fewer than those students in the social sciences. Business students completed 11.36 credits more than students in the social sciences, and students in engineering completed 11.72 credits fewer than students in the social sciences. This combination of predictor variables accounted for approximately 35% of the variance in the total number of credits completed at the time of graduation.

The next three regressions look at U.S. citizens, foreign students, and permanent residents separately to evaluate differences among the three groups.

Table 20

The Effects of Predictor Variables on Total Number Credits Completed at Graduation by U.S. Citizens

Variable	Parameter estimate	Standard error	t value	<i>pr > t </i>
Gender	2.03	0.63	3.24	0.00**
Financial support	5.16	0.67	7.72	<.00**
Enrolled full-time	2.13	0.64	3.32	0.00**
Changed majors	4.32	1.22	3.54	0.00**
Age	- 0.01	0.06	- 0.10	0.92
Arts & Humanities	- 2.23	0.83	- 2.69	0.01**
Sciences	- 7.73	1.27	- 6.08	<.00**
Business	10.85	0.86	12.59	<.00**
Engineering	-13.02	1.23	-10.60	<.00**
Verbal exam	- 1.31	0.64	- 2.05	0.04**
Quantitative exam	0.41	0.61	0.67	0.50
<i>R</i> ²		.32		
Adjusted <i>R</i> ²		.32		
<i>F</i> for Change in <i>R</i> ²		68.34 **		

Note: *p* < .05 = **

As shown in Table 20, the results of the analysis for U.S. citizens indicated that the model was statistically significant at the .05 levels (*F* = 68.34, *p* < .05) indicating that it explained a significant portion of the variance (adjusted *R*² = .32) in total number of credits completed at graduation. Further analysis identified that gender; financial support from the university; full-time enrollment; changing majors; academic field arts and humanities, business, and engineering; and verbal examination percentile ranking were all statistically significant at the .05 levels and were associated with the variance in total number of credits completed by U.S. citizens. Further analysis of the data shown in Table 30 showed that males took more credits than females, students who received financial support from the university completed more credits than those who did not, students enrolled full-time completed more credits than those who began their studies part-time, students who changed majors completed more credits, students enrolled in the arts and

humanities and the sciences completed fewer credits than those enrolled in the social sciences, those enrolled in business completed more credits by graduation than those in the social sciences, those enrolled in engineering took fewer credits than those enrolled in the social sciences, and those students with lower verbal percentile rankings appeared to have completed fewer credits at graduation than those with higher verbal percentiles. This combination of predictor variables accounted for approximately 32% of the variance in the total number of credits taken at degree completion.

The next regression examined the effects of the predictor variables on total number of credits completed at graduation by foreign students.

Table 21

The Effects of Predictor Variables on Total Number of Credits Completed at Graduation by Foreign Students

Variable	Parameter estimate	Standard error	t value	pr > t
Gender	-0.23	1.30	-0.17	0.86
Financial support	1.37	1.40	.98	0.33
Full-time enrollment	4.10	1.95	2.11	0.04**
Changed Majors	2.27	1.71	1.33	0.18
Age	-0.25	0.20	-1.28	0.20
Arts & Humanities	-2.09	3.47	-0.60	0.54
Sciences	-2.23	3.01	-0.74	0.46
Business	13.32	2.51	5.30	<.00**
Engineering	-8.10	2.55	-3.18	0.00**
Verbal exam	-1.14	1.18	-.97	0.33
Quantitative exam	.37	1.89	-.19	0.85
<i>R</i> ²	.49			
Adjusted <i>R</i> ²	.47			
<i>F</i> for Change in <i>R</i> ²	25.27**			

Note: $p < .05 = **$

As shown in Table 21, the results of the analysis of foreign students who completed the degree was statistically significant at the .05 level ($F = 25.27, p < .05$), indicating that the variables included in the model explained a significant portion of the

variance (adjusted $R^2 = .47$) in final number of credits completed. Further analysis identified that full-time enrollment, and the academic fields of business and engineering were associated with the variance in total number of credits completed at graduation. In other words, those foreign students who enrolled full-time in their first semester appeared to complete 4.10 credits more than those who went part-time, students enrolled in business completed 13.32 credits more than those enrolled in the social sciences, and students enrolled in engineering appeared to complete 8.10 credits fewer than those enrolled in the social sciences.

The next regression examined the effects of the predictor variables on total number of credits completed at graduation by permanent residents. As shown in Table 22, the results of the analysis for permanent residents included in the multiple regression was statistically significant at the .05 level ($F = 3.30, p < .05$), indicating that the variables included in the model explained a significant portion of the variance (adjusted $R^2 = .25$) in final number of credits completed. Further analysis identified that the academic field of business as compared to social sciences was statistically significant and was associated with the variance in total number of credits completed at graduation. In other words, those permanent residents enrolled in business completed 12.29 credits more than those enrolled in the social sciences. This combination of predictor variables accounted for approximately 25% of the variance in final number of credits completed at graduation.

Table 22

The Effects of Predictor Variables on Total Number of Credits Completed at Graduation by Permanent Residents

Variable	Parameter estimate	Standard error	t value	<i>pr > t </i>
Gender	2.05	3.83	0.54	0.59
Financial support	3.97	4.56	0.87	0.39
Full-time enrollment	0.69	3.61	0.19	0.85
Changed majors	3.31	5.58	0.59	0.56
Age	-0.02	0.26	-0.08	0.94
Arts & Humanities	9.66	6.34	1.52	0.13
Sciences	-3.49	6.20	-0.56	0.58
Business	12.29	5.89	2.09	0.04**
Engineering	-8.80	6.18	-1.43	0.16
Verbal exam	-0.17	2.08	-0.09	0.93
Quantitative exam	-1.30	5.75	-0.23	0.82
<i>R</i> ²	.37			
Adjusted <i>R</i> ²	.25			
<i>F</i> for Change in <i>R</i> ²	3.03**			

Note: *p* < .05 = **

The researcher then examined the slopes of the individual predictor variables to determine whether the affect of the predictor variables on total number of credits completed differed across the three groups (permanent residents, U.S. citizens, and foreign students). This was done by conducting a *t* test for the differences between the two slopes of a predictor variable. If the *t* test was statistically significant at the .05 levels, this meant the predictor variable was related to the total number of credits completed by the students differently across the three groups.

In comparing foreign students and permanent residents, none of the predictor variables were statistically significant at the .05 levels. This means that the affect of the predictor variables on the total number of credits completed at the time of graduation did not differ between foreign students and permanent residents. In comparing U.S. citizens

and permanent residents, none of the predictor variables was statistically significant at the .05 levels. This means that the affect of the predictor variables on total number of credits completed at the time of graduation did not differ for U.S. citizens and permanent residents. In comparing U.S. citizens and foreign students, the predictors of financial support from the university, enrollment in the sciences, and enrollment in engineering were all statistically significant at the .05 levels. Based upon this analysis, the difference between those students who received financial support and those who did not, and total number of credits completed at graduation, was larger for U.S. citizens (slope = 5.16) than it was for foreign students (slope = 1.41) after controlling for all other variables in the model. U.S. citizens who received financial support completed the degree with more credits than U.S. citizens who did not receive such support. Foreign students who received financial support also completed the degree with more credits than foreign students who did not receive financial support.

The difference in slope for the predictor variable *sciences* means that the difference in total number of credits completed at graduation between sciences and social sciences (reference group) was larger for U.S. citizens (slope = 7.73) than it was for foreign students (slope = 1.27), after controlling for all other variables in the model. The sign of slopes indicates that foreign science students had more credits at degree completion than foreign social science students. U.S. citizen science students also had more credits at degree completion than U.S. citizen social science students.

The difference in slope for the predictor variable *engineering* means that the difference in total number of credits completed at graduation between engineering and social sciences (reference group) was larger for U.S. citizens (slope = 13.02) than it was

for foreign students (slope = 7.34), after controlling for all other variables in the model.

The sign of the slopes indicates that U.S. citizen engineering students and foreign engineering students both had more credits at degree completion than U.S. social science students and foreign social science students.

Question Four: What cognitive characteristics and noncognitive characteristics were significantly related to and able predict academic achievement of these students as measured by whether or not they completed the degree (RECDMA)?

To test the likelihood of completing the master's degree, a logistic regression analysis was conducted. The dependent variable, which measured completion of master's degree was YES. YES was equal to 1 if the student completed the degree and 0 otherwise. The logistic regression model was used to estimate the factors that influenced completion of the master's degree.

The logistic regression analyzed whether or not the independent variables had a statistically significant affect on whether or not the students completed their degree. The logistic procedure showed that the overall model was significant at the .05 level according to the model's chi-square statistic (<.0001). The model predicted 72.1% of the responses correctly. The next table shows whether or not each variable was statistically significant on whether or not students completed the degree.

Table 23

Analysis of Maximum Likelihood Estimates for Completing the Degree

Variable	Estimate	Standard error	Wald Chi-square	<i>pr > Chi-square</i>
Permanent residents	1.09	0.96	1.30	.25
Foreign students	1.10	0.94	1.38	.24
Gender	-0.34	0.12	8.38	.00**
Financial support	0.77	0.14	29.25	<.0001**
Full-time enrollment	0.93	0.12	64.93	<.0001**
Changed majors	1.35	0.40	11.46	.00**
Age	-0.01	0.01	2.55	.11
Africa	-1.96	1.15	2.89	.10
Eastern Europe	-1.13	1.07	1.12	.29
Western Europe	-1.18	1.02	1.36	.24
South Asia	-0.87	0.96	.82	.36
East Asia	-0.75	0.97	.60	.44
Southeast Asia	-1.30	1.04	1.54	.21
Middle East	-1.60	1.11	2.09	.15
South & Latin America	-0.77	1.13	.47	.49
Arts & Humanities	0.19	0.15	1.70	.19
Sciences	0.14	0.21	.44	.51
Business	1.58	0.17	85.41	<.0001**
Engineering	0.50	0.20	6.48	.01**
Verbal exam	-0.10	0.10	1.07	.30
Quant. exam	-0.01	0.10	.01	.91

Note: $p < .05 = **$

As shown in Table 23, the *pr > chi-square* shows that gender, financial support, full-time enrollment, changing majors, business, and engineering were statistically significant at the .05 level. The next table shows the predicted odds for each variable's ability to predict degree completion.

Table 24

Predictive Odds Ratio Estimates for Completing the Degree

Effect	Point estimate	95% Wald confidence limits	
Permanent residents	2.99	0.46	19.62
Foreign students	3.00	0.48	18.80
Gender	0.71	0.57	0.90**
Financial support	2.17	1.64	2.87**
Full-time enrollment	2.55	2.03	3.20**
Changed majors	3.87	1.77	8.47**
Age	0.99	0.97	1.00
Africa	0.14	0.02	1.35
Eastern Europe	0.32	0.04	2.62
Western Europe	0.31	0.04	2.24
South Asia	0.42	0.06	2.75
East Asia	0.47	0.07	3.14
Southeast Asia	0.27	0.04	2.11
Middle East	0.20	0.02	1.77
South & Latin America	0.46	0.05	4.24
Arts & Humanities	1.21	0.91	1.62
Sciences	1.15	0.76	1.74
Business	4.83	3.46	6.75**
Engineering	1.64	1.12	2.42**
Verbal exam	0.90	0.74	1.10
Quant. exam	0.99	0.81	1.20

Note: $p < .05 = **$

As shown in Table 24, the odds ratio for the gender was .71. This suggests that the predicted odds of completing the degree were .71 times worse (28.6%) for men than for women, controlling for all other predictors in the model. The odds ratio for the financial support coefficient is 2.17. This suggests that those who received financial support from the university were 2.17 times more likely to complete the degree than those who did not receive funding. The odds ratio for full-time enrollment was 2.55, suggesting that those who attended full-time were 2.55 times more likely to complete the degree than those who attended part-time. The odds ratio for changing majors was 3.87. This suggests that those who changed majors were actually 3.87 times more likely to

complete the degree than those who did not change majors. The odds ratio for business, 4.83, suggests that those students who majored in business were 4.83 times more likely to complete the degree than those who majored in the social sciences. The odds ratio for engineering was 1.65, suggesting that those master's degree students who majored in engineering were 1.65 times more likely to complete the degree than those who majored in the social sciences.

The next three logistic regressions look at U.S. citizens, foreign students, and permanent residents separately and evaluate differences among the three groups in the predictor variables likelihood of estimating degree completion.

Table 25

Analysis of Maximum Likelihood Estimates for U.S. Citizens Completing the Degree

Parameter	Estimate	Standard error	Wald chi-square	pr > chi-square
Gender	-0.29	0.13	5.23	0.02**
Financial support	0.83	0.16	28.06	<.00**
Full-time enrollment	0.86	0.13	46.72	<.00**
Changed majors	1.14	0.44	.82	0.01**
Age	-0.02	0.01	2.66	0.10
Arts & Humanities	0.29	0.15	3.58	0.06
Sciences	0.23	0.23	0.96	0.32
Business	1.61	0.18	78.90	<.00**
Engineering	0.45	0.23	4.02	0.04**
Verbal exam	-0.18	0.13	2.14	0.14
Quant. exam	0.03	0.11	0.11	0.74
<i>R</i> ²		0.09		
Max-Rescaled <i>R</i> ²		0.14		
Wald Chi-Square		217.42**		

Note: $p < .05 = **$

As shown in the above table, the logistic procedure showed that the overall model was statistically significant at the .05 levels according to the model's chi-square statistic ($p < .05$). According to the classification table, the model predicted 78.90% of the

responses correctly. The above table shows that gender, financial support, full-time enrollment, changed majors, and academic area of study business and engineering were all statistically significant at the .05 levels.

Table 26

Predictive Odds Ratio Estimates for Completing the Degree by U.S. Citizens

Effect	Point estimate	95% Wald confidence limits	
Gender	0.75	0.59	0.96**
Financial support	2.29	1.68	3.10**
Full-time enrollment	2.37	1.85	3.03**
Changed majors	3.13	1.33	7.37**
Age	0.99	0.97	1.00
Arts & Humanities	1.33	0.99	1.79
Sciences	1.25	0.80	1.97
Business	5.03	3.52	7.18**
Engineering	1.57	1.01	2.43**
Verbal exam	0.84	0.66	1.06
Quant. exam	1.04	0.84	1.27

Note: $p < .05 = **$

Table 26 shows that the odds ratio for gender was .75. This suggests that the predicted odds of completing the degree were .75 times worse for men than for women, controlling for all other predictors in the model. The odds ratio for financial support was 2.29, suggesting that U.S. citizens who received financial support were 2.29 times more likely to complete the degree than those students who did not receive financial support. The odds ratio for changed majors, 3.13, suggests that those U.S. citizens who changed majors were 3.13 times more likely to complete the degree than the U.S. citizens who did not complete the degree. The odds ratio for business was 5.03. This suggests that those students enrolled in business were 5.03 times more likely to complete the degree than those students enrolled in the social sciences. Finally, the odds ratio for engineering, 1.57, suggests that U.S. citizens enrolled in engineering were 1.57 times more likely to

complete the degree than U.S. citizens enrolled in social sciences. None of the other predictor variables was statistically significant at the .05 levels for predicting degree completion.

Table 27

<i>Analysis of Maximum Likelihood Estimates for Completing the Degree by Foreign Students</i>				
	Parameter estimate	Standard error	Wald chi-square	<i>pr > chi-square</i>
Gender	-0.90	0.49	3.37	0.07
Financial support	1.05	0.58	3.30	0.07
Full-time enrollment	1.40	0.46	9.43	0.00**
Changed Majors	1.84	1.09	2.85	0.09
Age	0.02	0.07	0.13	0.71
Arts & Humanities	-1.40	0.85	2.57	0.10
Sciences	-0.29	0.87	0.11	0.74
Business	0.84	0.81	1.07	0.30
Engineering	0.30	0.77	0.15	0.70
Verbal exam	0.39	0.36	1.17	0.28
Quant. exam	-0.77	.79	0.96	0.33
<i>R</i> ²	0.10			
Max-Rescaled <i>R</i> ²	0.21			
Wald (29.94), <i>p</i> < .005				

The *pr > chi-square* reveals that when all variables are included, the model was statistically significant at the .05 levels. However, when looking at each variable, only the variable *full-time enrollment* was statistically significant at the .05 levels. According to the classification table, the model predicted 89.30% of the responses correctly.

As shown in Table 28, the odds ratio for the full-time enrollment coefficient was 4.06. This suggests that students enrolled full-time were approximately 4 times more likely to complete the master's degree than those who were enrolled part-time.

Table 28

Predictive Odds Ratio Estimates for Completing the Degree by Foreign Students

Effect	Point estimate	95% Wald confidence limits	
Gender	0.41	0.16	1.06
Financial support	2.86	0.92	8.91
Full-time enrollment	4.06	1.66	9.91**
Changed majors	6.26	0.74	52.75
Age	1.02	0.90	1.16
Sciences	0.75	0.14	4.12
Business	2.31	0.47	11.35
Engineering	1.34	0.30	6.08
Verbal exam	1.47	0.73	2.96
Quant. exam	0.46	0.10	2.16

Note: $p < .05 = **$

This failure to uncover statistically significant differences among individual variables may result from the relatively small sample size when only considering foreign students. As a sample size increases, a given coefficient is more likely to be found significant. In addition, the researcher was looking at the predictive value of each variable above and beyond all others in the regression model. For this reason, it was possible to obtain a result where overall regression is significant but no one variable is more significant than the others.

The next logistic regression examined the maximum likelihood of predicting degree completion by permanent residents.

The results from Table 29 show that the model for predicting whether or not permanent residents completed the degree was statistically significant at the .05 levels. According to the classification table, the model predicted 87.6% of the responses correctly for whether or not permanent residents completed their degree. The predictor variables of gender and full-time enrollment were statistically significant at the .05 levels.

Table 29

Analysis of Maximum Likelihood Estimates for Completing the Degree by Permanent Residents

Parameter	Estimate	Standard error	Wald chi-square	<i>pr > chi-square</i>
Gender	-0.90	0.39	5.40	0.02**
Financial support	0.75	0.43	2.99	0.08
Full-time enrollment	1.69	0.35	23.68	<.00**
Changed majors	2.06	1.04	3.91	0.05
Age	0.01	0.04	0.11	0.74
Arts & Humanities	-0.87	0.71	1.51	0.22
Sciences	-0.54	0.70	0.61	0.44
Business	0.74	0.64	1.33	0.25
Engineering	0.26	0.62	0.18	0.68
Verbal exam	0.04	0.19	0.05	0.83
Quant. exam	-0.25	0.47	0.28	0.60
<i>R</i> ²		0.14		
Max-Rescaled <i>R</i> ²		0.22		
Wald		43.58**		

Note: *p* < .05 = **

Table 29 shows that the odds ratio for gender was .41. This suggests that male permanent residents were approximately .41 times less likely to complete their master's degree than female permanent residents. The odds ratio for full-time enrollment was 5.40, suggesting that those permanent residents who enrolled full-time were approximately 5.40 times more likely to complete their master's degree than those enrolled part-time.

The slopes of the individual predictor variables were examined to determine the affect of the predictor variables on whether or not students graduated across the three groups (permanent residents, U.S. citizens, and foreign students). This was done by conducting a *t* test for the differences between the two slopes of a predictor variable. If the *t* test was statistically significant at the .05 levels, this meant the predictor variable affected whether or not the student completed the degree differently across the three groups.

Table 30

Predictive Odds Ratio Estimates for Permanent Residents

Effect	Point estimate	95% Wald confidence limits	
Gender	0.41	0.19	0.87**
Financial support	2.12	0.90	4.96
Full-time enrollment	5.40	2.74	10.64**
Changed majors	7.88	1.02	61.06
Age	1.01	0.94	1.10
Arts & Humanities	0.42	0.11	1.68
Sciences	0.58	0.15	2.28
Business	2.10	0.59	7.44
Engineering	1.30	0.39	4.34
Verbal exam	1.04	0.72	1.50
Quant. exam	0.78	0.31	1.95

In comparing foreign students and permanent residents, none of the predictor variables had slopes that differed statistically significantly at the .05 levels. This means that the predictor variables did not affect whether or not the student completed the degree differently across permanent residents and foreign students.

In comparing foreign students and U.S. citizens, the only predictor variable whose slope differed statistically significantly at the .05 levels was the variable *arts and humanities*. Because this is a dummy variable, the difference in slope means that the difference in whether or not the student completed the degree between arts and humanities and social sciences (reference group) was bigger for one group than the other. Based upon the analysis, the difference between arts and humanities and social sciences degree completion was larger for foreign students (slope = -1.65) than it was for U.S. citizens (slope = .29), after controlling for all other variables in the model. As a result of the difference in the sign of slopes, foreign arts and humanities students were less likely to complete the degree than foreign social sciences students, whereas U.S. citizen arts and

humanities students were more likely to complete the degree than U.S. citizen social sciences students.

In comparing U.S. citizens and permanent residents, the only predictor variable whose slope differed statistically significantly at the .05 levels was *full-time enrollment*. The difference in slope means that the difference in whether or not the student completed the degree between students who went full-time and those who went part-time was bigger for one group than the other. Based upon the analysis, the difference between those who went full-time and those who went part-time was larger for permanent residents (slope = 1.69) than it was for U.S. citizens (slope = .86), after controlling for all other variables in the model. Because there was no difference in the sign of slopes, permanent resident students who attended full-time were more likely to complete the degree than those who went part-time. U.S. citizens who enrolled full-time were also more likely to complete the degree than U.S. citizens who attended part-time.

Summary of the Analysis of Cognitive and Noncognitive Factors in Predicting Academic Success

Question One: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by graduate grade point average at the time of degree completion?

The results of the analysis for all students indicated that the model was statistically significant at the .05 levels, and approximately 10% of the variance in final GPA was attributed to the variation in the combination of these predictor variables. Further analysis identified gender, age, the verbal examination, the quantitative examination, and the academic fields of arts and humanities, business, and engineering

were statistically significant at the .05 levels and were associated with the variance in final GPA.

When separating U.S. citizens, foreign students, and permanent residents, the results of the analysis for the U.S. citizens indicated that the model was statistically significant at the .05 levels and explained 8% of the variance in final GPA for U.S. citizens. The analysis identified gender, age, arts and humanities, sciences, business, the verbal examination, and the quantitative examination as all statistically significant at the .05 levels and were associated with the variance in final GPA for U.S. citizens.

The results of the analysis of only foreign students indicated that the model was statistically significant at the .05 levels and explained 8% of the variance in final GPA for foreign students. Further analysis identified gender, sciences, business, and engineering as all statistically significant at the .05 levels and were associated with the variance in final GPA.

The results of the analysis of permanent residents indicated that the model was statistically significant at the .05 levels and explained 15% of the variance in final GPA. Further analysis did not identify any of the individual predictor variables to be statistically significant at the .05 levels.

In comparing foreign students and permanent residents, the only predictor that was statistically significant at the .05 levels was the business variable. The difference between business and social sciences average final GPA was larger for foreign students than it was for permanent residents. Foreign business students had lower average final GPAs than foreign social science students. Permanent resident business students had higher GPAs than permanent resident social science students.

Based upon the analysis of U.S. citizens and permanent residents, U.S. citizen business students and permanent resident business students both had higher GPAs than U.S. citizen social science students and permanent resident social science students.

Question Two: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how long (the number of semesters) it took them to complete the degree?

The results of the analysis for all students indicated that the model was statistically significant at the .05 levels and explained 19% the variance in total number of semesters taken to complete the degree. The analysis identified that gender, financial support from the university, full-time enrollment, arts and humanities, sciences, business, and engineering were statistically significant at the .05 levels and associated with the variance in total number of semesters taken to complete the degree.

The results of the analysis for the U.S. citizens was statistically significant at the .05 level, indicating that the model explained 20% of the variance in total number of semesters taken to complete the degree. Further analysis identified that financial support from the university; full-time enrollment; academic fields of arts and humanities, sciences, business, and engineering were all statistically significant and were associated with the variance in total number of semesters taken to complete the degree.

The results of the analysis for the foreign students who completed their degree was statistically significant at the .05 level, indicating that the model explained 11% of the variance in total number of semesters taken to complete the degree. Further analysis identified that academic field of business was statistically significant and associated with the variance in total number of semesters taken to complete the degree.

The results of the analysis of permanent residents who completed the degree was statistically significant at the .05 level, indicating that the model explained 53% of the variance in total number of semesters taken to complete the degree. Further analysis identified that only full-time enrollment was statistically significant and was associated with the variance in total number of semesters taken to complete the degree by permanent residents.

In comparing U.S. citizens and foreign students, the predictor variable *full-time enrollment* had a slope that differed statistically significantly at the .05 levels. Based upon the analysis of total number of semesters taken to graduate, the difference between those students who enrolled full-time and those did not was larger for U.S. citizens than it was for foreign students, after controlling for all other variables in the model. As indicated by the difference in the sign of slopes, U.S. citizens enrolled full-time took less time to complete the degree than U.S. citizens enrolled part-time, whereas foreign students enrolled full-time took slightly longer to complete degree than foreign students who enrolled part-time at the beginning of their program.

In comparing foreign students and U.S. citizens, the predictor variable *business* had a slope that differed statistically significantly at the .05 levels. Based upon this analysis, the difference between the total number of semesters taken to complete the degree in business and social sciences was larger for foreign students than it was for U.S. citizens, after controlling for all other variables in the model. The negative sign of the slopes revealed that foreign business students took fewer semesters to complete the degree than foreign social science students. U.S. citizen business students also took fewer semesters to complete the degree than U.S. social science students.

Question Three: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how many credits the student completed at the time of graduation?

The results of the multiple regression analysis for all students showed that the model was statistically significant at the .05 levels, indicating that the model explained 35% of the variance in total number of credits completed. Further analysis identified that gender; financial support; full-time enrollment; changing majors; country of origin East Asia and Southeast Asia; academic fields arts and humanities, sciences, business, and engineering, and the verbal examination were all statistically significant and associated with the variance in the total number of credits completed at the time of graduation.

The results of the analysis for U.S. citizens indicated that the model was statistically significant at the .05 levels, indicating that it explained 32% of the variance in total number of credits completed at graduation. Further analysis identified that gender; financial support from the university; full-time enrollment; changing majors; the academic fields arts and humanities, business, and engineering; and the verbal examination percentile ranking were all statistically significant at the .05 levels and were associated with the variance in total number of credits completed by U.S. citizens.

The results of the analysis of foreign students who completed the degree were statistically significant at the .05 levels, indicating that the model explained 48% of the variance in final number of credits completed. Further analysis identified that full-time enrollment, and the academic fields of business and engineering were statistically significant and were associated with the variance in total number of credits completed at graduation.

The results of the analysis for permanent residents included in the multiple regression were statistically significant at the .05 levels, indicating that the model explained 25% of the variance in final number of credits completed. Further analysis identified that the academic field of business was statistically significant and was associated with the variance in total number of credits completed at graduation.

In comparing foreign students and permanent residents none of the predictor variables were statistically significant at the .05 levels. This means that the affect of the predictor variables on the total number of credits completed at the time of graduation did not differ across foreign students and permanent residents. In comparing U.S. citizens and permanent residents, none of the predictor variables was statistically significant at the .05 levels. This means that the affect of the predictor variables on total number of credits completed at the time of graduation did not differ across U.S. citizens and permanent residents. In comparing U.S. citizens and foreign students, the predictors of financial support from the university and being enrolled in the sciences and engineering were all statistically significant at the .05 levels. Based upon this analysis, the difference between those students who received financial support and those who did not and total number of credits completed at graduation was larger for U.S. citizens than it was for foreign students, after controlling for all other variables in the model. U.S. citizens who received financial support completed the degree with more credits than U.S. citizens who did not receive financial support. Foreign students who received financial support also completed the degree with more credits than foreign students who did not receive financial support.

The difference in slope for the predictor variable *sciences* means that the difference in total number of credits completed at graduation between sciences and social

sciences was greater for U.S. citizens than for foreign students, after controlling for all other variables in the model. The sign of slopes indicated that foreign science students had more credits at degree completion than foreign social science students. U.S. citizen science students also had more credits at degree completion than U.S. citizen social science students.

The difference in slope for the predictor variable *engineering* means that the difference in total number of credits completed at graduation between engineering and social sciences was larger for U.S. citizens than it was for foreign students, after controlling for all other variables in the model. The sign of the slopes indicates that U.S. citizen engineering students and foreign engineering students both had more credits at degree completion than U.S. social science students and foreign social science students.

Question Four: What cognitive and noncognitive characteristics were significantly related to and able predict academic achievement of these students as measured by whether or not they completed the degree (RECDMA)?

The logistic regression analyzed whether or not the independent variables had a statically significant affect on whether or not the students completed their degree. The logistic procedure showed that the overall model was significant at the .05 level according to the model chi-square statistic (<.0001). The model predicted 72.1% of the responses correctly. The *pr > chi-square* showed that gender, financial support, full-time enrollment, changing majors, business, and engineering were statistically significant at the .05 level.

The logistic procedure that looked at only U.S. citizens showed that the overall model was statistically significant at the .05 levels according to the model chi-square

statistic ($p < .05$). The model predicted 78.90% of the responses correctly. The results showed that gender, financial support, full-time enrollment, changed majors, academic business, and engineering were all statistically significant at the .05 levels.

The logistic procedure that examined only foreign students showed that the $pr > chi-square$ was statistically significant at the .05 level, and further analysis showed that students enrolled full-time were approximately 4 times more likely to complete master's degree than those who were enrolled part-time. The model predicted 89.30% of the responses correctly.

This failure to uncover statistical significance among individual variables may be the result of the relatively small sample size when only considering foreign students. As mentioned previously, as a sample size increases, a given coefficient is more likely to be found significant. In addition, the predictive value of each variable beyond all others in the regression model was investigated. For this reason it was possible to obtain a result where the overall regression was significant but no one variable stood out above the rest.

The results from the logistic regression that predicted whether or not permanent residents completed the degree were statistically significant at the .05 levels. The model predicted 87.6% of the responses correctly regarding whether or not permanent residents completed their degree. The predictor variables of gender and full-time enrollment were statistically significant at the .05 levels.

In comparing foreign students and permanent residents, none of the predictor variables had slopes that differed statistically significantly at the .05 levels. This means that the predictor variables did not affect whether or not the student completed the degree differently across permanent residents and foreign students.

In comparing foreign students and U.S. citizens, the only predictor variable whose slope differed statistically significantly at the .05 levels was the arts and humanities variable. Based upon the analysis, the difference between arts and humanities and social sciences degree completion was larger for foreign students than it was for U.S. citizens after controlling for all other variables in the model. The difference in the sign of slopes revealed that foreign arts and humanities students were less likely to complete the degree than foreign social sciences students, whereas U.S. citizen arts and humanities students were more likely to complete the degree than U.S. citizen social sciences students.

In comparing U.S. citizens and permanent residents, the only predictor variable whose slope differed statistically significantly at the .05 levels was full-time enrollment. Based upon the analysis, the difference between those who attended full-time and those who enrolled part-time was larger for permanent residents than it was for U.S. citizens, after controlling for all other variables in the model. Because there was no difference in the sign of slopes, permanent resident students who attended full-time were more likely to complete the degree than those who went part-time. U.S. citizens who went full-time were also more likely to complete the degree than U.S. citizens who went part-time.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Overview of the Study

This study examined ways to improve the predictability of academic success in the selection and admission procedures for foreign students. These efforts were designed to help universities improve foreign student recruitment and to assure the individual student have a greater opportunity to complete a graduate program.

As a unique aspect of this study, foreign students also were compared to U.S. citizens and permanent residents to determine foreign students' achievements relative to the pool of U.S. citizens and permanent residents. Measures of academic success were students' cumulative graduate GPA, number of credits earned at the time of graduation, total number of semesters taken to complete the degree, and whether or not the degree program was completed by 2001. In addition, comparisons were made between those students who completed the degree and those who did not. Because many of the previous studies cited in the literature review used relatively small sample sizes, making it difficult to draw conclusions, this study combined three years of graduate data to provide a larger sample size.

A review of the literature showed that understanding the academic success of foreign students is a complex issue. To generate more understanding about foreign students among administrators and faculty members, studies of foreign students in individual institutions have been suggested (Waller, 1964; Homan, 1973; Strommen, 1981). If specific cognitive and noncognitive predictors are significant predictors of successful academic performance, they may be useful as admission criteria and as tools to

assist in the identification of at-risk students. It might be possible to design institutional policies to address these factors.

The researcher sought to understand how ten cognitive and noncognitive variables related to and predicted the academic achievement of foreign master's degree students, compared to students who were permanent residents or U.S. citizens in master's degree programs. The research focused on four specific questions.

Question One: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by graduate GPA at the time of degree completion?

Question Two: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by how long (the number of semesters) it took them to complete the degree?

Question Three: What cognitive and noncognitive characteristics were significantly related to and can predict academic achievement of these students as measured by how many credits the student completed at the time of graduation?

Question Four: What cognitive and noncognitive characteristics were significantly related to and able to predict academic achievement of these students as measured by whether or not they completed the degree?

Conclusions

This section discusses the conclusions derived from the research findings of cognitive and noncognitive variables as related to the academic success of graduate students, together with recommendations for future research.

Cognitive Variables and Academic Success

GRE- or GMAT-Verbal Percentile and Academic Success

Completers had an overall mean verbal percentile that was higher than the overall mean verbal percentile of non-completers, however, this difference was not statistically significant. The results of the logistic regression analysis for all graduate students showed that there was no statistically significant relationship between verbal percentiles and whether or not a student completed the degree. There was also no statistically significant relationship between verbal percentiles and degree completion when U.S. citizens, permanent residents and foreign students were looked at separately.

The results of the analysis for all graduate students showed that students with higher verbal percentiles had statistically significantly higher grade point averages at graduation. The results of the analysis for U.S. citizens who completed the degree also showed that those U.S. citizens with higher verbal examination percentiles had higher mean GPAs.

This was not the case with either foreign students or permanent residents. When looking at foreign students and permanent residents separately, the verbal percentile was not statistically significant and was not associated with the variance in final GPA. The results of the analysis for total number of semesters taken to graduate, and total number of credits completed by graduation, did not show a statistically significant relationship between verbal percentile and these two measures of academic success.

These results agree with research conducted by several authors discussed in the literature review. Angelis (1977) concluded that tests such as the GRE and GMAT are not appropriate for non-native speakers of English. Kaiser (1983) found that foreign

student scores on the verbal portion of the GRE were lower than those of those of U.S. citizens and concluded that the high discrepancy between U.S. citizens and foreign students indicated that foreign students are at a disadvantage with the GRE because of its language component. Sharon (1972) concluded that foreign students with low verbal scores still succeed in U.S. graduate schools.

Based upon the research conducted in this study and previous studies, there appears to be little relationship between verbal percentiles and foreign students' performance in graduate school. One possible explanation for these results is that because a minimum score on the examination (as established by the university) is required to gain entrance into a master's degree program, these students had all met that minimum score as a basic necessity for entrance.

GRE- or GMAT-Quantitative Percentile and Academic Success

The literature review revealed no definite conclusions regarding whether the quantitative examination was a good predictor of academic success. Angelis (1977) concluded that tests such as the GRE and GMAT are not appropriate for non-native speakers of English. Kaiser (1983) found that foreign student scores on the quantitative portion of the GRE were lower than those of those of U.S. citizens and concluded that the high discrepancy between U.S. citizens and foreign students indicated that foreign students are at a disadvantage with the GRE examination because of its language component. Sharon (1972), on the other hand, found the GRE-Quantitative examination to be the best single predictor of academic success. Paolillo (1982) found that the GMAT-Quantitative examination was significantly related to graduate GPA and concluded it was an important predictor of academic achievement. Youngblood and

Martin (1982) also concluded that the GMAT–Quantitative exam was helpful for admissions decisions and predicting academic performance.

The GRE and GMAT are designed to measure mental abilities thought to be important at the graduate level. This study, however, suggests that the quantitative examination is not a good predictor of academic success for foreign students; conventional interpretations of admissions test scores can be misleading for foreign students (Powers, 1980). Because these tests are made for English language speakers they do not appear to be appropriate for foreign students and permanent residents.

Completers had an overall mean quantitative percentile that was higher than the overall mean quantitative percentile of non-completers, however, this difference was not statistically significant. The results of the logistic regression analysis for all graduate students showed that there was no statistically significant relationship between quantitative percentiles and whether or not a student completed the degree. There was also no statistically significant relationship between quantitative percentiles and degree completion when U.S. citizens, permanent residents and foreign students were looked at separately.

The results of the analysis for all graduate students showed that students with higher quantitative percentiles had statistically significantly higher grade point averages at graduation. The results of the analysis for U.S. citizens who completed the degree also showed that the quantitative percentile was statistically significant and appeared to be associated with the variance in final GPA. Specifically, those U.S. citizens with higher quantitative examination percentiles appeared to have higher GPAs.

This was not the case when looking at only foreign students and permanent

residents. For both of these groups, the quantitative percentile score was not statistically significantly associated with the variance in final GPA. The results of the analysis for total number of semesters taken to graduate and total number of credits completed by graduation did not show a statistically significant relationship between the quantitative percentile score and these two measures of academic success. In summary, the results of this study question the validity of using the GMAT and GRE scores in the foreign student college admissions process.

TOEFL Total Mean Score and Academic Success

This study found no statistically significant relationship between TOEFL total mean scores and either graduate GPA, total number of semesters taken to complete the degree, total number of credits completed by graduation, or the likelihood of completing the master's degree. These results agree with some of the previous research conducted on the relationship of TOEFL scores to academic performance. Hwang and Dizney (1970), for example, found that the TOEFL examination scores were poor predictors of academic performance. Gue and Holdaway (1973) also concluded that the TOEFL examination was not a good predictor of academic success. Stover (1982) found that TOEFL scores and GPAs were significantly related for undergraduates but were not significant in the case of graduate students. Light, Xu, and Mossop (1987) also examined the relationship between TOEFL and GPA and concluded that TOEFL scores were not effective predictors of academic success. However, some researchers have concluded there is a significant relationship between TOEFL examinations and academic success. Burgess and Greis (1970) found that TOEFL did correlate significantly with GPA, and concluded that proficiency in reading and writing English, as measured by the TOEFL, was important to

college success. In addition, although Ho and Spinks (1985) and Ayers and Quattlebaum (1992) found the TOEFL was not an effective predictor of academic success as measured by GPA, these researchers still considered it to be a useful test as a preliminary screening device for determining if a potential student has the minimum communications skills needed to succeed in a U.S. university.

Based upon this study and a review of the literature, there did not appear to be any clear-cut answers for the admissions officer looking for guidance in making admissions recommendations. The TOEFL may still be a useful tool for screening foreign students for the English language skills necessary to succeed in graduate school. The results of this study could show that the level of English language competence required for foreign students to be admitted into this graduate school was sufficient for foreign students to successfully reach their academic goals.

Noncognitive Variables and Academic Success

Gender and Academic Success

In examining the research that investigated the relationship between gender and academic success, Tan-Ngarmtrong (1979) found no significant relationship between academic achievement and gender. Strommen (1981) found a statistically significant relationship between gender and academic success, finding males had lower GPAs than females. Strommen concluded that gender, along with other noncognitive variables, should be used in making decisions on the admission of foreign students. Wilson (1982) found that women appeared to outperform men. Hughey and Hinson (1993) found a statistically significant difference in mean GPA between genders, with women having higher GPAs than men. These authors concluded that gender is a good predictor of

academic success for foreign students.

The present study's results of the analysis for all students showed that males appeared to have statistically significantly lower GPAs than females. Analysis of the number of semesters taken to complete the degree showed males took statistically significantly longer to complete the degree than females. Analysis of total number of credits taken by graduation showed males took statistically significantly more credits by graduation than females. Finally, analysis of whether or not students completed the degree showed that the odds for completing the degree were statistically significantly worse for males than for females. In all cases, regardless of whether or not the students were U.S. citizens, foreign students, or permanent residents, females outperformed males in relation to all measures of academic success.

As a result of the findings in this study and previous research investigating the relationship between gender and academic success, it appears that there is a relationship between gender and academic success. There do not appear to be differences between foreign students, U.S. citizens, and permanent residents in each categories respective relationship between gender and academic success. In all cases, it appears that females are statistically significantly more successful in graduate school when investigating GPA, total number of semesters taken to complete the degree, total number credits taken by degree completion, and the likelihood of completing the degree.

Two reasons for these results could be that women work harder than men in graduate school and, therefore, are more successful academically, or that the measures of academic success used in this study are not as important to men, who may be focusing on different priorities. Universities may need to establish programs that might help male

students include faculty mentoring; academic aids such as test-taking skills, studying skills, and tutoring; and social and psychological support. Another possibility is that these programs already exist but men are less willing to ask for help and, therefore, are not using the resources available to help them succeed academically.

Age and Academic Success

As was seen in the literature review, there have been several studies that determined that the relationship between age and a foreign student's academic success was important. Therefore age and its relationship to academic success was examined. Strommen (1981) found that older students had higher GPAs than younger students and concluded that age had a significant affect on GPA for foreign students. Luthy (1983) found that not only did older students achieve higher GPAs than was anticipated by their GRE scores, younger students received lower GPAs than anticipated by their scores. These researchers concluded that age was a statistically significant predictor of academic success.

Based upon the findings of this study, older students appeared to have statistically significantly higher graduate GPAs than younger students at degree completion, both among all students combined and only among U.S. citizens. There were no statistically significant differences, however, when the researcher examined only foreign students or only permanent residents. In addition, no significant differences were found in the relationships between age and total number of semesters taken to complete the degree, age and total number of credits taken, and age and completion of the graduate program.

Consequently, age may be a significant predictor of academic success as measured by graduate GPA. However, more investigation of this variable is necessary.

Age does not appear to have a statistically significant affect on academic success when only foreign students are considered, which may mean it is more important in determining the academic success of U.S. citizens and permanent residents than for foreign students. In addition, age does not appear to have a significant relationship to the number of credits completed by graduation, whether or not the degree is completed, or the amount of time taken to finish the degree, regardless of whether the student is a U.S. citizen, permanent resident, or foreign student.

One possibility for why older students have higher GPAs is that they may have delayed the opportunity to continue their education for several years because financial concerns, family responsibilities, or various other factors. When they finally enter graduate school, they may be highly motivated to excel academically. Older students might be more motivated, independent, and successful in meeting the demands of graduate school. To address this, higher education leaders, faculty, and student services professionals may need to provide more academic support for younger students to help them succeed in graduate school. Programs that might help younger students include faculty mentoring; academic support, such as test-taking skills, studying skills, and tutoring; and social and psychological support.

Academic Field and Academic Success

As shown in the literature review, previous studies have shown that there are differences in academic performance among students enrolled in different academic fields. Academic field, therefore, was chosen as a variable that could possibly affect the academic success of graduate students.

The research of Light, Xu, and Mossop (1987) demonstrated that there might be

non-language factors, such as academic field, that accounted for the success of foreign students. Strommen (1981) also studied the degree to which noncognitive variables affected foreign students' academic achievement as measured by the students' GPAs: Students in engineering had higher GPAs than all other students combined. Strommen concluded that field of study was a significant predictor of GPA. Hughey and Hinson (1993) also conducted a study on foreign students and found differences in their GPAs relating to academic field of study. These researchers concluded that such differences may result, in part, from the distinct ways verbal and written communication skills are emphasized in different disciplines, and that the area of study may be related to the academic success of foreign students.

The research in this study showed a number of differences in academic success depending upon field of study. Arts and humanities students, compared to social sciences students, had significantly lower GPAs, took significantly fewer semesters to complete the degree, and took fewer credits. In addition, foreign arts and humanities students were less likely to complete the degree than foreign social sciences students (whereas U.S. citizen arts and humanities students were more likely to complete the degree than U.S. citizen social sciences students). Foreign students enrolled in the arts and humanities may need additional academic support to ensure their academic success.

Science students, compared to those in the social sciences, had significantly lower GPAs, took more semesters to complete their degrees, and took fewer credits. Foreign science students had more credits at degree completion than foreign social science students. U.S. citizen science students also had more credits at degree completion than U.S. citizen social science students.

Engineering students, compared to social science students, had significantly lower GPAs, took fewer semesters complete the degree, took fewer credits by graduation, and were more likely to complete the degree. U.S. citizen engineering students and foreign engineering students both had more credits at degree completion than U.S. social science students and foreign social science students.

Business students, compared to those in the social sciences, had significantly lower GPAs, took fewer semesters to finish their degrees, completed more credits, and were more likely to complete the degree. Foreign business students had lower average final GPAs, when controlling for all other variables in the model, than foreign social science students. This was not the case when comparing permanent residents. Permanent resident business students had higher GPAs than permanent resident social sciences students. The variable *business* had a statistically significant affect on graduate GPA for foreign students. Foreign students studying business had lower graduate GPAs when compared with foreign students studying social science. However, those studying business were likely to have higher graduate GPAs among permanent residents and U.S. citizens when compared with permanent residents and U.S. citizens studying social science.

Two interesting and unexpected results were that students enrolled in the sciences took more semesters to complete their degrees, but completed fewer credits at the time of graduation, than those students in the social sciences. Business students took fewer semesters to complete the degree, yet completed more credits at graduation, than students in the social sciences.

In addition, choosing *business* appeared to have a negative affect on graduate

GPA for foreign students when compared with foreign students studying social science. However, studying business had a positive affect on graduate GPA for permanent residents and U.S. citizens when compared with permanent residents and U.S. citizens studying social science. Foreign students at the University of Maryland make up a relatively large proportion (40.67%) of the student population studying business at the master's level. It is important that measures be taken to help these foreign students succeed academically.

Based upon the above results, regardless of whether or not the student was a permanent resident, U.S. citizen, or foreign student, the academic field of enrollment could have an effect on the academic success of a student, as measured by graduate GPA, total number of semesters taken to finish the degree, total number of credits completed at graduation, and whether or not a student completes the degree.

Academic advisors, higher education leaders, and faculty need to be aware that academic success may differ depending upon the academic field. The development of support services might assist people in certain fields of study in achieving higher academic performance. In addition, admissions officers should review their admissions policies to make certain those being admitted have the greatest potential to succeed in particular academic programs.

Country of Citizenship and Academic Success

As shown in the literature review, research on the relationship between academic success and country of citizenship is rather limited. The literature shows mixed results for this variable. Hosley (1979) found that Mexican students scored the highest on the TOEFL examination and students from Saudi Arabia and Libya scored the lowest.

Hosley concluded that country of citizenship had a significant affect on TOEFL examination performance. Strommen (1981) concluded that a significant portion of variance in GPA was explained by the student's geographic area of citizenship. Strommen found students from Latin America had statistically significant lower GPAs while students from the Far East had statistically significantly higher GPAs.

According to the research conducted in this study, country of origin was not significantly related to academic achievement of students as measured by graduate GPA at the time of graduation. In addition, country of origin was not significantly related to academic achievement as measured by whether the student completed the degree.

There were differences in country of citizenship in relation to how long it took to complete the degree, measured by number of credits completed by graduation. Students from East Asia and Southeast Asia completed statistically significantly fewer credits than those from North America.

Financial Support and Academic Success

As was seen in the literature review, over 75% of all foreign student's funding comes from sources outside the United States (IIE, 2000). Based on the research focused on foreign students who received some form of financial support from their university and the relationship of that aid to their academic performance, there appear to be mixed conclusions. Strommen (1981) found that those students who received financial aid had statistically significantly higher GPAs than those who received no financial assistance.

Deressa and Beavers (1988) found that financial need was the highest concern for foreign students. These authors concluded that colleges and universities should assist foreign students in finding part-time jobs or assistantships. This researcher therefore conducted

further study of the relationship of financial support and academic success.

When evaluating all students, there appeared to be no statistically significant relationship between receiving financial support from the university and graduate GPA at the time of graduation. However, those students who received financial support from the university took statistically significantly more semesters to complete their degree than those students who did not receive financial support. When evaluating all students, those students who received financial support from the university completed the degree with statistically significantly more credits than those who did not receive financial support. When looking at all students, those who received financial support from the university were more likely to complete the degree than those who did not receive funding.

There were no differences between foreign students, permanent residents, and U.S. citizens regarding the relationship between receiving financial aid and academic success. This suggests that while there is a positive relationship between financial aid and (1) the length of time taken to complete the degree, (2) the number credits received by degree completion, and (3) whether or not a person finishes the program. No distinction can be made in this respect between foreign students, permanent residents, and U.S. citizens. Financial aid is important for the success of all three categories of students.

Consistent with previous studies, a statistically significant positive effect was found between financial support from the university and academic success. This may be because if certain students were determined by the admissions committee to have more academic promise, those students might have been given financial support. Future research should be conducted on why certain students were given financial support by the university while other students were not.

Students in this study who received financial support from the university completed more credits by graduation and were more likely to finish the degree, but also took more semesters to finish. There was not a statistically significant relationship between financial support from the university and graduate GPA.

Permanent residents received the lowest percentage of financial support and also had the highest percentage of students not completing the degree. Further research is recommended using larger samples, and also employing interviews, to determine whether an increase in university financial support would help more permanent residents to complete the degree. Students who are more concerned about finances might need to seek employment, perhaps making completing the degree more difficult. Having to work could also relate to having to take more semesters to complete the degree.

Those not receiving funding from the university may have less commitment to the institution and consider completing their degree less important, while students receiving funding from the university may feel more obligated to perform well and to complete their degree.

Full-Time/Part-Time Enrollment and Academic Success

Another variable that was investigated was whether students began their graduate studies as full time or part-time students. Unlike other variables in this study, this one was not chosen because of findings in previous literature. At the time of this study, research could not be found that examined the relationship of full-time enrollment and academic success. However, full-time enrollment might have an affect on how long it would take the students to complete the degree, and since length of time was used as a measure of academic success, full-time enrollment was considered as a possible factor

that could have a relationship to academic success.

Based upon the results of this study, there was no statistically significant difference between students enrolled full-time and those enrolled part-time in terms of graduate GPA. When looking at all students in the study, those students enrolled full-time took statistically significantly fewer semesters to complete the degree than those enrolled part-time. This was true when looking at only permanent residents and when looking at only U.S. citizens. There was no statistically significant difference between foreign students enrolled full-time and foreign students enrolled part-time in terms of number of semesters taken to complete the degree. When looking at all students, those students who attended full-time appeared to complete the degree with statistically significantly more credits by graduation than those who went part-time. This also was true when looking at only foreign students and only permanent residents.

In comparing U.S. citizens and foreign students, U.S. citizens enrolled full-time took less time to complete the degree than U.S. citizens enrolled part-time, whereas foreign students enrolled full-time took slightly longer to complete their degree than foreign students enrolled part-time at the beginning of their program.

In terms of degree completion, those who attended full-time were more likely to complete the degree than those who attended part-time. In comparing U.S. citizens and permanent residents, permanent resident students who enrolled full-time were more likely to complete the degree than those who went part-time. Full time U.S. citizens were also more likely to complete the degree than U.S. citizens who went part-time.

As can be seen from this study, full-time enrollment had a statistically significant affect on academic success for graduate students in terms of taking fewer semesters to

complete the degree and also in terms of completing more credits by degree completion for permanent residents and U.S. citizens. This result may be because those students who enrolled part-time took fewer credits each semester, requiring them to enroll for more semesters to obtain enough credits to graduate. In addition, those students who were enrolled full-time may have taken courses that were interesting but not necessary for graduation, while those students enrolled part-time took only those courses necessary for graduation. This could account for the fact that students enrolled full-time had more credits at graduation than those enrolled part-time.

The finding that there were no statistically significant differences between foreign students enrolled full-time or part-time was likely the result of immigration laws that require foreign students to enroll full-time to maintain student status. The finding that foreign students who enrolled full-time took slightly longer to complete the degree than those enrolled part-time is difficult to understand. One possibility is that foreign students enrolled full-time were trying to prolong their stay in the United States, since immigration law requires visiting students to be enrolled full-time during their studies.

One explanation for the increased likelihood for full-time students to complete the degree than those who enrolled part-time is that full-time students may have fewer family and financial responsibilities than students enrolled part-time. Presumably these responsibilities could create obstacles for part-time students that result in an increase in the length of time taken to complete the degree as compared to full-time students.

Changed Majors and Academic Success

Another variable that might be an effective predictor of academic success is whether or not a student changes majors during their graduate degree. At the time of this

study, previous research could not be found that investigated the relationship between changing majors and academic success, so this variable was included. However, no statistically significant relationship was found between changing majors and graduate GPA, total number of semesters taken to complete the degree, total number of credits completed at graduation, or the likelihood of completing the degree. Because none of these comparisons were statistically significant, changing majors did not appear to have an affect on academic success.

Recommendations for Future Research

The following are recommendations for future research on factors contributing to the academic success of graduate students. These recommendations are based on the findings and limitations of the present study.

1. Similar studies are needed to verify the findings in this study. These studies should be conducted with similar populations (i.e., larger research universities) as well as different populations (i.e., smaller, private, four-year liberal arts colleges) to determine the extent to which the results can be generalized.
2. If future studies confirm these findings, the research methodology should be expanded to include a qualitative approach, such as case studies, focus groups, and interviews, to determine individual influences that may affect academic success. Additionally, open-ended questions could be utilized to allow students to express in their own words why they believe they succeeded or failed.
3. The current study showed that no single variable should be used to determine whom to admit to a master's degree program. In all of the regressions, the majority of the variance associated with the outcome measurements of academic

success was unexplained. This means there are other factors contributing to the academic success of these students. The results of this study suggest that further research should focus on non-quantitative factors to determine the quality of the master's degree program and to assess why students with appropriate admissions credentials fail to complete their degrees. Follow-up studies should investigate additional factors that may influence retention such as interest in the subject studied, help from home, self-confidence, test-taking ability, previous experience, student involvement with faculty, motivation, self-discipline, and independence to determine the relationship of these variables to success in master's degree programs.

4. Undergraduate GPA was not included in this study as a result of missing data, especially for foreign students. If a larger sample was used, perhaps from three or four large public universities, it might be sufficiently large enough to include foreign students' undergraduate GPAs in the study. Previous research has shown that undergraduate GPA can be a significant predictor of academic success in graduate school.
5. Further research via similar studies, interviews and questionnaires, is needed to confirm that age is an important predictor of college success. One reason older students had higher GPAs may be that they delayed their education for several years because of financial concerns, family responsibilities, and various other factors. When they finally enter graduate school, they may be highly motivated to excel academically.
6. The significance of academic field as an important predictor of graduate school

success suggests the need for more research on this variable. As was indicated in the limitations section of chapter 3, this study did not investigate the possibility that some graduate programs may require different numbers of credits to be completed in order to obtain a degree. In addition, some graduate programs may require that students remain enrolled full-time. These different requirements might account for some of the differences related to academic field and academic success. Therefore future studies are needed that consider program differences when researching this variable.

7. Achieving a greater understanding of the relationship between financial aid and academic success could assist colleges in predicting the academic success of all students. For example, this study did not look at students who received research or teaching assistantships, which require students work in addition to attending to staying enrolled full-time. Working and attending school may have an affect on academic success. Further research is recommended on financial aid and its relationship to academic success and working while attending school.
8. Understanding why women are more successful in graduate school than men requires further examination and attention from higher education leaders, administrators, and faculty. Further research should be conducted on the relationship of gender and its influence on academic success.
9. The finding that foreign students who were enrolled full-time appeared to take slightly longer to complete the degree than those enrolled part-time is surprising. As mentioned, one possibility for this is that foreign students enrolled full-time were trying to prolong their stay in the United States because immigration

regulations require students to be enrolled full-time during their studies, thus taking more semesters to graduate. Another possibility is that because foreign students change majors more frequently than U.S. citizens or permanent residents, it may take them longer to complete their degree. Further study of this variable is needed.

10. As shown in the literature review, there were no definite conclusions reached regarding the GRE–Verbal examination or the GMAT–Verbal examination as effective predictors of academic success. Based upon the results of this study, further research should be conducted on this variable. One possibility for the mixed results is that all these students had already met the minimum score required to gain entrance into a master’s degree, thus making these tests appear to have no significant affect on academic success. An investigation of a group of students who were admitted, even though their scores did not meet the minimum level, to see whether their scores had any significant effect on their academic success would be interesting
11. As shown in the literature review, there were no definite conclusions made using the GRE– or the GMAT–Quantitative examinations as effective predictors of academic success. Like the verbal portion of these examinations discussed above, one possibility for the mixed results is that all these students had already met the minimum score required to gain entrance into a master’s degree, making these tests appear to have no significant effect on academic success. Again, a study investigating a group of students who were admitted, even though their scores did not meet the minimum level, to see whether their scores had any significant effect

on their academic success would be interesting.

12. According to this study, TOEFL total mean scores do not have an affect on academic success. However, further study of this variable is recommended because a minimum score on the examination is required to gain entrance into a master's degree, and these students all meet that minimum score. Further research might conclude that beyond the minimum score, there is no significant effect on academic success. A study of a group of students, who were admitted even though their scores did not meet the minimum level, to see whether their scores had any significant affect on their academic success would help clarify the relationship between these two variables.

Concluding Statement

This study identified some cognitive and noncognitive factors that could be helpful in making admissions decisions. In addition, the results of this study showed that there are likely many factors influencing the academic success of foreign students that are more related to retention and persistence policies, rather than admissions policies. Graduate education is an expensive endeavor for the individual student and the graduate institution. Predicting academic performance is a complex task, and the search for factors that can serve as valid predictors of academic performance is important. Identification of variables that may be predictors of students' successful master's degree completion may provide useful information to improve retention and completion rates. Understanding the unique combination of factors that are related to a student's decision to remain in their graduate program may allow college administrators and faculty to adopt a proactive stance toward

improving the retention rates for those students by guiding institutional policies toward improving student graduation rates.

REFERENCES

- Alderson, D., & Holland, P. (1981). *Item performance across native language groups on the Test of English as a Foreign Language*. Princeton, NJ: ETS.
- Altbach, P. (1985). The foreign student dilemma. *Bulletin of the International Bureau of Education* 236–37, 7–92.
- Altbach, P. (1997a). The foreign student dilemma. In P. Altbach, *Comparative higher education: Knowledge, the university, and development* (pp. 225–246). Boston: Center for International Higher Education, Boston College.
- Altbach, P. (1997b). The new internationalism: Foreign students and scholars. In P. Altbach, *Comparative higher education: Knowledge, the university, and development* (pp. 207–224). Boston: Center for International Higher Education, Boston College.
- American Assembly of Collegiate Schools of Business. (1981). *Accreditation Council Policies and Standard Manual*. Louis, MO: Author.
- American Association of Collegiate Registrars and Admissions Officers. (1971). *AACRAO-AID participant selection and placement study (Report to the agency for International Development, United States Department of State)*. Washington, DC: USAID.
- American Association of Collegiate Registrars and Admissions Officers. (1982). *A bibliography of reference materials for evaluating foreign student credentials* (3rd ed.). Washington, DC: Author.
- American Council on Education. (1982). *Foreign students and institutional policy*. Washington, DC: Author.
- Angelis, P. (1977). Language testing and intelligence testing: Friends or foes? In J.E. Reddon (Ed.) Proceedings of the First International Conference on Frontiers in Language Proficiency and Dominance Testings. *Occasional Papers on Languages*, 1. Carbondale, IL: Southern Illinois University. (ERIC Document Reproduction Service No. ED 145 677).
- Angoff, William H., & Johnson, Eugene G. (1990). The differential impact of curriculum on aptitude test scores. *Journal of Educational Measurement*, 27(4), 291–305.
- Ayers, J. & Peters, R. (1977). Predictive validity of the Test of English as a Foreign Language for Asian graduate students in engineering, chemistry, or mathematics. *Educational and Psychological Measurement*, 37(2), 461–463.

- Ayers, J. & Quattlebaum, R. (1992). TOEFL performance and success in a master's program in engineering. *Educational and Psychological Measurement*, 52, 973–975.
- Bostic, M. (1981). A correlational study of academic achievement and the test of English as a second language (TOEFL). *Dissertation Abstracts International*, 42, 468A. (University Microfilms No. 81-16, 851).
- Boyer, S. & Sedlacek, W. (1988). *Noncognitive predictors of academic success for international students: A longitudinal study* (Maryland University Counseling Center Rep. No. 1-87). College Park, MD: Maryland University.
- Burgess, T. & Greis, N. (1970). *English language proficiency and academic achievement among students of English as a second language at the college level*. (ERIC Document Reproduction Service No. ED 074 812.)
- Campbell, C.T., & Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally College Publishing Company.
- Chai, S. & Woehlke, P. (1979). *The predictive ability of standardized tests of English as foreign language*. Paper presented at the International Conference on Language Proficiency and Dominance Testing, Southern Illinois University, IL.
- College Entrance Examination Board. (1977). *Guidelines for the recruitment of foreign students*. New York: Author.
- Fletcher, A. & Aldrich-Langen, C. (1996) Refining the methodology of comparing United States and foreign educational credentials. From the Milwaukee Symposium (1996). <http://www.nafsa.org/educator/milsymp/chap5.html>.
- Council of Graduate Schools in the United States. (1980). *The foreign students in American graduate schools*. Washington, DC: Author. (ERIC Document Reproduction Service No. ED207411)
- Deressa, B. & Beavers, I. (1988). Needs assessment of international students in a college of home economics. *Educational Research Quarterly*, 12(2), 51–56.
- Diener, T. (1977). *Profile of foreign students in United States community and junior colleges*. New York: College Entrance Examination Board.
- Du Bois, C. (1965). *Foreign students and higher education in the United States*. Washington, DC: American Council on Education.
- Dunnett, S. (1985). Current communicative needs of foreign students in the college/university classroom. *International Programs Quarterly*, 1(2), 22–26.

- Educational Testing Service. (1977). *GRE information bulletin*. Princeton, NJ: Author.
- Educational Testing Service. (1978a). *TOEFL test and score manual*. Princeton, NJ: Author.
- Educational Testing Services. (1978b). *The Graduate Record Examinations Aptitude Test*. Princeton, NJ: Author.
- Educational Testing Service. (1985). *TOEFL test manual*. Princeton, NJ: Author.
- Educational Testing Service. (1987a). *1987–1988 bulletin of information for TOEFL and TES*. Princeton, NJ: Author.
- Educational Testing Service. (1987b). *1987–1988 GRE information bulletin*. Princeton, NJ: Author.
- Educational Testing Service. (1996a). *GMAT information bulletin*. Princeton, NJ: Author.
- Educational Testing Service. (1996b). *TOEFL test manual*. Princeton, NJ: Author.
- Educational Testing Service (1997). *TOEFL test and score manual*. Princeton, NJ: Author.
- Goodwin, C. & Nacho, M. (Eds.). (1983). *Absence of decision* (IIE Research Rep. No.1). New York: Institution of International Education.
- Graham, J. (1984). *Predictors of ESL student academic success*. Unpublished manuscript, University of Maryland, Baltimore County.
- Graham, J. (1987). English language proficiency and the prediction of academic success. *TESOL Quarterly*, 21(3), 505–521.
- Gue, L. & Holdaway, E. (1973). English proficiency tests as predictors of success in graduate studies in education. *Language Learning*, 23, 89–103.
- Haas, G. (1979). Undergraduate transfer credits from abroad. *NAFSA Newsletter*, 30(8), 195–198.
- Hale, G., Stansfield, C., & Duran, R. (1983). *Summaries of TOEFL studies, 1963–1982* (Research Rep. No. 16). Princeton, NJ: Educational Testing Service.
- Hancock, G.R., & Klockars, A.J. (1996). The quest for alpha: Developments in multiple comparison procedures in the quarter century since Games (1971). *Review of Educational Research*, 66(3), 269-306.

- Heil, D., & Aleamoni, L. (1974). *Assessment of the proficiency in the use and understanding of English by foreign students as measured by the Test of English as a Foreign Language* (Report No. 350). Urbana, IL: University of Illinois. (ERIC Document Reproduction Service No. ED093948)
- Ho, D., & Spinks, J. (1985). Multivariate prediction of academic performance by Hong Kong University students. *Contemporary Educational Psychology, 10*, 249–259.
- Homan, J. (1973). Foreign student admissions: A discriminant analysis approach. *Dissertation Abstracts International, 34*, 3759A.
- Hosley, D., & Meredith, K. (1979). Inter- and intra-test correlates of the TOEFL. *TESOL Quarterly, 13*(2), 209–217.
- Hughey, A., & Hinson, D. (1993). Assessing the efficacy of the Test of English as a Foreign Language. *Psychological Reports, 73*, 197–199.
- Hunter, S., Harvey, P., Springer, G., & MacGregor, J. (1968). What is the Graduate Record Examination? *College and University, 43*, 524–533.
- Hwang, K. & Dizney, H. (1970). Predictive validity of the Test of English as a Foreign Language for Chinese graduate students at an American university. *Educational and Psychological Measurement, 30*, 475–477.
- Institute of International Education. (1966). *Open doors: 1965/1966 report on international educational exchange*. New York: Author.
- Institute of International Education. (1981a). *Evaluating foreign students' credentials*. [Reprint from *World Higher Education Communiqué*.] New York: Author.
- Institute of International Education. (1981b). *Open doors: 1980/81 report on international educational exchange*. New York: Author.
- Institute of International Education. (1986). *Open doors: 1985/86 report on international educational exchange*. New York: Author.
- Institute of International Education. (1996). *Open doors: 1995/96 report on international educational exchange*. New York: Author.
- Institute of International Education. (1998). *Open doors: 1997/98 report on international educational exchange*. New York: Author.
- Institute of International Education. (2000). *Open doors: 1999/2000 report on international educational exchange*. New York: Author.

- Jenkins, H. (1980). *The relevance of United States education to students from developing countries: A report of the AID/NAFSA workshop (4th)*. Published by the National Association for Foreign Student Affairs through a contract with the United States Agency for International Development. (ERIC Documentation Reproduction Service No. ED197672).
- Jenkins, H. (1983a). Growth and impact of educational interchanges. In H. Jenkins & Associates, *Educating students from other nations*. San Francisco: Jossey Bass.
- Jenkins, H. (1983b). Economics: analyzing costs and benefits. In H. Jenkins & Associates, *Educating students from other nations*. San Francisco: Jossey Bass.
- Kaiser, J. (1982, November 12). *The predictive validity of the GRE Aptitude Test*. Paper presented at the annual meeting of Rocky Mountain Research Association, Albuquerque, NM. .
- Kaiser, J. (1983). *The different predictive validity of the GRE aptitude test for foreign students*. Baltimore, MD: Eastern Educational Research Association.
- Kaplan, R. (1983). Meeting the educational needs of other nations. In H. Jenkins & Associates, *Educating students from other nations*. San Francisco: Jossey Bass.
- Knowles, A. (Ed.). (1977). *The international encyclopedia of higher education*. San Francisco: Jossey Bass.
- Light, R., Xu, M., & Mossop, J. (1987). English proficiency and academic performance of international students. *TESOL Quarterly*, 21, 251–261.
- Luthy, Melvin J. (1983). Nonnative speakers' perceptions of English "nonlexical" intonation signals. *Language Learning*, 33(1), 19–36.
- Manning, W., Willingham, W., & Breland, H. (1977). *Selective admissions in higher education*. San Francisco: Jossey Bass.
- Martin, G. (1971). A model for the cultural and statistical analysis of academic achievement of foreign graduate students at the University of North Carolina at Chapel Hill. *Dissertation Abstracts International*, 32, 2311A. (University Microfilms No. 71–30, 578.)
- Martin, J. & Rudolph, L. (1972). Correlates of the Wechsler Adult Intelligence Scale, the Slossen Intelligence Test, ACT scores and grade point averages. *Educational and Psychological Measurement*, 25, 1105–1110.
- Meloni, C. (1986). Adjustment problems of foreign students in United States colleges and universities. Washington, DC: ERIC Clearing House on Languages and Linguistics.

- Mulligan, A. (1966). Evaluating foreign credentials. *College and University*, 41, 307–313.
- National Association for Foreign Student Affairs. (1977). *English language proficiency, guideline series, No. 3*. Washington, DC: Author.
- National Association for Foreign Student Affairs. (1978). *Selection and admission of foreign students, guideline series, No. 2*. Washington, DC: Author.
- National Association for Foreign Student Affairs. (1979a). *Foreign student admissions, credentials bibliography*. Washington, DC: Author.
- National Association for Foreign Student Affairs. (1979b). *Standards and responsibilities in international educational interchange, guideline series, No. 1*. Washington, DC: Author.
- National Association for Foreign Student Affairs. (1981). *NAFSA principles for international educational exchange*. Washington, DC: Author.
- National Association for Foreign Student Affairs. (1995). *Foreign students in United States institutions*. Washington, DC: Author.
- National Association for Foreign Student Affairs and American Association of Collegiate Registrars and Admissions Officers. (1970). *A guide to the admission of foreign students* (rev. ed.). Washington, DC: Author.
- National Science Foundation. (1985). *A selected list of fellowship opportunities and aids to advanced education*. Washington, DC: Author.
- Odunze, O. (1982). Test of English as a Foreign Language and first year GPA of Nigerian students. *Dissertation Abstracts International*, 42, 3419A–3420A. (University Microfilms No. 82–02, 657.)
- Paolillo, J. (1982). The predicting validity of selected admissions variables relative to grade point average earned in a Master of Business Administration program. *Educational and Psychology Measurement*, 42, 1163–1167.
- Patrick, W. (1976). Nonresident student practices. *College and Universities*, 57(3), 291–321.
- Patrick, W. (1983). Admissions: Developing effective selection practices. In H. Jenkins & Associates, *Educating students from other nations*. San Francisco: Jossey Bass.
- Pedhazur, E. (1982). *Multiple regression in behavioral research* (2nd ed.). New York: Dreyden Press.

- Powers, D. (1980). *The relationship between scores on the Graduate Management Admission Test and the Test of English as a Foreign Language.* (TOEFL Research Rep. No. 5; ETS Research Rep. No. 80-31). Princeton, NJ: Educational Testing Service. (ERIC Document Reproduction Services No. ED218329).
- Quann, C. & Associates. (1979). *Admissions, academic records, and registrar services.* San Francisco, CA: Jossey Bass.
- Sabine, T. (1975). Foreign students coping with the American culture at eight selected American universities. *Dissertation Abstract International*, 36, 6593A.
- Sharon, A. (1972). English proficiency, verbal aptitude, and foreign student success in American graduate school. *Educational and Psychological Measurement*, 32, 425–431.
- Shay, H. (1975). Effect of foreign students' language proficiency on academic performance. *Dissertation Abstracts International*, 36, 1983A. (University Microfilms No. 75-21, 931.)
- Slark, J., & Bateman, H. (1982). *A study of non-native English speakers' academic performance at Santa Ana College.* Santa Ana College, CA. Institutional Research Office. (ERIC Document Reproduction Service No. ED206368)
- Spady, William G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. *Interchange*, 1(1), 64–85.
- Spaulding, S., & Flack, M. (1976). *The world's students in the United States: A review and evaluation of research on foreign students.* New York: Praeger.
- Stover, A. (1982). Effects of language admission criteria on academic performance of non-native English-speaking students. *Dissertation Abstracts International*, 42, 4374A–4375A. (University Microfilms No. 82-07,017.)
- Stoynoff, S. (1990). English language proficiency and study strategies as determinants of academic success for international students in United States universities (Doctoral dissertation, University of Oregon, 1990). *Dissertation Abstracts International*, 52, 01A.
- Strommen, C. (1981). *The relationship of noncognitive variables to the degree of academic achievement of foreign graduate students at the University of Houston.* Unpublished doctoral dissertation, University of Houston.
- Tan-Ngarmstrong, T. (1979). *The relationship of selected variables to academic achievement of foreign graduate students at Mississippi State University.* Unpublished doctoral dissertation, Mississippi State University.

- Thornell, J. & McCoy, A. (1985). The predictive validity of the Graduate Record Examinations for subgroups of students in different academic disciplines. *Educational and Psychology Measurement, 45*, 415–419.
- Traynor, R. (1985). The TOEFL: An appraisal. *ELT Journal, 39*, 43–47.
- UNESCO. (1976). *Statistics of students abroad 1969–1973*. Paris: Author.
- UNESCO. (1995). *Statistics of students abroad 1989–1993*. Paris: Author.
- Von Dorpowski, H. (1977). The problem of Oriental, Latin American, and Arab students in United States colleges and universities as perceived by these foreign students and by foreign students advisors. *Dissertation Abstracts International, 38*, 7160A.
- Waller, C. (1964). Research related to college persistence. *College University, 39*, 281–294.
- Walton, B. (1971). Research on foreign graduate students. *International Educational and Cultural Exchange, 6*, 17–29.
- Wheeler, W., King, H., and Davidson, A. (Eds.). (1925). *The foreign student in America*. New York: Association Press.
- Wigdor, A. & Garner, W. (Eds.). (1982). *Ability testing: Uses, consequences, and controversies, part II*. Washington, DC: National Academy.
- Wilcox, L. (1975). The prediction of academic success of undergraduate foreign students. *Dissertation Abstracts International, 35*, 6084B. (University Microfilms, No. 75–12, 178.)
- Willingham, W. (1976). *Validity and the Graduate Record Examination*. Princeton, NJ: Educational Testing Service.
- Wilson, K. (1982). *GMAT and GRE Aptitude Test performance in relation to primary language and scores on TOEFL*. Princeton, NJ: Educational Testing Service.
- Youngblood, S.A., & Martin, B.J. (1982). Ability testing and graduate admissions: Decision process modeling and validation. *Psychology Measurement, 42*, 1153–1160.