THE SIGNIFICANCE OF WRITING SKILLS AND OTHER COMPETENCY VARIABLES IN PREDICTING STUDENT SUCCESS IN ONLINE MBA COURSES

A Dissertation
presented to
the Faculty of the Graduate School
at the University of Missouri-Columbia
in Partial Fulfillment
of the Requirements of the Degree
Doctor of Education

by

JAMES KENNETH COOK
Dr. Paul Watkins, Dissertation Supervisor
July 2015
The undersigned appointed by the Dean of the Graduate Faculty, have examined a dissertation entitled:

THE SIGNIFICANCE OF WRITING SKILLS AND OTHER COMPETENCY VARIABLES IN PREDICTING STUDENT SUCCESS IN ONLINE MBA COURSES

Presented by JAMES K. COOK, a candidate for the degree of DOCTOR OF EDUCATION and hereby certify that in their opinion it is worthy of acceptance.

___________________________________________
Dr. Paul Watkins, Major Advisor
Educational Leadership and Counseling

___________________________________________
Dr. Margaret Dalton
Educational Leadership and Counseling

___________________________________________
Dr. Jeremy Heider
Psychology

___________________________________________
Dr. Kenneth A. Heischmidt, Director
College of Business MBA Program

___________________________________________
Dr. David Stader
Educational Leadership and Counseling
ACKNOWLEDGEMENTS

I take this opportunity to thank the many people who gave me their unconditional support and invaluable contributions in this endeavor to achieve this late-life goal. Without their encouragement, help, and support I would have never been able to attain and appreciate the value of an education. This educational process has changed me both personally and professionally, making me a more whole person, and enabling me to know a little more about what I didn’t know or understand.

I thank my dissertation chairs, Dr. Paul Watkins and Dr. Ruth Ann Roberts, for providing me the knowledge to perform at this level, and more importantly, the encouragement, advice, and support to perform quality research. Dr. Roberts, who retired this past year, guided me smoothly through the first three chapters of my research. After a long hiatus, it was Dr. Watkins who guided me through the last two chapters. I also thank my dissertation committee whose critique, recommendations, and support made this endeavor a reality. Special thanks to Dr. Kenneth Heischmidt who helped me focus on the research topic, and Dr. Jeremy Heider for help and guidance on statistics. Without all of their untiring encouragement and support, this accomplishment would not have been possible.

I owe a great deal of gratitude to Floyd Lockhart, LMS Administrator, and Margaret Brickhaus, Sr. Systems Analyst/Programmer, who put forth a great amount of effort to help me acquire, analyze, and code the data obtained from the Center for Scholarship and Learning and Ellusian Database at the University. They contributed much to the reliability and validity of the data for this study.
I also thank my colleagues and leadership at the University for their help and support through my coursework and research. From ‘covering’ for me when I was out of the office to attend classes to listening to my challenges, their encouragement, help, support has been unwavering.

My most heartfelt thanks go to my family. First and foremost to my wife, Sue Cook, for her unconditional love and belief in me; her encouragement and support; and, her willingness to sacrifice part of her life for me to complete my doctoral degree. To my adult children, Jennifer Cook and Jeff Cook-McCormac, for their love, encouragement, and support; and who, through their own initiative, efforts, perseverance, and accomplishments in their lives, have shown me what it takes to perform at this level. Finally, to my parents, Alvin and Maxine Cook, for their nurturing, love, and support. Without their encouraging me to go to college in the first place, this journey would have never begun.
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS .................................................................................................................. ii

LIST OF TABLES ............................................................................................................................... viii

LIST OF FIGURES ............................................................................................................................. ix

ABSTRACT ...................................................................................................................................... xi

CHAPTER ONE: Introduction to the Study ......................................................................................... 1

  Conceptual Framework .................................................................................................................. 2

  Problem Statement ......................................................................................................................... 4

  Research Purpose .......................................................................................................................... 6

  Research Approach ....................................................................................................................... 11

    Population and Sample .............................................................................................................. 12

    Data Collection .......................................................................................................................... 14

    Data Analysis .............................................................................................................................. 15

  Assumptions of the Study ............................................................................................................ 16

  Anticipated Study Limitations ...................................................................................................... 17

  Definition of Key Terms ............................................................................................................... 18

  Significance of the Research ......................................................................................................... 22

  Summary .................................................................................................................................... 23
CHAPTER TWO: Review of Related Literature ................................................................. 24
Online Learning Theory ............................................................................................ 25
Traditional Learning Theory ...................................................................................... 26
Technological Learning Theory .................................................................................. 28
Assessment Theory .................................................................................................... 29
Prescriptive Theory ................................................................................................... 31
Predictive Theory ....................................................................................................... 33
Summary ..................................................................................................................... 34

CHAPTER THREE: Research Design and Methods ..................................................... 36
Design and Methods ................................................................................................... 42
Population and Sample ............................................................................................... 46
Data Collection ........................................................................................................... 47
Data Analysis ............................................................................................................. 48
Strategies to Address Issues of Quality ...................................................................... 51
Summary ..................................................................................................................... 53

CHAPTER FOUR: Analysis of Data ............................................................................ 54
Overview of the Study ............................................................................................... 55
Organization of Data Analysis .................................................................................... 60
Presentation of Descriptive Statistics .......................................................................... 61
Analysis of Data ......................................................................................................... 96
Descriptive Statistics of Sample ................................................................................ 97
SPSS Output – Correlations ....................................................................................... 100
Summary ..................................................................................................................... 118
CHAPTER FIVE: Findings, Conclusions, Implications, and Recommendations .......... 119

Summary of the Study ......................................................................................... 119

Findings ............................................................................................................. 126

Summation of Demographic Data ................................................................. 126

Research Question One .................................................................................. 137

Research Question Two .................................................................................. 140

Research Question Three ............................................................................... 143

Research Question Four .................................................................................. 146

Conclusions ..................................................................................................... 151

Summation of Demographic Data ................................................................. 151

Research Question One .................................................................................. 165

Research Question Two .................................................................................. 170

Research Question Three ............................................................................... 175

Research Question Four .................................................................................. 180

Implications ..................................................................................................... 191

Future Research ............................................................................................ 195

Summary .......................................................................................................... 198

BIBLIOGRAPHY ............................................................................................... 200

APPENDIX A: 2006-2007 Requirements for MBA Program Admission
at the Midwest University .................................................................................... 210

Admission Criteria .......................................................................................... 210

Additional Admissions Criteria ....................................................................... 210
APPENDIX B: 2008-2009 Requirements for MBA Program Admission at the Midwest University...211
   Admission Criteria .................................................................211
   Additional Admissions Criteria .............................................211

APPENDIX C: 2009-2010 Requirements for MBA Program Admission at the Midwest University...212
   Admission Criteria .................................................................212
   Additional Admissions Criteria .............................................212

APPENDIX D: 2010-2011 Requirements for MBA Program Admission at the Midwest University...213
   Admission Criteria .................................................................213
   Additional Admissions Criteria .............................................213
   Provisional Admission Criteria ............................................213

APPENDIX E: 2013-2014 Requirements for MBA Program Admission at the Midwest University...215
   Admission Criteria .................................................................215
   Regular Admission .................................................................215
   Probationary Admission .........................................................216

APPENDIX F: The Writing Proficiency Exam (WP003) Requirements at the Midwest University...217

APPENDIX G: Correlation and Comparability Table.................................................219
   Overall Face-to-Face (F2F) MBA Course Grade Correlations ...219
   Overall Online MBA Course Grade Correlations ...219
   Overall MBA Grade Point Average Correlations ...220
   Overall Face-to-Face Course Grade, Overall Online Course Grade, and Overall MBA Grade Point Average Comparability Analysis of the Mean Correlations...220

VITA........................................................................................................221
LIST OF TABLES

Table 1: Total Population - Number of MBA Students Matriculating Per Year at the Midwestern University .......................................................... 62

Table 2: Net Population - Number of Different MBA Students Matriculating Per Year at the Midwestern University .............................................. 63

Table 3: Sample Sizes by Variable .................................................................. 65

Table 4: Descriptive Statistics of Sample .......................................................... 97

Table 5: SPSS Output – Correlations ................................................................. 100

Table 6: Overall F2F Grades (criterion variable) ................................................. 165

Table 7: Overall Online Grades (criterion variable) ........................................... 170

Table 8: Overall MBA GPA (criterion variable) ................................................. 175

Table 9: F2F Grades, Online Grades, and Overall MBA GPA (criterion variables) .... 180
LIST OF FIGURES

Figure 1: Gender of Students in Sample ..........................................................66
Figure 2: Age of Students in Sample ..................................................................67
Figure 3: Ethnicity of Students in Sample .........................................................68
Figure 4: UGPA of Students in Sample ...............................................................69
Figure 6: GMAT Verbal Score of Students in Sample ........................................71
Figure 7: GMAT Quantitative Score of Students in Sample .............................72
Figure 8: GMAT Analytic Writing Assessment Score of Students in Sample ......73
Figure 9: GMAT Total Score of Students in Sample ..........................................74
Figure 10: Writing Proficiency Exam Score of Students in Sample ....................75
Figure 11: EN100 Grade of Students in Sample ...............................................76
Figure 12: EN140 Grade of Students in Sample ...............................................77
Figure 13: Test Grades Percent in Online Courses of Students in Sample ..........78
Figure 14: Written Work Grades Percent in Online Courses of Students in Sample 79
Figure 15: Overall MBA Grade Percent in Courses with Test and Written Work Grade Data of Students in Sample .........................................................80
Figure 16: Overall Credits Taken in Courses with Test and Written Work Grade Data of Students in Sample .................................................................81
Figure 17: Test, Written Work and Overall Grade % in Online Courses with Test and Written Work Grade Data of Students in Sample .................................82
Figure 18: Overall Online Credits Taken by Students with Test and Written Work Data of Students in Sample .................................................................83
Figure 19: Credits Taken in Online Courses with Test and Written Work Data Compared to all Credits Taken in Online Courses of Students in Sample ......84
Figure 20: Percent of Online Courses Taken with Test and Written Work Data to all Online Courses Taken of Students in Sample ..................................85
Figure 21: Online MBA GPA of Students in Sample .........................................86
Figure 22: Online MBA Credits of Students in Online MBA GPA Sample .................87

Figure 24: F2F MBA Credits of Students in F2F MBA GPA Sample ......................89

Figure 26: Online and F2F MBA Credits Combined of Students in Online and Face-to-Face MBA GPA Samples.............................................................91

Figure 27: MBA GPA of Students in Sample ......................................................92

Figure 28: Number of MBA Credits Earned by Students in MBA GPA Sample ..........93

Figure 29: Term Graduated of Students in Sample...............................................94

Figure 30: Number of Attributes Per Student of Students in Sample .....................95
THE SIGNIFICANCE OF WRITING SKILLS AND OTHER COMPETENCY VARIABLES IN PREDICTING STUDENT SUCCESS IN ONLINE MBA COURSES

James K. Cook

Dr. Paul Watkins, Dissertation Supervisor

ABSTRACT

The purpose of this study is to (a) explore the relationship of student cognitive skill indicators (predictor variables) to student performance in online and face-to-face MBA courses (criterion variables) at a Midwestern United States University (University) conferring undergraduate and graduate degrees in a variety of academic fields; (b) determine if there is a statistically significant correlation between the predictor and criterion variables; and, (c) determine if there is any statistically significant difference between any statistically significant correlations of predictor and criterion variables. A sample of 322 students were studied using seven-years of pre-existing data (Fall 2006 – Fall 2013) from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and the Institutional Research department at the University. Statistical correlation and regression procedures were used to analyze the data.

Contrary to existing online education research, this study did not conclusively indicate that students’ ability to write effectively had any significant relationship to students’ performance in online versus face-to-face courses in the MBA program at the University. This finding, combined with the foundational learning theory research, suggests that online course design, pedagogy, and assessment may be mitigating the affect differences in student writing skills and learning has on student performance in online versus face-to-face courses.
This study also found significant differences in the relationship of student GMAT-Verbal score, GMAT-Analytical Writing score and GMAT-Total score, and student performance in online versus face-to-face MBA courses. Student GMAT-Verbal score and GMAT-Total score significantly correlated with student performance in face-to-face MBA courses at $p < .01$, but did not significantly correlate with online MBA courses. Student GMAT-Analytical Writing score significantly correlated with student performance in face-to-face MBA courses at $p < .01$, but only correlated with student performance in online MBA courses at $p < .05$. These findings suggest that the use of GMAT scores in making MBA program admission decisions may not be appropriate.

This study indicated that GMAT scores were not valid predictors of student performance in online MBA courses at the University.

Finally, this study indicated that students with undergraduate grade point averages less than 3.0, and students with combined undergraduate grade point averages and GMAT scores outside the threshold of the requirements for regular MBA program admittance, performed successfully. Comparing this finding with the findings that student Writing Proficiency Exam scores and EN140 Grades of students were also valid predictors of student success in Online MBA program courses; and, the finding that GMAT scores were not valid predictors of student performance in Online MBA program courses; suggest that the use of Undergraduate Grade Point Average and GMAT scores for MBA program admission requirements should be reviewed and possibly revised.
CHAPTER ONE

Introduction to the Study

Distance learning has been part of the fabric of education and evolving since the earliest correspondence courses in the late 1800s (James & Gardner, 1995). Holmberg (1977) defines distance education as education where the instructor and the student are separated for the majority of the teaching function. For nearly 100 years, distance learning maintained a minor role in education, limited by technology, public acceptance, and absence of accredited degree based programs. Due to these limitations, distance learning pedagogy and learning assessment stagnated with little to no research into improving this form of education. This all changed in the 1980s with the invention of affordable personal computers, a transformation which has catapulted distance education into the mainstream of higher education.

Today, distance education has become primarily online education, and is embraced by students worldwide due to convenience and accessibility (Kim, Liu, & Bonk, 2005; Ally, 2005). General online research has primarily focused on student acceptance and the application of face-to-face pedagogy in an online environment. Online educational research has focused on several learning theories, which suggest that online education can improve learner-centered pedagogy through online communities, discussion boards, and peer-feedback (Meyen, Aust, Bui, & Isaacson, 2002; Bauer & Anderson, 2000; Loveland, 2005). This research has indicated that students use different cognitive skills to learn in online versus face to face courses.

Although online educational research has indicated that students taking online courses score lower on final exams than students taking face-to-face courses, there is minimal research exploring why this occurs (Daud & Zubairi, 2005; Terry, 2007).
Accordingly, there is a need to explore and understand the relationship of student cognitive skills and learning strategies employed; differences in online and face-to-face course pedagogy, student learning, and student assessment; and, student performance. This research is appropriate and timely since online education is rapidly becoming a significant method of course delivery in higher education; and, there is minimal research to support online pedagogy and identify factors that may predict student success.

This study will explore and attempt to identify the relationship of student cognitive skills to student performance in online and face-to-face courses. A problem statement and conceptual framework is provided to further clarify the problem and offer suggestions as to how the problem can be studied. The purpose of this study will be addressed through study of Master of Business Administration (MBA) students taking online and face-to-face courses at a regional Midwestern University (University). The research purpose will be further clarified and research questions presented to address the problem. The design and methods for the study will also be presented. Finally, the significance of the research to leadership practice will be discussed.

Conceptual Framework

Student satisfaction and higher education’s dependence on online course delivery continues to increase as research indicates that students in online MBA courses score lower grades on final exams than students in face-to-face classes (Allen & Seaman, 2007; Kim, Liu, & Bonk, 2005; Daud & Zubairi, 2005). Foundational online learning theories suggest that, while both online and face-to-face course share the same basic social cognitive learning theory, students and instructors employ different cognitive learning skills in online versus face-to-face course in pedagogy and assessment (Keegan, 1986; Holmberg, 1996; Carroll, 2000).
Online learning theories recommend new pedagogical, learning, and assessment theory specific to online course delivery; however, there is minimal empirical research to support these recommendations, understand the relationship of cognitive skills to student performance, and the use cognitive skill indicators to predict student success in online courses. Research suggests that dependence on written communication in online courses and students’ use of different learning styles for multiple-choice exams versus written assignments may be the major differences in how students learn in online versus face-to-face courses (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Looking at these studies in the context of foundational online learning theory, the emphasis on students’ cognitive writing skills and use of different learning styles in online courses compared to face-to-face courses, may explain how and why student performance and assessment are affected.

This study will use the concepts of cognitive student skill indicators and assessment type to explore the relationship and predictability of cognitive student skill indicators to student performance in online and face-to-face MBA courses at the University. Assessment types are defined as student grades in face-to-face courses (OVERALL F2F GRADES) and online courses (OVERALL OL GRADES), and overall student grades in all MBA courses (OVERALL MBA GPA). Cognitive student skill indicators are Undergraduate Grade Point Average (UGPA); student performance on the Graduate Management Admission Test (GMAT) Verbal section (GMAT-VERBAL) score, Quantitative section (GMAT-QUANTITATIVE) score, Analytical Writing Assessment section (GMAT-ANALYTICAL WRITING) score, and overall students’ performance on GMAT (GMAT-TOTAL) score; WRITING PROFICIENCE EXAM score; writing specific undergraduate courses (EN100 GRADES and EN140 GRADES);
and, tests and written work in online courses (OL TEST GRADES and OL WRITING GRADES). Writing intensive undergraduate courses are an English Composition course (EN100) and English Composition II/Rhetoric and Critical Thinking course (EN140) taken by all undergraduate students at the University. The study will also use GENDER, AGE, and ETHNICITY as predictor variables to determine if any statistical difference exists between cognitive skill correlations and demographic correlations in their relationship with the predictor variables.

While current research indicates that the GMAT and UGPA are highly valid predictors of student success in graduate business programs (Kunzel, Crede, & Thomas, 2007), there is no research correlating student GMAT and undergraduate performance with student performance in online-only courses. Quantifying the relationship between and among cognitive student skill indicators and student performance could have a significant effect on online course design and pedagogy, as well as provide an empirical basis for predicting student success in online MBA courses.

Problem Statement

Higher education is rapidly being transformed by computer technology. In an educational environment once dominated by face-to-face delivery of course materials, computer technology has facilitated various combinations of online course delivery which includes blended, hybrid, and online courses. Blended courses primarily utilize face-to-face pedagogy, while employing minimal online pedagogy to facilitate primarily face-to-face learning; hybrid courses utilize a combination of online and face-to-face pedagogy to facilitate both online and face-to-face learning; and, online courses exclusively use online pedagogy and technology. While this transformation has spawned new pedagogical, learning, and assessment theory specific to online course delivery,
research indicates that students in online courses score lower grades on their final exams than students in face-to-face or hybrid courses (Daud & Zubairi, 2005; Terry, 2007).

Foundational online theory by Keegan (1986), Holmberg (1996), and Carroll (2000) suggests that online versus face-to-face course pedagogy and assessment require the student and the instructor to employ different cognitive learning skills. However, there is minimal empirical research into understanding the relationship of student cognitive skills to student performance in online courses. The lack of research limits the ability of educators and advisors to predict student success in online courses as well as the most effective pedagogy for student learning in an online environment.

Research indicates that online courses have a much greater dependence on cognitive skills related to written communication than face-to-face courses. Research also indicates that students employ different cognitive learning skills for multiple-choice exams versus written assignments; and, that the emphasis on written assignments in online learning may explain why online student’s score lower on exams than students who take face-to-face courses (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Looking at these studies in the context of the foundational online learning theory suggests that students’ use of different cognitive skills in online and face-to-face courses, may relate to differences in student performance. As students, instructors, and learning institutions embrace online education, there is an increasing need to study the relationship between student cognitive skills and student performance in online versus face-to-face courses.
Research Purpose

The purpose of this study is to (a) explore the relationship of student cognitive skill indicators (predictor variables) to student performance in online and face-to-face MBA courses (criterion variables) at a Midwestern United States University (University) conferring undergraduate and graduate degrees in a variety of academic fields; (b) determine if there is a statistically significant correlation between the predictor and criterion variables; and, (c) determine if there is any statistically significant difference between any statistically significant correlations of predictor and criterion variables. The conceptual framework of the study is that there is a need to conduct empirical research to explore and understand the relationship of student cognitive skills and learning strategies employed; to differences in online and face-to-face course pedagogy, student learning, and student assessment; and, student performance.

A review of literature indicates that students use different cognitive learning skills in online versus face-to-face courses (Keegan, 1986; Holmberg, 1996; Carroll, 2000). The literature review also indicates that assessment type; students’ cognitive skill indicators; students’ writing ability; and, the type of learning strategies employed, may help explain the difference in student performance (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). The lack of research in this area indicates a clear need to study this relationship and provide empirical data to address the knowledge gap.

This study addresses the research purpose by focusing on students taking online and face-to-face MBA courses at the University. The MBA program offers an excellent area to study online learning through the lens of assessment type and student cognitive skills indicators. The MBA program offers a variety of course delivery methods that
include face-to-face only, online only, and a combination of face-to-face and online courses for study. Accordingly, the MBA program data provide many student cognitive skill and performance indicators useful for study. High student retention in MBA programs also provides a stable student population for study.

The study is designed to explore and provide empirical data which indicate the relationship and predictability of MBA students’ cognitive skill indicators to student performance indicators in online and face-to-face MBA courses. Research indicates that correlation studies have been effective in exploring and identifying student cognitive skill indicators which predict student success in face-to-face MBA courses (Kunzel, Crede, & Thomas, 2007). Accordingly, this study uses statistical correlation analysis to explore the relationship and predictability of student cognitive skill indicators to student performance in online and face-to-face MBA courses at the University. Statistical regression analysis is also used to understand if any of the correlating factors relate differently to online versus face-to-face courses. Using these statistical procedures, the study provides empirical data which explain the relationship of student cognitive skill factors and students’ writing ability; to student performance in online and face-to-face courses.

Research Questions

This study uses statistical correlation procedures to explore the use of student cognitive skill indictors, and other assessment instruments to predict student performance in face-to-face and online MBA courses at the University. The study also uses statistical regression procedures to explore the relationship of any statistically correlating factors in face-to-face and online MBA courses at the University. Previous empirical research indicates that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and
Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003). Therefore, student gender, age, and ethnicity demographics are explored to determine if any adverse sub-group impact exists. Within the context of this study, the following research questions are addressed:

1. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?

2. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?
3. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?

4. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

Research Hypotheses

1. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-
TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES.

2. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL OL GRADES.

3. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL MBA GPA.

4. There is no statistically significant difference in the correlation coefficients between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA.
Research Approach

This research project explores the relationship and significance of student writing ability and other competency variables, to student performance in online versus face-to-face MBA courses. The design of the study is quantitative, using both correlation and inferential statistical procedures to analyze student data from the University MBA program. A quantitative design provides the best opportunity to obtain empirical evidence on the relationship of student cognitive skill factors to student performance in online and face-to-face MBA courses. The predictability of these factors can be quantified statistically by exploring answers to the study’s research questions and provides useful data for online course design and student advising.

This is a prediction study exploring the relationship of predictor variables to predicting project performance of criterion variables (Mertens, 2005). Correlation procedures were selected because they provide the ability to include several variables in the same study (Mertens, 2005). Predictor variables are a student’s GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), student grades on tests in online MBA courses (OL TEST GRDES), and student grades on writing intensive work in online MBA courses (OL WRITING GRADES) at the University. Criterion variables are a student’s overall grade point average in face-to-face courses (OVERALL F2F GRADES), online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University. The study’s theoretical framework indicates these
predictor variables may be effective predictors of student performance in face-to-face and online courses.

Statistical correlation and regression procedures are used to answer the research questions. The proposed correlation of skill and performance factors in face-to-face and online courses, and comparison or the correlations between face-to-face and online courses, is indicated in Appendix G. Similar correlation designs have been used effectively in other studies exploring the relationship of student cognitive skill factors to student performance in online and face-to-face courses independently (Owens, 2007; Schwen & Bednar, 1979). No studies have been found that compare the relationship of student cognitive skill factors to student performance across online and face-to-face courses; accordingly, this approach is innovative.

Population and Sample

The population for this study is all students enrolled in MBA courses at the University from the Fall semester of 2006 through the Fall semester of 2013 (N=912). The data set was selected because it includes academic years in which online courses were offered for the MBA program; and, was convenient, assessable, and provided a large enough population for study.

The total population represents all students matriculating in the MBA program in any given year over the seven year study period. Since students matriculate in the MBA program over several years, students are duplicated in the overall population data. Duplication of student data is eliminated and net population determined by subtracting the number of students graduating the previous year from the number of students matriculating in that year, then subtracting that result from the number of students matriculating in the following year. Using this method, the resultant net population of
individual students matriculating is three hundred and ninety three (N=393) or 43% of the total population. This figure indicates an average student matriculation time in the MBA program of 2.3 years.

The study sample includes only those students from the net population who completed both face-to-face and online courses in the MBA program (N = 322) (criterion variables). This figure indicates that 82% of the net population completed both face-to-face and online courses. The sample size of predictor variables vary based on the differing number of attribute data available for each student. Sample sizes for predictor variables are indicated in parentheses next to variables. The sample is used in the correlation of GENDER (N = 322); AGE (N = 322); ETHNICITY (N = 322); UGPA (N = 271); GMAT-VERBAL scores (N = 283); GMAT-QUANTITIVE scores (N = 283); GMAT-ANALYTICAL WRITING scores (N = 278); GMAT-TOTAL scores (N = 286); WRITING PROFICIENCY EXAM score (N = 187), undergraduate grades in writing intensive courses (EN100 GRADES (N = 180) and EN140 GRADES (N = 189)); student grades on tests (OL TEST GRADES (N = 95)) in online courses; and, student grades on written work in online courses (OL WRITING GRADES (N = 95)); to overall grades in online courses (OVERALL OL GRADES (N = 322)), overall grades in face-to-face courses (OVERALL F2F GRADES (N = 322)), and overall grades in MBA courses (OVERALL MBA GPA (N = 322)).
Data Collection

This study is a secondary analysis of data from the Center for Scholarship Teaching and Learning (CSTL) online course database, student module of Ellusian database used by the University Registrar’s office, and data from the Institutional Research department at a Midwest university. Data queries were written using University student identification numbers to extract data on the OL TEST GRADES and OL WRITING GRADES predictor variables from the CSTL database; and, data on the GENDER, AGE, ETHNICITY, UGPA, GMAT-VERBAL, GMAT-QUANTITATIVE, GMAT-ANALYTICAL WRITING, GMAT-TOTAL, WRITING PROFICIENCY EXAM score, EN100 GRADES, EN140 GRADES, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA from the Registrar’s database. The student number was then be recoded to the same number in both queries to match data and protect the identity of the student. The student number code conversion key is retained by the University Information Technology department. Student demographic data were categorized as nominal data, while student grades, course credits, and standardized test scores was categorized as interval data.
Data Analysis

Data are analyzed using Predictive Analytics SoftWare (PASW) and statistical methods recommended for this type of analysis by Field (2009), Mertens (2005), Wiersma & Jurs (2005), and Gravetter & Wallnau (2004). Statistical correlation methods are used to study the relationship between GENDER, AGE, ETHNICITY, UGPA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY score, EN100 GRADES, EN140 GRADES, OL TEST GRADES, OL WRITING GRADES (predictor variables); and, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA (criterion variables). Statistical significance is determined throughout the study based on both $p < 0.05$ and $p < 0.01$. The following procedures are used to answer the research questions.

The Pearson Correlation is used to explore the relationship of the predictor variables to criterion variables and provide the degree and direction of the relationship. The Pearson Correlation result is then squared to provide a coefficient of determination which indicates the strength of the relationship between predictor and criterion variables in terms of the amount of variance both variables share. An analysis of covariance procedure is performed to make statistical adjustments to the predictor variable based on the correlation between the criterion variable and other predictor variables.

Statistical regression is used to answer each research question by comparing and determining if there is a statistically significant difference between each predictor variables correlating to student grades in face-to-face courses, online courses, and overall MBA grade point average. Multiple Regression Analysis is also be used with this procedure to indicate the relationship between variables after making adjustment for the
effect of other variables on the relationship. Forward Step-wise Logistical Regression Analysis is also be used with this procedure to indicate the relationship between variables after making adjustment for the effect of other variables on the relationship.

Internal reliability and validity is enhanced by using standardized input data from University databases; using undergraduate grades in writing intensive courses that include two required courses taken by all students included in the sample; and, defining the criteria for tests and writing intensive work in online courses. Reliability is also enhanced by using appropriate methods of statistical analysis indicted above that have proven to be reliable in similar studies; and, documenting the process by which data are collected and analyzed, making the study understandable and replicable. External validity and generalizability is enhanced through explicit description of the research methods and the use of standardized data proven reliable and valid for use in similar correlation studies to predict student performance in face-to-face courses (Kunzel, Crede, & Thomas, 2007).

Assumptions of the Study

1. It was assumed that the quality of the course content was similar in face-to-face courses completed by the students in the study.

2. It was assumed that the quality of the course content was similar in online courses completed by the students in the study.

3. It was assumed that the skills of the instructor were similar in face-to-face courses completed by the students in the study.

4. It was assumed that the skills of the instructor were similar in online courses completed by the students in the study.
Anticipated Study Limitations

There following are anticipated limitations to this study:

1. The population and sample for the study is taken from one University. Accordingly, making generalizing the results to other populations uncertain.

2. Changes in online course delivery, instructor skill, and student familiarity with online technology may have changed over the seven-year period study period. Accordingly, generalizing the findings to the study population, or other populations, is uncertain.

3. Different sample sizes of student predictor variables statistically affect the correlation results. Accordingly, the reliability of the findings is statistically uncertain and generalizing the findings to other populations is also uncertain.

4. The calculation of grades for predictor and criterion variables are not weighted according to credits taken. Accordingly, the reliability of the findings is uncertain.

5. Identifying, categorizing, and coding data by courses type, student work type, and measurement used, was a subjective process and unique to the University studied. Accordingly, the external validity is uncertain.
Definition of Key Terms

The key terms used throughout this study are defined as follows:

*Age.* Student age when the data were extracted from the Ellucian database-student module (January 31, 2014).

*Blended courses.* University courses that primarily utilize face-to-face pedagogy, but employ minimal online pedagogy to facilitate primarily face-to-face learning.

*Cognitive skills.* Mental processes students and instructors use to acquire, process, analyze, and express information in the learning process.

*Cognitive skill factors/indicators.* Empirical data that statistically express and correlate with a student’s intelligence and ability to learn.

*CSTL.* Acronym for the Center for Scholarship Teaching and Learning at the University which operates and maintains the University’s learning management systems used to provide online courses and information for blended, face-to-face, and hybrid courses.

*Distance education/learning.* The pedagogy and learning that occurs when the instructor and students are physically separated. This term incorporates all types of distance education/learning that spans correspondence courses using mail to online courses utilizing computer technology.

*Ellucian database - student module.* The module of the University’s common database used to create, maintain, and manage student data.

*EN100 grades.* Student grades in a writing intensive English Composition course taken by all undergraduate students at the University.
**EN140 grades.** Student grades in a writing intensive English Composition II/Rhetoric and Critical Thinking course taken by all undergraduate students at the University.

**Ethnicity.** Student reported ethnicity of the student coded as 1 for Non-Resident Alien, 2 for Unknown/Not Reported, 3 for Hispanic, 4 for American Indian/Alaskan Native, 5 for Asian, 6 for Black/African American, 7 for Hawaiian/Other Pacific Islander, 8 for White, and 9 for Multiple Races (two or more).

**Face-to-face courses.** University courses that exclusively utilize a traditional classroom setting and pedagogy to facilitate face-to-face learning.

**Gender.** Student reported gender of the student coded as 70 for female and 77 for male in the study.

**GMAT-analytical writing assessment score.** The Graduate Management Admission Test – Analytical Writing Assessment score, a section of the GMAT, owned by the Graduate Management Admission Council, and used by most MBA programs to screen applicants for admission using a numerical score indicating the student’s analytical writing ability.

**GMAT-quantitative score.** The Graduate Management Admission Test – Quantitative score, a section of the GMAT, owned by the Graduate Management Admission Council, and used by most MBA programs to screen applicants for admission using a numerical score indicating the student’s quantitative ability.

**GMAT-total score.** The Graduate Management Admission Test total score, owned by the Graduate Management Admission Council, and used by most MBA programs to screen applicants for admission based on a numerical score indicating the student’s general management aptitude.
**GMAT-verbal score.** The Graduate Management Admission Test – Analytical Writing Assessment, a section of the GMAT, owned by the Graduate Management Admission Council, and used by most MBA programs to screen applicants for admission using a numerical score indicating the student’s verbal ability.

**Hybrid courses.** University courses that utilize a combination of online and face-to-face pedagogy to facilitate both online and face-to-face learning.

**Internet.** The world-wide web of interconnected computers.

**MBA courses.** Academic courses required by the College of Business for confirmation of an AACSB (Association to Advance Collegiate Schools of Business) internationally accredited Master of Business Administration degree from the University.

**Net population.** The individual students from the total population (N=912) matriculating during the study period and is calculated as (N=393). This number represents 43% of the total population.

**Online courses.** University courses that exclusively utilize online pedagogy to facilitate online learning.

**Online education/learning.** The pedagogy and learning that occurs through the use computer technology and the internet.

**OL test grades.** Student grades on tests in online MBA courses.

**OL writing grades.** Student grades on written work in online MBA courses.

**Overall F2F grades.** Student grades received in all face-to-face courses completed in the MBA program.

**Overall OL grades.** Student grades received in all online courses completed in the MBA program.
Overall MBA GPA. Student overall grade point average calculated from grades received in both face-to-face and online courses completed in the MBA program.

Population sample. Individual students in the net population (N=393) who completed both face-to-face and online courses in the MBA program (N = 322). This number represents 82% of the Net Population.

Total population. The sum of all students matriculating in each of the study years (N = 912).

Writing proficiency exam score. Student score on a writing proficiency exam taken by all undergraduate students at the University after they have completed 75 credit hours of instruction.

UGPA. Student undergraduate grade point average numerically expressed and calculated by applying a numerical score to a course grade, multiplying the score times the number of credit hours for the course, summing the credit hour scores, then dividing the result by the total credit hours taken.

University. A post-secondary institution located in Midwestern United States of America conferring undergraduate and graduate degrees in a variety of academic fields based on designated academic requirements.
Significance of the Research

This research is important to leadership and instructional practice because it addresses the knowledge gap in understanding the relationship of student cognitive skills and learning strategies employed; differences in online and face-to-face course pedagogy, student learning, student assessment; and, student performance. Whether or not a correlation or statistical difference is identified, the research will add important empirical data to the literature regarding the relationship of student cognitive skills and assessment to online education. A finding of no statistically significant correlation between the variables, or no statistically significant difference in the correlation between online and face-to-face MBA courses will contribute to the literature by providing empirical data that show no significant relationship between student cognitive skill factors and student performance.

A finding that there is a statistically significant correlation between variables for online MBA courses, or statistically significant difference in the correlation between online and face-to-face MBA courses, will contribute to the literature by providing empirical evidence as to how and why different student cognitive skill factors in online and face-to-face course, effects student performance. Understanding the relationship of student cognitive skills to student performance will significantly contribute to practice in two ways. First, academic advisors will be able use student cognitive skill indicators to predict student performance in online courses, recommend remediation to improve skills before taking online courses, or recommend that a student not enroll in online courses. Also, online MBA courses could be designed to further moderate the effect of students’ cognitive skills use in online learning to improve performance.
Summary

Online education is rapidly becoming a significant method of course delivery and research indicates that online pedagogy and assessment requires students and instructors to use different cognitive skills than in face-to-face courses; and, that students in online courses score lower on their final exams than students in face-to-face courses. However, there is a lack of research exploring the relationship of students’ use of cognitive learning skills in online versus face-to-face courses, and student performance.

The purpose of this study was to provide empirical data on the relationship of student cognitive skills to online learning by: (a) exploring the relationship of student cognitive skill indicators to student performance in online and face-to-face MBA courses at the University; (b) determining if there is a statistically significant correlation between any of the indicators; and, (c) determining if there is any statistically significant difference between any indicators for which there is a statistically significant correlation. This study addresses the research purpose by providing a research design and methods that will effectively explore and provide empirical evidence of the relationship of student cognitive skills to performance in online and face-to-face courses. Issues of reliability, validity, and generalizability are also addressed, making the findings useful in course design, pedagogy; and, predicting student success in online MBA courses.
CHAPTER TWO
Review of Related Literature

Distance learning has been part of the fabric of education and evolving since the earliest correspondence courses in the late 1800s (James and Gardner, 1995). Holmberg (1977) defines distance education as education where the instructor and the student are separated for majority of the teaching function. For nearly 100 years, distance learning maintained a minor role in education, limited by technology, public acceptance, and absence of accredited degree based programs. Due to these limitations, distance learning pedagogy assessment stagnated with little to no research into improving this form of education. This all changed in the 1980s with the invention of affordable personal computers, a transformation which has catapulted distance education into the mainstream of higher education.

Today, distance education is known as online education, and is embraced by students worldwide due to convenience and accessibility (Kim, Liu, & Bonk, 2005; Ally, 2005). Online educational research has focused on several learning theories, which educators use to laud the ability of online education to improve learner-centered pedagogy through online communities, discussion boards, and peer-feedback (Meyen, Aust, Bui, & Isaacson, 2002; Bauer & Anderson, 2000; Loveland, 2005). As online education becomes part of mainstream higher education, research has focused on student acceptance and the application of face-to-face pedagogy in an online environment.

The focus of this study is to explore the reasons for the difference in student performance between students taking online versus face-to-face courses (Daud and Zubairi, 2005; Terry, 2007), and identify student cognitive skill indicators that may be
used in predicting student success in online courses. This study will explore foundational online learning theory literature to help the reader understand how students and instructors use different cognitive learning skills in online versus face-to-face courses, requiring different pedagogy and assessment techniques. The study will then explore assessment theory literature which suggests that assessment type, students’ cognitive skill indicators, and specifically, a student’s ability to write effectively and different learning styles employed in written work and multiple-choice exams may explain why there is a difference in student performance in online versus face-to-face courses. Finally, the study will review the literature that suggests how student cognitive skill factors have been used to predict student success in face-to-face courses and research methods which may be useful in this study.

Online Learning Theory

As online course pedagogy and learning takes on an identity of its own, the literature indicates that there are two perspectives from which learning theory related to online education is approached. One perspective uses traditional learning theories associated with face-to-face learning, looking at how the logistics of online learning can enhance traditional aspects of what is known about learning in a face-to-face instructional environment. A second perspective uses the technological aspects of online education to focus on the learner-centered pedagogy, enhanced communication, and the community aspects of online learning. Research indicates that although communication may be enhanced by the technological aspects of online learning, communication is significantly limited to writing and highly dependent on the ability of the student, as well as the instructor, to write effectively (Gray, 2002).
Although it is difficult to dispute the positive attributes of convenience, enhanced learner-centered pedagogy, and community in online learning, research does not indicate that these attributes are resulting in improved student performance. It is time to step back and consider whether all students are prepared for online learning, and more specifically, whether students’ writing abilities are a predictor of student success in online coursework. It is from this perspective that this research explores the literature on online learning theory.

*Traditional Learning Theory*

*Vygostky’s Theory of Social Cognitive Development* (Vygostky, 1997) is the foundational work used in looking at online learning from a traditional perspective. Vygosky theorized that human higher mental functions are cognitive processes, developed over time, through the social interactions associated with learning and teaching. Bandura’s *Social Learning Theory* (Bandura, 1977) builds upon Vygosky’s social learning approach and offers the four component processes of attention, retention, motor reproduction, and motivation as critical to social learning. The *Constructivist Theory* (Bruner, 1996) states that learning itself is an active process in which learners construct new ideas from existing knowledge and use this new knowledge to learn on their own. Bruner adds that the structure of learning is the key to this process and must include a readiness for learning, spiral curriculum, encourage intuitive and analytical thinking, and motivation for learning (Bruner, 1996).

Gagne helps to further clarify the traditional learning perspective by offering a more practical application of these theories in his *Conditions of Learning Theory* (Gagne, 1985). Gagne opines that intellectual skills are acquired in a hierarchy of stimulus
recognition, response generation, procedure following, use of terminology, discriminations, concept formation, rule application, and problem solving; and that instruction should be sequenced to make the learning process more efficient. Instructional events associated with cognitive skills are gaining attention (reception), informing learners of the objective (expectancy), stimulating recall of prior learning (retrieval), presenting the stimulus (selective perception), providing learning guidance (semantic encoding), eliciting performance (responding), providing feedback (reinforcement), assessing performance (retrieval), and enhancing retention and transfer (generalization) (Gagne, 1985).

While the traditional learning perspective offers a solid foundational basis for online course development based on traditional student cognitive learning processes, these perspectives, developed in a face-to-face learning environment, fail to take into account the effect of the method of communication in applying these theories. The absence in the literature of considering the method of communication in the teaching and learning of cognitive skills serves to undermine the appropriateness and effectiveness in application of these theories to online education. Similar to Maslow’s *Hierarchy of Needs Theory* (Maslow, 2005), where humans must satisfy their lower hierarchy of needs prior to satisfying higher needs, the potential exist where a student’s mastery of the cognitive skill of writing may have a profound effect on the development of other higher cognitive skills in an online teaching environment.
Technological Learning Theory

Holmberg’s *Guided Didactic Conversion Theory* (Holmberg, 1996) is the foundational work considering online learning from a technological perspective. Holmberg was one of the first researchers to consider the different roles communications play in online versus face-to-face education and posited that online education would promote student motivation, learning pleasure, and rapport between the learner and the institution, by making study more relevant to the individual learner needs, facilitating access to course content, engaging the learner in activity, discussions, and decisions, and enhancing communication to and from the learner. As other researchers like Peters (1993) and Moore (1993) weighed in on Holmberg’s early theory that student motivation to learn would be enhanced by the communication provided in an online educational environment, and offered a more holistic approach to include organizational and transactional issues. Holmberg later modified his theory to what is known as Transactional Distance Theory (Holmberg, 1996), which includes consideration of the student, organization, and transactional issues.

Carroll helps to clarify the technological learning perspective, similar to Gagne (1985) with the traditional learning perspective, by offering a more practical application of the Transactional Distance Theory in his *Minimalist Theory* (Carroll, 2000). Carroll, in keeping with the premise that online education is distinct from face-to-face education, opined that online course design should minimize instructional materials that obstruct learning and focus on activities that enhance learner-centered activity by minimizing reading (2000).
Keegan’s *Theoretical Framework for Distance Education* (Keegan, 1986) offers yet another practical approach for looking at online learning from a technological learning perspective. Keegan opined that online education should seek to replicate face-to-face education by reintegrating the teaching with learning act and providing the necessary peer and instructor feedback. Academic support services to enhance student retention and the feeling that he or she is a member of the academic community, was also considered important.

While the technological learning perspective offers a holistic, theoretical way of looking at online education that considers the different forms of communications provided by the online medium, it too is based on cognitive learning theories that assume that the failure of a student to master any one skill will not inhibit their ability to acquire new skills, and fails to consider how and if technology affects cognitive skill development. Although this perspective recognizes online learning as a new and distinct form of education, the appropriateness and effectiveness of the perspective is potentially undermined by failing to consider an instructor’s or student’s inability to effectively communicate in writing.

**Assessment Theory**

The literature has indicated that both the traditional and technological perspectives of online learning theory fail to consider the effect of online education’s dependence on written communication on a student’s cognitive skill development, and ultimately their performance. The literature on student performance in online versus face-to-face courses suggests that the dependence on written communications and resulting effect on cognitive skill development, may explain lower student performance at both the
undergraduate and graduate level of online students in final exams (Daud and Zubari, 2005; Ferguson and Tryjankowki, 2009).

At the undergraduate level, the study by Daud and Zubari (2005) on student performance in online and face-to-face English academic writing course, found that students in the online course performed significantly lower on their final semester exam. At the graduate level, a study by Ferguson and Tryjankowki (2009) on student performance in cognition, learning and assessment in online and face-to-face courses, found that students in the face-to-face courses scored significantly higher in two of the three measures. A study by Terry (2007) on student performance in online and face-to-face MBA courses, also found that students in the face-to-face courses scored 4% higher on their final exams than students in online courses.

Exploring the literature further, we begin to see patterns that may serve to validate a hypothesis that there is a relationship between a students’ cognitive skills in writing that and their ability to learn in express themselves in an online learning environment. In the Ferguson and Tyrjankowki study (2009) the researchers found that, while there was no significant difference in student performance in written assignments, the learning was not transferred to their performance in exams. Daud and Zubari (2005) also found that, while there was no significant difference in student performance in project papers, students from online courses scored significantly lower on final exams. Terry (2007) also found that online students performed significantly lower on final exams, even though there was no significant difference in student performance in class assignments. Further validation of the potential inadequacy of online learning theory is provided in a study by Davies and
Graff (2005), who found that greater interactions by students in online courses had no significant effect on their performance.

Assuming that differences in the relation of student cognitive learning skills to face-to-face and online courses result in differences in student performance, the purpose of this study is to explore the significance of these relationships. Prescriptive and predictive assessment theory has proven to be effective, in the past, in determining which student cognitive learning skills are important in predicting student success in face-to-face courses. It is from this perspective that this research explores the online specific literature on assessment theory.

**Prescriptive Theory**

Prescriptive theory research on online learning further suggests that there is an absence of knowledge and understanding in online learning theory of the relationship between students’ cognitive skill of writing and performance in the classroom. Green offers that, “while we know that technology changes the learning experience, we do not have hard, consistent evidence documenting that it enhances academic achievement and learning outcomes” (Speck 2002, p. 13). Goodfellow and Lea (2005) suggest that writing in online courses is a contextualized social practice that requires a relationship between pedagogy, technology, and assessment in online course design. In addressing the special needs of assessing student online learning, researchers offer that this new form of pedagogy requires new assessment strategies that include electronic portfolios and assessment rubrics that address the changes in measurement methodology caused by computer technology (Meyen, Aust, Bui, and Isaacson, 2002; Bauer and Anderson, 2000). While these strategies may offer potential in improved assessment of student
performance in an online environment, they fail to address the underlying problem of discovering why online student performance is lagging.

Performance-based assessment, writing skills, interactive assessment and learner autonomy were all identified as major assessment aspects to inform teaching and enhance learning in addressing the needs of this new pedagogy, (Liang and Creasy, 2004). Building upon this theory of the relationship between assessment, writing skills, and learner autonomy in online pedagogy, Schouller (2006) identified a relationship between student learning strategies and their perceived assessment method of either written essay or multiple choice exams. In Schouller’s (2006) research, students employed deep learning for written essays, surface learning for multiple choice exams, and that when they employed deep learning for multiple choice exams, their performance was lower. In their review of research on teaching courses online, Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, and Liu (2006), found that “asynchronous communication seemed to facilitate in-depth communication (but not more than in traditional classes), students liked to move at their own pace, learning outcomes appeared to be the same as in traditional courses” (p. 93).

The literature suggests that, while student cognitive skills have been shown to be critical to students’ success in an online and face-to-face coursework, strategies for assessing student work in online courses is lagging. Clearly, the attributes of online learning are driving a need for new assessment strategies to discover how and why the different relationship of student cognitive skills and specifically, the ability to write effectively, affect student performance in online versus face-to-face courses.
Predictive Theory

Predictive theory literature indicates that standardized entrance exams and undergraduate grade point averages have been accurate in predicting student success in graduate level coursework in the past and may be an effective tool in assessing the impact of students’ cognitive skills necessary for learning. A meta-analysis performed by Kunzel, Crede, and Thomas (2007) found that the Graduate Management Admissions Test (GMAT) was superior to undergraduate grade point average (UPGA) in predicting student success in MBA programs, while the combination of GMAT score and UGPA had “a high level of validity in predicting student performance” (p. 51). Owens (2007) also found that a combination of GMAT Quantitative and Verbal scores and UPGA “could effectively be used in combination to select students who performed well in an executive program” (p. 1).

Looking specifically at the cognitive skill of writing, the literature indicates a correlation between students’ writing skills and performance at both the undergraduate and graduate level. In a study of community college students in high literacy content courses, Goldstein and Perin (2008) found that “students who completed college English were more likely to pass the content course than students with developmental-level English skills” (p. 89), and that “academically underprepared students who completed developmental English passed the content course at the same rate as students who entered the college with college-level skills” (p. 89). Perney (1994), in a study writing samples of graduate level Education students, found “although none of the variables could accurately predict student teaching performance or graduation success, the writing sample, in
conjunction with the junior/senior undergraduate grade point average could be used with moderate success to predict a student’s graduate grade point average.

While the Goldstein and Perin, and Perney studies indicate that students were enrolled in face-to-face courses, the timing and student sample of the Crede and Thomas study indicates that students may have been enrolled in both face-to-face and online courses. Considering that GMAT, UPGA, English skill levels, and writing samples have been valid predictors of student success in undergraduate and graduate face-to-face courses, the potential exists that they some may be valid predictors of student success in online-only courses. Clearly, further exploration of the relationship between student preparedness and performance in online courses is needed.

Summary

The purpose of this literature review was to explore the many learning theories directly and indirectly related to online course research and development, past research on student assessment and performance in online courses, and use these theories and research to examine the relationship between student preparation and student performance in online courses. Learning theory literature indicates that there are traditional and technological learning theory perspectives of online learning. The literature also indicates that both the traditional or technological learning theory perspectives fail to adequately see or consider students’ cognitive skills of writing as a potential barrier to the application of these theories.

The literature clearly indicates that, while students have a high preference for online courses due to accessibility and convenience, an achievement gap exists where
students perform at a higher level in face-to-face versus online courses. Minimal research was found related to discovering the reason for the achievement gap.

Exploration of the literature on the assessment of online learning revealed the importance of students’ cognitive skills of writing. The literature indicates that students use different learning strategies in preparation for multiple choice exams versus written assignments and that writing in online courses is a contextualized social practice that requires a relationship between pedagogy, technology, and assessment in online course design. While most online assessment theory calls for a new form of pedagogy for online education that addresses the writing skills of both the student and the instructor, there is minimal research to support this approach.

Finally, the literature indicates that student GMAT scores, UPGA, English competency, and writing samples have been valid predictors in undergraduate and graduate coursework. While these findings do not necessarily mean they will be valid predictors of student success in online courses, the potential clearly exists.
CHAPTER THREE
Research Design and Methods

Online education has great promise as a method of course delivery in higher education. It increases student and instructor accessibility, has high student satisfaction, provides a cost effective method of course delivery, and enhances learner-centered pedagogy (Kim, Liu, & Bonk, 2005; Ally, 2005). As online learning enters the mainstream of higher education, there is still much to learn about the influence of technology on pedagogy, assessment, and student performance.

Online course pedagogy has evolved from face-to-face course pedagogy. Originally, online courses simply applied computer technology to present face-to-face course materials. Online education evolved and research indicated that the technology caused students to employ different cognitive skills (Keegan, 1986; Holmberg, 1996; Carroll, 2000). Research also indicated that assessment and learning in online courses were more dependent on the writing skills of the student and instructor than traditional courses (Ally, 2005). As a result, assessment rubrics and peer-feedback were integrated into online course design to address the use of different cognitive skills (Meyen, Aust, Bui, & Isaacson, 2002; Bauer & Anderson, 2000; Loveland, 2005). These changes improved assessment and increased student learning; however, they have not addressed the fact that online students score lower on final exams than students who take face-to-face courses (Daud & Zubairi, 2005; Terry, 2007).

The rapid design and implementation of online courses, without adequate research, has created a knowledge gap in understanding the relationship of students’ use of cognitive skills and learning strategies in online courses versus traditional courses to
student performance. The purpose of this study addresses the knowledge gap by; (a) exploring the relationship of student cognitive skill indicators to student performance in online and face-to-face Master of Business Administration (MBA) courses at a regional Midwestern university (University); (b) determining if there is a statistically significant correlation between any of the indicators; and, (c) determining if there is any statistically significant difference between any indicators for which there is a statistically significant correlation.

This study uses the concepts of cognitive student skill indicators and assessment type to explore the relationship and predictability of cognitive student skill indicators to student performance in online and face-to-face MBA courses at the University. The findings from this study provide useful empirical data that can be used by higher education leaders in course design, pedagogy; and, provide useful empirical data for predicting student success in online MBA courses. The study also provides useful data for future research in online education. The research purpose was clarified and research questions were presented to address the problem in Chapter 1. Study assumptions, limitations, and key terms were also defined in Chapter 1. The design and methods for the study are discussed here along with strategies to address issues of quality.
Research Questions

This study uses statistical correlation procedures to explore the use of student cognitive skill indicators, and other assessment instruments (predictor variables) to predict student performance in face-to-face courses, online courses, and overall MBA coursework (criterion variables) at the University. The study also uses statistical regression procedures to explore the relationship of any statistically correlating factors face-to-face, online, overall MBA courses at the University. Previous empirical research indicates that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003). Therefore, student age, race, ethnic, and gender demographics are also explored to determine if any adverse sub-group impact exists. Within the context of this study, the following research questions are addressed:

1. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?
2. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?

3. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?
4. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

**Research Hypotheses**

1. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES.
2. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL OL GRADES.

3. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL MBA GPA.

4. There is no statistically significant difference in the correlation coefficients between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA.
Design and Methods

This research project addresses the knowledge gap in online education caused by a lack of research exploring the relationship of students’ use of cognitive learning skills in online versus face-to-face courses, and student performance. The study focuses on students taking online and face-to-face MBA courses at the University. The MBA program offers an excellent area to study the knowledge gap in online learning through the lens of assessment type and student cognitive skills indicators. The MBA program provides a variety of course delivery methods that include face-to-face only, online only, and a combination of face-to-face and online courses. The MBA program also provides course work that includes both multiple choice exams and written assignments, and requires a standardized entrance test. The standardize Graduate Management Admissions Test (GMAT), and its sections (GMAT-VERBAL, GMAT-QUANTITATIVE, and GMAT-ANALYTICAL WRITING Assessment) provides evidence of students’ cognitive and analytical writing skills, as well as other data for analysis. High student retention in MBA programs also provides a stable student population for study.

The study design is quantitative, using statistical correlation and regression procedures to analyze student data from the University MBA program. A quantitative design provides the best opportunity to obtain empirical evidence on the relationship of student cognitive skill factors to student performance in online and face-to-face MBA courses. The predictability of these factors can be quantified statistically by exploring answers to the study’s research questions and will provide useful data for online course design and student advising.
The study was designed to explore and provide empirical data which indicate the relationship and predictability of MBA students’ cognitive skill indicators to indicators of student performance in online and face-to-face MBA courses. Cognitive skill indicators (predictor variables) are defined as students’ undergraduate grade point average GENDER, AGE, ETHNICITY, UGPA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING Assessment score, GMAT-Total score, WRITING PROFICIENCY EXAM score, grades in required writing intensive undergraduate courses (EN100 GRADES AND EN140 GRADES), grades on tests in online courses (OL TEST GRADES), and grades in writing intensive work in online courses (OL WRITING GRADES). Student performance indicators (criterion variables) are student grades in face-to-face courses (OVERALL F2F GRADES), student grades in online courses (OVERALL OL GRADES), and students’ OVERALL MBA GPA.

Research indicates that correlation studies have been effective in exploring and identifying student cognitive skill indicators which predict student success in face-to-face MBA courses (Kunzel, Crede, & Thomas, 2007). These studies indicate there is a statistically significant correlation between students’ UGPA and GMAT scores, and their performance in face-to-face MBA courses (Kunzel, Crede, & Thomas, 2007). Accordingly, this study uses statistical correlation analysis to explore the relationship and predictability of student cognitive skill indicators to student performance in online and face-to-face MBA courses at the University. Statistical regression analysis is also used to understand if any of the correlating factors relate differently to student performance in face-to-face, online, or overall MBA coursework. Using these statistical procedures, the
study addresses the knowledge gap by providing empirical data which indicate the relationship of student cognitive skill factors and students’ writing ability; to student performance in online and face-to-face courses.

In this prediction study, the relationship and use of predictor variables to predict project performance of criterion variables was explored (Mertens, 2005). Correlation procedures were selected because they provide the ability to include several variables in the same study (Mertens, 2005). Predictor variables are a student’s GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADES and EN140 GRADES), student grades on tests in online MBA courses (OL TEST GRADES), and student grades on writing intensive work in online MBA courses (OL WRITING GRADES) at the University. Criterion variables are a student’s overall grade point average in face-to-face MBA courses (OVERALL F2F GRADES), online MBA courses (OVERALL OL GRADES), and OVERALL MBA GPA at the University. The study’s theoretical framework indicates these predictor variables may be effective predictors of student performance in online and face-to-face courses.

Statistical correlation procedures were used to answer research questions one and two by identifying any statistically significant relationships between selected student cognitive skill indicators (predictor variables) and student performance in face-to-face and online MBA courses (criterion variables). A finding that there is a statistically significant correlation between a cognitive skill indicator (predictor variable) and student
assessment type (criterion variable) would indicate that the skill indicator would be a valid predictor of student performance in that type of course.

Statistical correlation procedures were also used to answer research questions three by identifying any statistically significant relationships between selected student cognitive skill indicators (predictor variables) and student performance in overall MBA courses (criterion variable). A finding that there is a statistically significant correlation between a cognitive skill indicator (predictor variable) and student assessment type (criterion variable) would indicate that the skill indicator would be a valid predictor of student performance in overall MBA coursework.

Statistical regression procedures were used to answer research question four by identifying any statistically significant differences in the relationship of correlation findings to face-to-face, online and overall MBA courses. Statistical regression is used when there is a need to determine the statistical significance of group differences, such as online and face-to-face MBA courses (Mertens, 2005). A finding that there are any statistically significant differences between the statistical correlations would provide empirical evidence that student cognitive skill factors (predictor variables) relate to student performance in face-to-face, online, and overall MBA courses differently. The correlation of skill and performance factors in online and face-to-face courses, and comparison or the correlations between online and face-to-face courses, is indicated in Appendix G.

Similar correlation designs have been used effectively in other studies exploring the relationship of student cognitive skill factors to student performance in online or face-to-face courses (Owens, 2007; Schwen & Bednar, 1979). No studies have been found that
compare the relationship of student cognitive skill factors to student performance across online and face-to-face courses; accordingly, this approach is innovative.

**Population and Sample**

The University is a regional institution with approximately 12,000 students, offering undergraduate and Master degrees. The MBA program offers online and face-to-face courses in nine areas of specialization and, is one of only 400 MBA programs accredited by The Association to Advance Collegiate Schools of Business. The population for this study included all students enrolled in MBA courses at the University from the Fall semester of 2006 through the Fall semester of 2013 (N=912). The data set was selected because it includes academic years in which online courses were offered for the MBA program; and, was convenient, assessable, and provided a large enough population for study.

The total population represents all students matriculating in the MBA program in any given year over the seven year study period. Since students matriculate in the MBA program over several years, students are duplicated in the overall population data. Duplication of student data is eliminated and net population determined by subtracting the number of students graduating the previous year from the number of students matriculating in that year, then subtracting that result from the number of students matriculating in the preceding year. Using this method, the resultant net population of individual students matriculating is three hundred and ninety three (N=393) or 43% of the total population. This figure indicates an average student matriculation time in the MBA program of 2.3 years.
The study sample includes only those students from the net population who completed both face-to-face and online courses in the MBA program (N = 322) (criterion variables). This figure indicates that 82% of the net population completed both face-to-face and online courses. The sample size of predictor variables vary based on the differing number of attribute data available for each student. Sample sizes for predictor variables are indicated in parentheses next to variables. The sample is used in the correlation of GENDER (N = 322); AGE (N = 322); ETHNICITY (N = 322); UGPA (N = 271); GMAT-VERBAL scores (N = 283); GMAT-QUANTITITIVE scores (N = 283); GMAT-ANALYTICAL WRITING scores (N = 278); GMAT-TOTAL scores (N = 286); WRITING PROFICIENCY EXAM score (N = 187), undergraduate grades in writing intensive courses (EN100 GRADES (N = 180) and EN140 GRADES (N = 189)); student grades on tests (OL TEST GRADES (N = 95)) in online courses; and, student grades on written work in online courses (OL WRITING GRADES (N = 95)); to overall grades in online courses (OVERALL OL GRADES (N = 322)), overall grades in face-to-face courses (OVERALL F2F GRADES (N = 322)), and overall grades in MBA courses (OVERALL MBA GPA (N = 322)).

Data Collection

This study is a secondary analysis of data from the Center for Scholarship Teaching and Learning (CSTL) online course database and the student module of Ellusian database used by the University Registrar’s office. Data queries were written using University student identification numbers to extract data on the OL TEST GRADES and OL WRITING GRADES predictor variables from the CSTL database; and, data on the GENDER, AGE, ETHNICITY, UGPA, GMAT-VERBAL, GMAT-
QUANTITATIVE, GMAT-ANALYTICAL WRITING, GMAT-TOTAL, WRITING PROFICIENCY EXAM score, EN100 GRADES, EN140 GRADES, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA from the Registrar’s database. The student number was then be recoded to the same number in both queries to match data and protect the identity of the student. The student number code conversion key is retained by the University Information Technology department. Student demographic data were categorized as nominal data, while student grades, course credits, and standardized test scores were categorized as interval data.

Data Analysis

Data were analyzed using Predictive Analytics SoftWare (PASW) and statistical methods recommended for this type of analysis by Field (2009), Mertens (2005), Green & Salkind (2003), Wiersma & Jurs (2005), and Gravetter & Wallnau (2004). Statistical correlation methods were used to study the relationship between GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADES and EN140 GRADES), student grades on tests in online MBA courses (OL TEST GRADES), and student grades on writing intensive work in online MBA courses (OL WRITING GRADES) (predictor variables); and, students’ overall grade point average in face-to-face MBA courses (OVERALL F2F GRADES), online MBA courses (OVERALL OL GRADES), and OVERALL MBA GPA (criterion variables). Statistical significance will be determined throughout the study based on both $p < 0.05$ and $p < 0.01$. The following procedures were used to answer research questions one, two, and three.
The Pearson Correlation Coefficient was used to explore the relationship of the predictor variables to criterion variables. The “measure of correlation is called the correlation coefficient” which is “an index of the extent of relationship between two variables that can take on values from -1.00 through 0 to +1.00, inclusive” (Wiersma & Jurs, 2005, p. 359). The correlation coefficient provides the degree and direction of the relationship. A large negative number indicates a high degree of negative correlation, meaning that as the predictor variable value increases, the criterion variable value decreases. A correlation coefficient of zero means that there is no correlation. A large positive number indicates a high degree of positive correlation, meaning that as the predictor variable value increases, the criterion variable value increases. The Pearson Correlation formula is as follows:

\[ r = \text{correlation coefficient of the two variables}; \]

\[ SP = \text{sum of the products of deviations}; \]

\[ SS = \text{sum of the squared deviations}; \]

While the Pearson Correlation Coefficient provides the degree and direction of correlation, relationship strength will be determined by squaring the correlation result (\(r^2\)). Correlation squaring “measures the proportion of the variability in the data that is explained by the relationship between X and Y” (Gravetter & Wallnau, 2004, p. 535). The resultant coefficient of determination indicates the strength of the relationship between predictor and criterion variables, and is expressed as the percent to which the variability of one variable can be explained by the variability of the other variable.
Multiple regression analysis was “used to indicate the amount of variance that all of the predictor variables explain” (Mertens, 2005, p. 403). This analysis of covariance procedure makes statistical adjustments to the criterion variable based on the correlation between the criterion variable and another predictor variable (Wiersma & Jurs, 2005). This procedure provides a correlation matrix indicating the strength of the variable correlations after statistical adjustments have been made for the relationship of other variables.

Statistical regression was used to compare the statistically significant mean correlations and answer research question four. The purpose of this procedure was to determine if there is a statistically significant difference between predictor variables correlating to student grades in face-to-face courses (OVERALL F2F GRADES), online courses (OVERALL OL GRADES), and students’ OVERALL MBA GPA. The equations for determining the difference between individual correlation coefficients are as follows:

\[
\begin{align*}
\end{align*}
\]

where,

- In —

\[
\text{and, } \quad \quad = \quad \quad \quad \quad
\]

Forward Step-wise Logistical Regression Analysis was also be used with this procedure to indicate the relationship between variables after making adjustment for the effect of other variables on the relationship. The results of this analysis facilitate the ordering of predictor variables based on the significance of their relationship with the criterion variables.
Strategies to Address Issues of Quality

Internal reliability was controlled in several ways. First, the study used standardized input data from University databases on GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING Assessment score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, and student grades on writing intensive work in online MBA courses (OL WRITING GRADES), overall grades in face-to-face courses (OVERALL F2F GRADES), grades in online courses (OVERALL OL GRADES), and OVERALL MBA GPA. This data has proven to be reliable in other research (Kunzel, Crede, & Thomas, 2007). Second, undergraduate grades in writing intensive courses (EN100 GRADES and EN140 GRADES) were obtained from the students’ grades in two required courses taken by students used the sample. Third, tests in online courses (OL TEST GRADES) and writing intensive work in online courses (OL WRITING GRADES) was defined and data extracted using the same criteria for all students in the population. Finally, reliability of output data was controlled using appropriate methods of statistical analysis indicted above that have proven to be reliable in similar studies. External reliability was controlled by documenting the process by which data are collected and analyzed, making the study understandable and replicable.

Internal validity was addressed in several ways. First, student GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING Assessment score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, student grades in face-to-face courses (OVERALL F2F GRADES), student grades in online courses (OVERALL OL GRADES), and student
OVERALL MBA GPA were obtained using the standardized data bases. These measures have proven to be valid in similar studies (Kunzel, Crede, & Thomas, 2007). Second, validity of student grades in writing intensive courses (EN100 GRADES AND EN140 GRADES) was controlled by defining and using two required writing intensive courses taken by all undergraduate students at the University. Finally, validity of tests and written work in online courses (OL TEST GRADES and OL WRITING GRADES) was addressed by identifying, categorizing, and coding data by courses type, student work type, and measurement used.

External validity and generalizability was addressed through the explicit description of the research methods which will be “sufficiently described so that the reader could reproduce it” (Mertens, 2005, p. 125). This description included accepted and proven statistical procedures for this type of research which produce results in sufficient detail to facilitate study reproducibility. External validity is enhanced by the use of UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING Assessment score, GMAT-TOTAL score, and student overall grade data (OVERALL MBA GPA), which have proven reliable and valid for use in similar correlation studies to predict student performance in face-to-face courses (Kunzel, Crede, & Thomas, 2007).
Summary

The purpose of this study was to (a) explore the relationship of student cognitive skill indicators to student performance in online and face-to-face MBA courses at the University; (b) determine if there is a statistically significant correlation between any of the indicators; and, (c) determine if there is any statistically significant difference between any indicators for which there is a statistically significant correlation. This paper has addressed the purpose of the study by providing a research design and methods that effectively explore the relationship of student cognitive skills (predictor variables) to performance in online and face-to-face courses, as well as overall MBA GPA (criterion variables). Statistical correlation procedures indicate the direction, strength, statistical significance of the relationship. Statistical regression analysis indicates whether or not there is a statistically significant difference in the correlation of predictor variables to criterion variables in online versus face-to-face and overall MBA coursework. Issues of reliability, validity, and generalizability have also been addressed, making the findings useful in course design, pedagogy; and, predicting student success in online MBA courses. Analysis of the study data using this research design and methods is presented in chapter four. Findings, conclusions, and implications are presented and discussed in chapter five.
CHAPTER FOUR

Analysis of Data

The study explored the relationship between student cognitive skill factors and demographics (predictor variables), and student performance in face-to-face and online MBA courses (criterion variables) at a Midwest university. Online learning has rapidly expanded since the 1980s with the invention of affordable personal computers and the expansion of the World Wide Web. Today, online education is in the mainstream of higher education, where it is embraced by students worldwide due to convenience and accessibility (Kim, Liu, & Bonk, 2005; Ally, 2005), and online courses represent 20% of all student credit hours at the Midwest university.

Although new pedagogical, learning, and assessment theory specific to online course delivery continues to be developed, research indicates that student performance on final exams is lower for students in online courses than students in face-to-face or hybrid courses (Daud & Zubairi, 2005; Terry, 2007). Research by Keegan (1986), Holmberg (1996), and Carroll (2000) suggests that online versus face-to-face pedagogy and assessment require the student and instructor to employ different cognitive learning skills. However, there is minimal empirical research into understanding the relationship between student cognitive skills and student performance in online courses.

This study used statistical correlation and regression techniques to study the relationship of students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and
EN140 GRADE), grades on tests in online courses (OL TEST GRADES), and, grades on written work in online courses (OL WRITING GRADES) (predictor variable); with overall student grades in face-to-face MBA courses (OVERALL F2F GRADES), overall student grades in online MBA courses (OVERALL OL GRADES), and overall student grades in MBA courses (OVERALL MBA GRADES) (criterion variables) at a Midwest university. By exploring the relationship between the student demographic data and cognitive skills (predictor variables) and student performance in face-to-face, online and overall MBA courses (criterion variables), using statistical correlation and regression techniques, empirical data is created which indicate whether a statistically significant relationship exists between predictor and criterion variables, as well as whether there is a statistically significant difference between any of the statistically significant factors. This empirical data may be useful to higher education faculty and staff in online course design and pedagogy, as well as to predicting student success.

This chapter presents a general overview of the study, research questions and hypotheses, organization of the data analysis, descriptive statistics, and analysis of data. The chapter concludes with a summary of the analysis.

Overview of the Study

This study is a secondary analysis of data from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and data from the Institutional Research department at a Midwest university. The study utilized statistical correlation and regression techniques to analyze the data and answer the research questions.
The study population was all students enrolled in MBA courses at the University from the Fall semester of 2006 through the Fall semester of 2013 (N=912). After eliminating duplicate population data resulting from students matriculating over several years, the net population for the study was three hundred and ninety three (N=393) or 43% of the total population. The study sample for criterion variables included only those students from the net population who completed both face-to-face and online courses in the MBA program (N = 322) or 82% of the net population.

The study sample for predictor variables varied based on the differing number of attribute data available for each student. Sample sizes for predictor variables used in the correlation are indicated in parentheses next to variables and were as follows: GENDER (N = 322); AGE (N = 322); ETHNICITY (N = 322); UGPA (N = 271); GMAT-VERBAL scores (N = 283); GMAT-QUANTITIVE scores (N = 283); GMAT-ANALYTICAL WRITING scores (N = 278); GMAT-TOTAL scores (N = 286); WRITING PROFICIENCY EXAM score (N = 187), undergraduate grades in writing intensive courses (EN100 GRADES (N = 180) and EN140 GRADES (N = 189)); student grades on tests (OL TEST GRADES (N = 95)) in online courses; and, student grades on written work in online courses (OL WRITING GRADES (N = 95)); to overall grades in online courses (OVERALL OL GRADES (N = 322)), overall grades in face-to-face courses (OVERALL F2F GRADES (N = 322)), and overall grades in MBA courses (OVERALL MBA GPA (N = 322)).
Research Questions

The following research questions were addressed in the study:

1. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?

2. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?
3. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?

4. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?
Research Hypotheses

The following research hypotheses were tested using statistical correlation and regression techniques to answer the research questions.

1. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES.

2. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL OL GRADES.

3. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL MBA GPA.
4. There is no statistically significant difference in the correlation coefficients between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA.

Organization of Data Analysis

Data are organized for analysis by first presenting the descriptive statistics of the study population and sample, followed by presentation of the data output from the statistical correlation and regression procedures. Descriptive statistics of the population and sample are important because they help define the data and provide a framework from which the data can be analyzed. A text and table summary of the population is presented. Sample data include all available attribute data from students who completed both face-to-face and online courses in the MBA program from the Fall semester of 2006 through the Fall semester of 2013 at the Midwest university. Sample data statistics are presented using text and figures which illustrate and describe the individual attributes of the sample, as well as provide relevant data that assist in understanding the distribution and magnitude of the individual attribute statistics.

Statistical output from the correlation and regression procedures are presented in table and text to illustrate and describe the overall results of the study. Correlation and regression output results are then used to answer the research questions and test the research hypotheses.
Presentation of Descriptive Statistics

This section includes population data obtained from the Institution Research department and sample data on gender, age, ethnicity, UGPA, GMAT-VERBAL, GMAT-QUANTITATIVE, GMAT-ANALYTICAL WRITING ASSESSMENT, GMAT-TOTAL, WRITING PROFICIENCY EXAM, EN100 GRADES, EN140 GRADES, F2F GRADES, OL GRADES, and OVERALL MBA GRADES from the student module of Ellusian database used by the University Registrar’s office at the Midwest university. Sample data on OL TEST GRADES and OL WRITING GRADES were obtained from the Center for Scholarship Teaching and Learning (CSTL) online course database at the university.

Analysis of the total population is presented first, followed by an analysis of the net population and the sample. The section concludes with an analysis of the descriptive statistics of the sample.

Total Population, Net Population, and Sample

The total population of students matriculating in the MBA program during the study period, the Fall semester of 2006 through the Fall semester of 2013, was N = 912. The numbers of students matriculating in each study year is indicated in Table 1. The Table indicates that student enrollment in the MBA program increased 89% from 75 in 2006, to 142 in 2013. Table 1 also indicates that although there is a diversity of enrollment in each of the eleven majors offered, approximately 56% of the students were enrolled in General Management major. Other majors with significant enrollment included Accounting and Financial Management which represented approximately 15% and 12% of the total students enrolled respectively. Enrollment growth in General
Management, Accounting, and Financial Management was 90%, 31%, and 138% respectively. Accordingly, overall enrollment increased due to increased enrollment in the General and Financial Management majors.

Table 1

*Total Population - Number of MBA Students Matriculating Per Year at the Midwestern University*

<table>
<thead>
<tr>
<th>Department/Major</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business/Pre-Business</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>Environmental Management</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Financial Management</td>
<td>8</td>
<td>5</td>
<td>13</td>
<td>18</td>
<td>14</td>
<td>16</td>
<td>13</td>
<td>19</td>
<td>106</td>
</tr>
<tr>
<td>General Management</td>
<td>44</td>
<td>45</td>
<td>63</td>
<td>65</td>
<td>66</td>
<td>64</td>
<td>76</td>
<td>84</td>
<td>507</td>
</tr>
<tr>
<td>Health Administration</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>International Business</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>11</td>
<td>10</td>
<td>11</td>
<td>10</td>
<td>9</td>
<td>65</td>
</tr>
<tr>
<td>Industrial Management</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Accounting</td>
<td>13</td>
<td>17</td>
<td>15</td>
<td>16</td>
<td>20</td>
<td>20</td>
<td>22</td>
<td>17</td>
<td>140</td>
</tr>
<tr>
<td>Secondary Ed: Business Ed</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sport Management</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Total Student Matriculating:</td>
<td>75</td>
<td>80</td>
<td>106</td>
<td>123</td>
<td>124</td>
<td>126</td>
<td>136</td>
<td>142</td>
<td>912</td>
</tr>
</tbody>
</table>

The net population for the study represents the number of different or new students matriculating in each year of the study period. Since students matriculate in the MBA program over several years, individual students are duplicated in the total.
population data in such a way that a student who was enrolled in the 2007, 2008, and 2009 academic years is counted as a student three times in the total population.

Duplication of student numbers were eliminated and the actual number of different students in each year of the population was calculated by starting with number of students matriculating in 2006; adding the number of students graduating in the previous year to succeeding year’s total students matriculating; then, subtracting the total students matriculating from the previous year. Table 2 illustrates this methodology and a resulting net population for the study of three hundred and ninety three (N=393) or 43% of the total population. Dividing the total population of 912 by the net population of 393 indicated that an individual student’s estimated total matriculation time in the MBA program was 2.3 years.

Table 2

*Net Population - Number of Different MBA Students Matriculating Per Year at the Midwestern University*

<table>
<thead>
<tr>
<th>Data Calculation</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Students Matriculating</td>
<td>75</td>
<td>80</td>
<td>106</td>
<td>123</td>
<td>124</td>
<td>126</td>
<td>136</td>
<td>142</td>
<td>912</td>
</tr>
<tr>
<td>Students Graduating the Previous Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Total:</td>
<td>75</td>
<td>100</td>
<td>125</td>
<td>152</td>
<td>160</td>
<td>173</td>
<td>186</td>
<td>192</td>
<td>1163</td>
</tr>
<tr>
<td>Minus Number of Students Matriculating in Previous Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Different Students Matriculating:</td>
<td>75</td>
<td>25</td>
<td>45</td>
<td>46</td>
<td>37</td>
<td>49</td>
<td>60</td>
<td>56</td>
<td>393</td>
</tr>
</tbody>
</table>
The sample for the study was 322 MBA students from the net population who took both Online (OL) and Face-to-Face (F2F) courses during the academic years 2006-2013. The sample of 322 students represents 82% of the net population of 393 students. Table 3 indicates that all 322 students are included in the sample size for the descriptive statistics related to the predictor variables of GENDER, AGE, and ETHNICITY; and, the criterion variables of F2F GRADES, OL GRADES, and OVERALL MBA GPA. Sample sizes for the descriptive statistics related to the other predictor variables were less than 322 and the reasons for the differences are described in Table 3. Table 3 also indicates the sample sizes for the other predictor variables and the likely reason why the data were not available for study. The validity of missing UGPA and GMAT score data was explained by the varied student admission requirements which are shown in Appendix A, B, C, D, and E. Descriptive statistics for the predictor variables, criterion variables, and other variable attribute data are provided in Figures 1 through 30.
### Table 3

*Sample Sizes by Variable*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Reason for Missing Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>322</td>
<td>No missing data</td>
</tr>
<tr>
<td>Age</td>
<td>322</td>
<td>No missing data</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>322</td>
<td>No missing data</td>
</tr>
<tr>
<td>UGPA</td>
<td>271</td>
<td>Student did not matriculate undergraduate from the University or UGPA not required for MBA admission</td>
</tr>
<tr>
<td>GMAT Verbal score</td>
<td>283</td>
<td>Complete or partial GMAT scores not required for admission</td>
</tr>
<tr>
<td>GMAT Quantitative score</td>
<td>283</td>
<td>Complete or partial GMAT scores not required for admission</td>
</tr>
<tr>
<td>GMAT Analytical Writing Assessment score</td>
<td>278</td>
<td>Complete or partial GMAT scores not required for admission</td>
</tr>
<tr>
<td>GMAT Total score</td>
<td>286</td>
<td>Complete or partial GMAT scores not required for admission</td>
</tr>
<tr>
<td>Writing Proficiency Exam score</td>
<td>187</td>
<td>Student did not matriculate undergraduate from the University</td>
</tr>
<tr>
<td>EN100 Grade</td>
<td>180</td>
<td>Student did not matriculate undergraduate from the University or tested out of course</td>
</tr>
<tr>
<td>EN140 Grade</td>
<td>189</td>
<td>Student did not matriculate undergraduate from the University or tested out of course</td>
</tr>
<tr>
<td>Test grades in online courses</td>
<td>95</td>
<td>Grade book data not available for all online courses</td>
</tr>
<tr>
<td>Written work grades in online courses</td>
<td>95</td>
<td>Grade book data not available for all online courses</td>
</tr>
<tr>
<td>Online MBA GPA</td>
<td>322</td>
<td>No missing data</td>
</tr>
<tr>
<td>Face-to-face MBA GPA</td>
<td>322</td>
<td>No missing data</td>
</tr>
<tr>
<td>Overall MBA GPA</td>
<td>322</td>
<td>No missing data</td>
</tr>
</tbody>
</table>
Descriptive Statistics of the Sample

Figure 1 illustrates the gender distribution of students in the sample of N = 322. Approximately 56% of the sample was male and 44% female. Gender distribution of the sample was comparable to the overall graduate student gender distribution for the College of Business at the University which was approximately 59% male and 41% female for the fall semester of 2013.

Figure 1

Gender of Students in Sample
Figure 2 illustrates the age distribution of students in the sample of N = 322. As indicated, a significant number of students ranged in age from 26 to 30 which represented approximately 46% of the sample. 282 students ranged in age from 20 to 35 and represented approximately 88% of the sample. The mean age of students in the sample was 30.6. Age distribution of the sample was comparable to the average graduate student age for the College of Business at the University which ranged from 27 in 2006 to 29 in 2013.

Figure 2

*Age of Students in Sample*
Figure 3 illustrates the ethnicity of students in the sample of N = 322. As indicated, the majority of students were white (68%). The second largest student ethnic group was non-resident alien, which represented 25% of the students in the sample. Other student ethnicity’s only accounted for 7% of the sample. Ethnicity distribution of the sample was comparable to the graduate student ethnicity for the College of Business at the University which was 61% white, 28% non-resident alien, and 11% other ethnicities reported in the fall of 2013.

Figure 3

*Ethnicity of Students in Sample*
Figure 4 illustrates the undergraduate grade point average (UGPA) of students in the sample of N = 271. As indicated in Table 3, UGPA was not available for all students in the sample was not available for study because some students did not matriculate undergraduate from the University or their UGPA was not required for MBA admission. The UGPA sample mean was 3.4 with a widely distributed range from below 3.0 to 4.0.

40 students had sample UGPA’s less than 3.0 and represented approximately 15% of the sample. Analysis of students with less than 3.0 UGPA indicated that 13 met and 27 did not meet the 2013 MBA program admission requirements. Combining the 27 students who did not meet admission requirements with the 51 students missing from the sample because they did not have a report UGPA, indicates 78 students from the overall sample either met previous lower admission standards or had the admission standards waived.

Figure 4

UGPA of Students in Sample
Figure 5 illustrates the number of undergraduate credits earned by students in the UGPA sample of N = 271. As indicated, 199 (74%) students in the sample had at least 120 credits, the number required for undergraduate graduation from the University. Seventy-two (26%) students in the sample had less than 120 credits, indicating that those students were not undergraduate graduates of the University and likely completed undergraduate courses as prerequisites for MBA program. Overall, the 271 students in the UPGA sample completed an average of 111.4 undergraduate credits, indicating that the students completed an average of 92.8% of the coursework required for an undergraduate degree.

Figure 5

*Number of Undergraduate Credits Earned by Students in UGPA Sample*
Figure 6 illustrates the GMAT Verbal score of students in the sample of \( N = 283 \).

The GMAT Verbal score sample size of 283 indicates that approximately 88\% of the students in the overall sample of \( N = 322 \) used a GMAT Verbal score for admission in the MBA program. The GMAT Verbal score sample distribution was normal with a mean of 27.16.

Figure 6

GMAT Verbal Score of Students in Sample
Figure 7 illustrates the GMAT Quantitative score of students in the sample of N = 283. The GMAT Quantitative score sample size of 283 indicates that approximately 88% of the students in the overall sample of N = 322 used a GMAT Quantitative score for admission in the MBA program. The GMAT Quantitative score sample distribution was normal with a mean of 32.11.

Figure 7

GMAT Quantitative Score of Students in Sample
Figure 8 illustrates the GMAT Analytical Writing Assessment score of students in the sample of N = 278. The GMAT Analytical Writing Assessment score sample size of 278 indicates that approximately 86% of the students in the overall sample of N = 322 used a GMAT Analytical Writing Assessment score for admission in the MBA program. The GMAT Analytical Writing Assessment score sample distribution was normal with a mean of 45.86. It is unknown why 5 fewer students than in the GMAT Verbal and GMAT Quantitative samples did not have a GMAT Analytical Writing Assessment score posted.

Figure 8

**GMAT Analytical Writing Assessment Score of Students in Sample**
Figure 9 illustrates the GMAT Total score of students in the sample of N = 286.

The GMAT Total score sample size of 286 indicates that approximately 89% of the students in the overall sample of N = 322 used a GMAT Total score for admission in the MBA program. The 36 students without a GMAT score would have been admitted to the MBA program with a Graduate Record Exam score or provisionally under the varying admission requirements in effect over seven-year timeframe of the study. The GMAT Total score sample distribution was right-skewed with a mean of 502.57. It is assumed that the GMAT Total sample size was larger than the GMAT Verbal, GMAT Quantitative, and GMAT Analytical Writing Assessment sample sizes due to students only needing the GMAT Total for admittance in the MBA program.

Figure 9

*GMAT Total Score of Students in Sample*
Figure 10 illustrates the Writing Proficiency Exam score of students in sample of N = 187. The Writing Proficiency Exam is required for all students that matriculate undergraduate at the University. The Writing Proficiency Exam score sample size of 187 indicates that approximately 58% of the students in the overall sample of N = 322 had a Writing Proficiency Exam score because they matriculated undergraduate at the University. The Writing Proficiency Exam score sample distribution was normal with a mean of 8.42.

Figure 10

_**Writing Proficiency Exam Score of Students in Sample**_
Figure 11 illustrates the EN100 Grade of students in the sample of $N = 180$.

EN100 Grade is a student’s numerical grade a writing intensive English Composition course required for undergraduate matriculation at the University. The EN100 Grade sample size of 180 indicates that approximately 56% of the students in the overall sample of $N = 322$ had an EN100 grade because they matriculated undergraduate at the University. It is unknown why 7 fewer students had an EN100 grade than students with a Writing Proficiency Exam score. The EN100 Grade sample distribution was left-skewed with a mean of 3.4.

**Figure 11**

*EN100 Grade of Students in Sample*
Figure 12 illustrates the EN140 Grade of students in the sample of $N = 189$.

EN140 Grade is a student’s numerical grade in an English Composition II/Rhetoric and Critical Thinking course required for undergraduate matriculation at the University. The EN140 Grade sample size of 189 indicates that approximately 59% of the students in the overall sample of $N = 322$ had an EN140 grade because they matriculated undergraduate at the University. It is unknown why 2 additional students had an EN140 grade than students with a Writing Proficiency Exam score. It is also unknown why 9 additional students had an EN140 grades than students with an EN100 grade. The EN140 Grade sample distribution was left-skewed with a mean of 3.4, almost identical to the EN100 Grade sample distribution and mean.

Figure 12

*EN140 Grade of Students in Sample*
Figure 13 illustrates the Test Grade percent in Online MBA courses of students in the sample of N = 95. This data were obtained by reviewing individual course grade book data and extracting student test grade scores from each course taken. Course grade book data were not available for all courses included in the Online MBA GPA sample of N = 322, accordingly this sample represents 29.5% of the Online MBA GPA sample. The Test Grade percent sample mean was 88% with a left-skewed sample distribution. The Online Test Grade percent distribution was dissimilar to the overall Online MBA GPA distribution which was somewhat uniform with 39% of the grades above 3.9.

Figure 13

*Test Grades Percent in Online Courses of Students in Sample*
Figure 14 illustrates the Written Work Grade percent in Online MBA courses of students in the sample of N = 95. This data were obtained by reviewing individual course grade book data and extracting student written work grade scores from each course taken. Written work included essays, case studies, and journal reviews. Course grade book data were not available for all courses included in the Online MBA GPA sample of N = 322, accordingly this sample represents 29.5% of the Online MBA GPA sample. The Written Work Grade percent sample mean was 92% with a left-skewed sample distribution. The Online Written Work Grade percent mean was 4% higher than the Online Test Grade percent mean and the distribution was dissimilar to the overall Online MBA GPA distribution which was somewhat uniform with 39% of the grades above 3.9.

Figure 14

*Written Work Grades Percent in Online Courses of Students in Sample*
Figure 15 illustrates the composite Online Test and Written Work Grade percent in Online MBA courses of students in the sample of N = 95. This data were obtained by reviewing individual course grade book data and extracting student test and written work grade scores from each course taken. Data include grades on tests, essays, case studies, and journal reviews. Course grade book data were not available for all courses included in the Online MBA GPA sample of N = 322, accordingly this sample represents 29.5% of the Online MBA GPA sample. The Online Test and Written Work Grade percent sample mean was 90% with a left-skewed sample distribution. The composite Online Test and Written Work Grade percent distribution was dissimilar to the overall Online MBA GPA distribution which was somewhat uniform with 39% of the grades above 3.9.

Figure 15

*Overall MBA Grade Percent in Courses with Test and Written Work Grade Data of Students in Sample*
Figure 16 illustrates the number of Online MBA credits earned by students in the Online Test and Written Work grade sample of N = 95. The mean number of credits earned by students in the sample was approximately 7. While, the sample mean of 7, indicates that the Online Test and Written Work grade sample was of 67% of the average 10.5 hours of total online coursework for students in the Online GPA sample, the Online Test and Written Work grade sample of 95 was only 29.5% of the Online MBA GPA sample of 322. Online Test and Written Work grade sample distribution was right-skewed and similar to the Online MBA GPA credits sample distribution, but dissimilar to the left-skewed total MBA GPA credit distribution.

Figure 16

*Overall Credits Taken in Courses with Test and Written Work Grade Data of Students in Sample*
Figure 17 compares the Test, Written Work and Overall Grade % in Online Courses with Test and Written Work Grade Data of Students in the samples of N = 95.

The Test, Written Work and Overall Grade percent sample distributions were all left-skewed and reflected the similarities of their respective 88%, 92%, and 90% mean grade percents.

Figure 17

*Test, Written Work and Overall Grade % in Online Courses with Test and Written Work Grade Data of Students in Sample*
Figure 18 shows only the overall online MBA GPA credits of students in the Test and Written Work Grade percent data sample of N = 95. The overall Online MBA GPA credits taken mean for this sample was 11.7. Comparing the overall Online MBA GPA credits mean for the sample of 11.7 to the Test and Written Work grade percent credit mean of 7, indicates that nearly 60% of 95 students’ Test and Written Work grade data were obtained and analyzed. Although the overall sample distribution is bimodal, the twin sample peaks indicated that while the average student only took 7 to 9 overall credits of online courses, there was a trend for a few students to take an increasingly higher number of overall online courses.

Figure 18

*Overall Online Credits Taken by Students with Test and Written Work Data of Students in Sample*
Figure 19 compares credits taken in online courses with Test and Written Work data available in the sample of N = 95 with all Online MBA GPA credits taken by students in the same sample. Comparing the right-skewed sample distribution of credits taken in online courses with Test and Written Work data available to the bimodal sample distribution of all Online MBA GPA credits taken, indicates that students in the sample with Test and Written Work data available did not share the increasing trend of students in the Online MBA GPA credit sample to take online courses.

Figure 19

*Credits Taken in Online Courses with Test and Written Work Data Compared to all Credits Taken in Online Courses of Students in Sample*
Figure 20 illustrates the percent of online courses taken by students with Test and Written Work data available to all online MBA courses taken by the student. The data indicate that Online Test and Written Work data were available from approximately 60.4% from all online course work completed by the 95 students in the sample. The bimodal distribution of the sample shows that 21 students or 28% of the sample at one sample distribution peak had 50% to 59% of data available with a normal distribution around that peak. 32 (34%) students of the sample at the other sample distribution peak had 100% of data available. Overall, Figure 20 shows that 76 (80%) of the students in the total Test and Written Work sample had 50% or more of their total Online MBA coursework available for study.

Figure 20

*Percent of Online Courses Taken with Test and Written Work Data to all Online Courses Taken of Students in Sample*

<table>
<thead>
<tr>
<th>Percent of OL Courses with Date to Total OL Courses</th>
<th>Number of Students (N = 95)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 29%</td>
<td>2</td>
</tr>
<tr>
<td>30 - 39%</td>
<td>10</td>
</tr>
<tr>
<td>40 - 49%</td>
<td>7</td>
</tr>
<tr>
<td>50 - 59%</td>
<td>21</td>
</tr>
<tr>
<td>60 - 69%</td>
<td>15</td>
</tr>
<tr>
<td>70 - 79%</td>
<td>6</td>
</tr>
<tr>
<td>80 - 89%</td>
<td>2</td>
</tr>
<tr>
<td>90 - 99%</td>
<td>0</td>
</tr>
<tr>
<td>100%</td>
<td>32</td>
</tr>
</tbody>
</table>
Figure 21 illustrates the Online MBA GPA of the students in the sample of N = 322. The sample data had a mean Online MBA GPA of 3.6, was unevenly skewed to the left, and not normally distributed. The data distribution also indicated 126 (39%) students had an Online MBA GPA of greater than 3.91. The uneven distribution of the Online MBA GPA sample was dissimilar with the evenly left-skewed distribution of the overall MBA GPA sample, indicating that some students performed better in online courses than they performed overall in MBA coursework. Since the mean Online MBA GPA and the mean overall MBA GPA were almost identical, this data also indicate that some students performed worse in Online MBA courses than they performed in overall MBA coursework.

Figure 21

*Online MBA GPA of Students in Sample*
Figure 22 illustrates the number of Online MBA credits earned by students in the Online MBA GPA sample of N = 322. The mean number of credits earned by students in the sample was approximately 10.5. The right-skewed distribution of the sample, with a sample mean of 10.5, indicates that the students in the Online MBA GPA sample had completed an average of 26.3% of the required 40 hours of MBA coursework in online courses. The dissimilarity of the total MBA GPA credit distribution with the Online MBA GPA credit distribution may account for the differences in the overall MBA GPA and the Online MBA GPA grade distributions.

Figure 22

*Online MBA Credits of Students in Online MBA GPA Sample*
Figure 23 illustrates the Face-to Face MBA GPA of the students in the sample of N = 322. The sample data had a mean Face-to-Face MBA GPA of 3.6, was unevenly skewed to the left, and not normally distributed. The data distribution also indicated 81 (25%) students had a Face-to-Face MBA GPA of greater than 3.91. The uneven distribution of the Face-to-Face MBA GPA sample was dissimilar with the evenly left-skewed distribution of the overall MBA GPA sample, indicating that some students performed better in online courses than they performed overall in MBA coursework. Since the mean Face-to-Face MBA GPA and the mean overall MBA GPA was almost identical, this data also indicate that some students performed worse in Face-to-Face MBA courses than they performed in overall MBA coursework.

Figure 23

*F2F MBA GPA of Students in Sample*
Figure 24 illustrates the number of Face-to-Face MBA credits earned by students in the Face-to-Face MBA GPA sample of N = 322. The mean number of credits earned by students in the sample was approximately 20.4 and 94% higher than the average 10.5 earned by students in the Online MBA GPA sample. The somewhat normal distribution of the sample, with a sample mean of 20.4, indicates that the students in the Face-to-Face MBA GPA sample had completed an average of 51% of the required 40 hours of MBA coursework in Face-to-Face courses.

Figure 24

*F2F MBA Credits of Students in F2F MBA GPA Sample*
Figure 25 shows a comparison of the Online and Face-to-Face MBA GPA of students in the samples of N = 322. Figure 25 indicated that the mean Online and Face-to-Face MBA GPA’s were nearly identical at 3.6, however a greater number of students had a 3.0 – 3.1, 3.41-3.5, and 3.91-4.0 GPA in Online courses than in Face-to-Face courses. The data also indicate that a greater number of students also had a <.3.0, 3.11-3.2, 3.21-3.3, 3.31-3.4, 3.51-3.6, 3.61-3.7, and 3.71-3.8 GPA in Face-to Face courses than in Online courses. This GPA data illustrate that student grade distributions in Online and Face-to-Face courses were not similar, but the differences were not explained by the GPA data.

Figure 25

*Online and F2F MBA GPA Combined of Students in Sample*
Figure 26 compares the number of Online and Face-to-Face MBA credits earned by students in the Online and Face-to-Face MBA GPA samples of N = 322. The right-skewed Online MBA credit sample distribution compared to the normally distributed Face-to-Face credit sample right of the Online MBA credits sample illustrates the 94% higher 20.4 Face-to-Face credits mean compared to the 10.5 Online credits mean.

Figure 26

*Online and F2F MBA Credits Combined of Students in Online and Face-to-Face MBA GPA Samples*
Figure 27 illustrates the overall MBA GPA of the students in the sample of N = 322. The sample data were normally distributed and left-skewed with a mean MBA GPA of 3.6. The left-skewed distribution of the MBA GPA sample was dissimilar with the uniform distribution of the UGPA sample, indicating that overall student performance increased from undergraduate to graduate program course work. This difference in the UGPA mean of 3.4 compared to the MBA GPA mean of 3.6 reflected a 6% increase in student performance.

Figure 27

*MBA GPA of Students in Sample*
Figure 28 illustrates the number of MBA credits earned by students in the Overall MBA GPA sample of N = 322. The mean number of credits earned by students in the sample was approximately 30.9. The left-skewed distribution of the sample, with a sample mean of 30.9, indicates that the students in the MBA GPA sample had completed an average of 77.3% of the required 40 hours of MBA coursework.

Figure 28

*Number of MBA Credits Earned by Students in MBA GPA Sample*
Figure 29 illustrates the academic term in which students graduated in the sample of N = 215. This figure indicates that 67% of the students in the overall sample of N = 322 graduated during the period of the study. Although 67% of sample graduated during the study period, the Overall MBA GPA credits data in Figure 28 which show that only 10 students completed the 40 credits needed for graduation. Accordingly, many of their credits needed for graduation were taken outside the study period. The left-skewed sample distribution shows that more students graduated towards the end of the study period.

Figure 29

Term Graduated of Students in Sample
Figure 30 illustrates the number of attributes per student in the overall sample of N = 322. The sample distribution is left-skewed with a mean number of attributes per student of 13.3. The sample distribution and mean indicated that the average student had 78% of the total attributes available for study.
Analysis of Data

The descriptive statistics and statistical output of the correlation procedure is presented and discussed in this section. Data analysis and discussion of the type of statistical analysis used, results, and statistical significance of the output for each research question is also presented.

Table 4 shows the descriptive statistics of the predictor and criterion variables used in the correlation procedure. These statistics define the data mean, standard deviation of the data from the respective mean, and the sample size of each predictor and criterion variable used in the procedure. The data means provide sample sizes and reference points of the average numerical values of the sample. Standard deviations provide the range to which the particular sample data vary or deviate plus or minus relative to the mean. The means and standard deviations for the predictor variables Gender and Ethnicity are omitted from the Table 4 as they result from nominal coding that was not scale based. All other predictor and criterion variable data were scale data with descriptive means and standard deviations.

The data show that the sample sizes for the criterion variables, OVERALL OL GRADES, OVERALL F2F GRADES, and OVERALL MBA GPA were N = 322. The samples sizes for AGE, UGPA, GMAT-VERBAL, GMAT-QUANTITATIVE, GMAT-ANALYTICAL WRITING, GMAT-TOTAL, WPE, EN100, EN140, ONLINE TEST GRADES, and ONLINE WRITNG GRADES ranged from N = 95 to N = 322. Field suggests that for correlation coefficients to be reliable, sample sizes need to be in the range of 10 to 15 participants per variable (2009). Accordingly, the samples sizes for all criterion variables are adequate and reliable for study. In the case of predictor variables,
the lowest sample size of N = 95 would also produce an adequate and reliable correlation coefficient when analyzed with the three criterion variables.

Table 4

*Descriptive Statistics of Sample*

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>30.59</td>
<td>6.688</td>
<td>322</td>
</tr>
<tr>
<td>UNDERGRADUATE GRADE POINT AVERAGE (UGPA)</td>
<td>3.37939</td>
<td>.439345</td>
<td>271</td>
</tr>
<tr>
<td>GMAT VERBAL SCORE (GMAT-VERBAL)</td>
<td>27.16</td>
<td>6.998</td>
<td>283</td>
</tr>
<tr>
<td>GMAT QUANTITATIVE SCORE (GMAT-QUANTITATIVE)</td>
<td>32.11</td>
<td>7.279</td>
<td>283</td>
</tr>
<tr>
<td>GMAT ANALYTICAL WRITING ASSESSMENT SCORE</td>
<td>45.86</td>
<td>8.695</td>
<td>278</td>
</tr>
<tr>
<td>GMAT TOTAL SCORE (GMAT-TOTAL)</td>
<td>502.57</td>
<td>71.919</td>
<td>286</td>
</tr>
<tr>
<td>WRITING PROFICIENCY EXAM SCORE (WPE)</td>
<td>8.417</td>
<td>.8229</td>
<td>187</td>
</tr>
<tr>
<td>ENGLISH COMPREHENSION COURSE GRADE (EN100 GRADE)</td>
<td>3.40222</td>
<td>.705284</td>
<td>180</td>
</tr>
<tr>
<td>RHETORIC AND CRITICAL THINKING COURSE GRADE (EN140 GRADE)</td>
<td>3.40741</td>
<td>.720629</td>
<td>189</td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td>.88164</td>
<td>.067904</td>
<td>95</td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td>.91902</td>
<td>.073389</td>
<td>95</td>
</tr>
<tr>
<td>OVERALL OL GRADES</td>
<td>3.60491</td>
<td>.426154</td>
<td>322</td>
</tr>
<tr>
<td>OVERALL F2F GRADES</td>
<td>3.60845</td>
<td>.359379</td>
<td>322</td>
</tr>
<tr>
<td>OVERALL MBA GPA</td>
<td>3.61304</td>
<td>.315667</td>
<td>322</td>
</tr>
</tbody>
</table>
Table 5 shows the output from running the Pearson statistical correlation procedure in SPSS. All three criterion variables (dependent variables) and thirteen predictor variables (independent variables) were included in the procedure. The results from the correlation procedure provided the Pearson correlation coefficient, the two-tailed significance factor, the sum of the squares and cross-products, and the covariance of the statistic.

The Pearson correlation coefficient squared provides the statistical percent to which one variable correlated with another variable on a scale of -1 to +1. A zero correlation means that there was no correlation between the numeric changes in one variable to the numeric change in the other variable. A negative correlation coefficient means that as the numeric value of one variable changed in one direction (positively or negatively) the numeric value of the other variable changed in the other direction (negatively or positively). A positive correlation coefficient means that as the numeric value of one variable changed in one direction (positively or negatively) the numeric value of the other variable changed in the same direction (positively or negatively).

Correlation coefficients of .1 indicate a small effect that explains 1% of the total variance (Field, 2009). Correlation coefficients of .3 indicate a medium effect that explains 9% of the total variance (Field, 2009). While correlation coefficients of .5 indicate a large effect that accounts for 25% of the total variance (Field, 2009). Double asterisks indicate that the correlation coefficient was significant at the $p < .01$ level, meaning that there is a one percent probability the correlation of the two variables occurred by chance. Single asterisks indicate that the correlation coefficient was significant at the $p < .05$ level, meaning that there is a five percent probability the correlation of the two variables
occurred by chance. In cases where there is no significant correlation, the results are stated as $p > .05$, meaning that there is greater than a five percent probability the correlation of the two variables occurred by chance.

The two-tailed significance factor provides a non-directional testing of the null hypothesis. Dividing the two-tailed significance factor by two shows the percent that that the correlation statistics varies to either side of the null hypothesis of no correlation.

The sum of the squares and cross-products statistic indicates the combined statistical error between two variables. “Whereas, the sum of the squares variable is the total squared differences between the observed values and mean value, the cross-product is the total combine error between two variables” (Field, 2009, p.590).

The covariance statistic provides a positive or negative numerical value to which the variables deviate from their means. A positive covariance indicates that as one variable deviates from its mean in one direction, the other variable deviates from its mean in the same direction. A negative covariance indicates that as one variable deviates from its mean, the other variable deviates from its mean in the opposite direction.
Table 5

*SPSS Output – Correlations of GENDER, AGE, ETHNICITY, UGPA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, WRITING PROFICIENCY score, EN100 GRADE, EN140 GRADE, ONLINE TEST GRADES, OL WRITING GRADES, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL GPA in MBA courses*

<table>
<thead>
<tr>
<th>PREDICTOR VARIABLES</th>
<th>CRITERION VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OVERALL F2F GRADES</td>
</tr>
<tr>
<td>GENDER</td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.010</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.852</td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>-4.198</td>
</tr>
<tr>
<td>Covariance</td>
<td>-.013</td>
</tr>
<tr>
<td>N</td>
<td>322</td>
</tr>
<tr>
<td>AGE</td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.017</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.763</td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>-13.024</td>
</tr>
<tr>
<td>Covariance</td>
<td>-.041</td>
</tr>
<tr>
<td>N</td>
<td>322</td>
</tr>
<tr>
<td>ETHNICITY</td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.067</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.233</td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>23.558</td>
</tr>
<tr>
<td>Covariance</td>
<td>.073</td>
</tr>
<tr>
<td>N</td>
<td>322</td>
</tr>
<tr>
<td>UGPA</td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.342**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>14.832</td>
</tr>
<tr>
<td>Covariance</td>
<td>.055</td>
</tr>
<tr>
<td>N</td>
<td>271</td>
</tr>
</tbody>
</table>
Table 5 (continued)

<table>
<thead>
<tr>
<th>PREDICTOR VARIABLES</th>
<th>CRITERION VARIABLES</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OVERALL</td>
<td>F2F</td>
<td>OVERALL</td>
<td>OVERALL</td>
</tr>
<tr>
<td></td>
<td>GRADES</td>
<td>GRADES</td>
<td>MBA GPA</td>
<td></td>
</tr>
<tr>
<td>GMAT-VERBAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.212**</td>
<td>.078</td>
<td>.195**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.188</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>140.346</td>
<td>64.279</td>
<td>116.456</td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.498</td>
<td>.228</td>
<td>.413</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>283</td>
<td>283</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td>GMAT-QUANTITATIVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.090</td>
<td>.059</td>
<td>.088</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.131</td>
<td>.324</td>
<td>.139</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>61.881</td>
<td>50.218</td>
<td>54.714</td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.219</td>
<td>.178</td>
<td>.194</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>283</td>
<td>283</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td>GMAT-ANALYTICAL WRITING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.243**</td>
<td>.143*</td>
<td>.243**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.017</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>19.492</td>
<td>14.274</td>
<td>17.727</td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.070</td>
<td>.052</td>
<td>.064</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>278</td>
<td>278</td>
<td>278</td>
<td></td>
</tr>
<tr>
<td>GMAT-TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.233**</td>
<td>.110</td>
<td>.221**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.063</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>1596.601</td>
<td>935.272</td>
<td>1370.946</td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>5.602</td>
<td>3.282</td>
<td>4.810</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>286</td>
<td>286</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>WRITING PROFICIENCY EXAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.142</td>
<td>.189**</td>
<td>.202**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.052</td>
<td>.010</td>
<td>.006</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>7.929</td>
<td>12.836</td>
<td>10.249</td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.043</td>
<td>.069</td>
<td>.055</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>187</td>
<td>187</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>PREDICTOR VARIABLES</td>
<td>CRITERION VARIABLES</td>
<td>PREDICTOR VARIABLES</td>
<td>CRITERION VARIABLES</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>EN100 GRADE</td>
<td></td>
<td>EN140 GRADE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.217**</td>
<td>.181*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.003</td>
<td>.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>10.078</td>
<td>8.763</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.056</td>
<td>.047</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>180</td>
<td>189</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL F2F GRADES</td>
<td></td>
<td>OVERALL OL GRADES</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.260**</td>
<td>.300**</td>
<td>.272**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.839</td>
<td>18.141</td>
<td>11.997</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.083</td>
<td>.096</td>
<td>.064</td>
<td></td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>189</td>
<td>189</td>
<td></td>
</tr>
<tr>
<td>OVERALL MBA GPA</td>
<td></td>
<td>OVERALL OL GRADES</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.275**</td>
<td>.272**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.000</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11.650</td>
<td>11.997</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.065</td>
<td>.064</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>189</td>
<td>189</td>
<td></td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td></td>
<td>OVERALL OL GRADES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.376**</td>
<td>.509**</td>
<td>.775**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>.910</td>
<td>.982</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.010</td>
<td>.010</td>
<td>.014</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td></td>
<td>OVERALL OL GRADES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.573**</td>
<td>.593**</td>
<td>.590**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>1.344</td>
<td>1.504</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.014</td>
<td>.016</td>
<td>.014</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>OVERALL OL GRADES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.485**</td>
<td>.509**</td>
<td>.775**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Sum of Squares and Cross-products</td>
<td>1.272</td>
<td>33.452</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covariance</td>
<td>.014</td>
<td>.014</td>
<td>.014</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
</tr>
</tbody>
</table>
Table 5 (continued)

<table>
<thead>
<tr>
<th>PREDICTOR VARIABLES</th>
<th>CRITERION VARIABLES</th>
<th>OVERALL F2F GRADES</th>
<th>OVERALL OL GRADES</th>
<th>OVERALL MBA GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL F2F GRADES</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.509**</td>
<td>.880**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum of Squares and Cross-products</td>
<td>41.458</td>
<td>25.037</td>
<td>32.041</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>.129</td>
<td>.078</td>
<td>.100</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>322</td>
<td>322</td>
<td>322</td>
</tr>
<tr>
<td>OVERALL MBA GPA</td>
<td>Pearson Correlation</td>
<td>.880**</td>
<td>.775**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sum of Squares and Cross-products</td>
<td>32.041</td>
<td>33.452</td>
<td>31.986</td>
</tr>
<tr>
<td></td>
<td>Covariance</td>
<td>.100</td>
<td>.104</td>
<td>.100</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>322</td>
<td>322</td>
<td>322</td>
</tr>
</tbody>
</table>

* Significant Correlation at $p < .05$

** Significant Correlation at $p < .01$


Research Question One. Is there a statistically significant correlation between students' GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?

Table 5 shows the SPSS output of the correlation procedure used in the study to explore the relationship between the predictor variables of GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, EN100 GRADE, EN140 GRADE, OL TEST GRADES, and OL WRITING GRADES; and, the criterion variable OVERALL F2F GRADES.

GENDER was not significantly related to how well students performed overall in F2F courses, \( r(322) = -0.01, p > .05 \). AGE was not significantly related to how well students performed overall in F2F courses, \( r(322) = -0.02, p > .05 \). Ethnicity was not significantly related to how well students performed overall in F2F courses, \( r(322) = 0.07, p > .05 \). Accordingly, none of the demographic predictor variables were significantly related to how well students performed overall in F2F courses and the null hypothesis was accepted.
UGPA was significantly related to how well students performed overall in F2F courses, $r (271) = .34, p < .01$. By squaring the $r$ value of .34, the statistic shows that 11.7% of the variance in OVERALL F2F GRADES can be explained by the variance in UGPA. Accordingly, the null hypothesis was rejected.

GMAT-VERBAL score was significantly related to how well students performed in overall F2F courses, $r (283) = .21, p < .01$. By squaring the $r$ value of .21, the statistic shows that 4.5% of the variance in OVERALL F2F GRADES can be explained by the variance in GMAT-VERBAL score. Accordingly, the null hypothesis was rejected.

GMAT-QUANTITATIVE score was not significantly related to how well students performed in overall F2F courses, $r (283) = .09, p > .05$. By squaring the $r$ value of .09, the statistic shows that less than 1% of the variance in OVERALL F2F GRADES can be explained by the variance in GMAT-QUANTITATIVE score. Accordingly, the null hypothesis was accepted.

GMAT-ANALYTICAL WRITING score was significantly related to how well students performed in overall F2F courses, $r (278) = .24, p < .01$. By squaring the $r$ value of .24, the statistic shows that 5.9% of the variance in OVERALL F2F GRADES can be explained by the variance in GMAT-ANALYTICAL WRITING score. Accordingly, the null hypothesis was rejected.

GMAT-TOTAL score was significantly related to how well students performed in overall F2F courses, $r (286) = .23, p < .01$. By squaring the $r$ value of .23, the statistic shows that 5.4% of the variance in OVERALL F2F GRADES can be explained by the variance in GMAT-TOTAL score. Accordingly, the null hypothesis was rejected.
WRITING PROFICIENCY EXAM score was not significantly related to how well students performed in overall F2F courses, $r (187) = .14, p > .05$. By squaring the $r$ value of .14, the statistic shows that less than 2% of the variance in OVERALL F2F GRADES can be explained by the variance in WRITING PROFICIENCY EXAM score. Accordingly, the null hypothesis was accepted.

EN100 GRADE was significantly related to how well students performed in overall F2F courses, $r (180) = .22, p < .01$. By squaring the $r$ value of .22, the statistic shows that 4.7% of the variance in OVERALL F2F GRADES can be explained by the variance in EN100 GRADE. Accordingly, the null hypothesis was rejected.

EN140 GRADE was significantly related to how well students performed in overall F2F courses, $r (189) = .18, p < .05$, but the relationship was not as significant as the variables correlating at $p < .01$. By squaring the $r$ value of .18, the statistic shows that 3.3% of the variance in OVERALL F2F GRADES can be explained by the variance in EN140 GRADE. Accordingly, the null hypothesis was rejected.

OL TEST GRADES was significantly related to how well students performed in overall F2F courses, $r (95) = .38, p < .01$. By squaring the $r$ value of .38, the statistic shows that 14.1% of the variance in OVERALL F2F GRADES can be explained by the variance in OL TEST GRADES. Accordingly, the null hypothesis was rejected.

OL WRITING GRADES was significantly related to how well students performed in overall F2F courses, $r (95) = .38, p < .01$. By squaring the $r$ value of .38, the statistic shows that 14.1% of the variance in OVERALL F2F GRADES can be explained by the variance in OL WRITING GRADES. Accordingly, the null hypothesis was rejected.
Research Question Two. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?

Table 5 shows the SPSS output of the correlation procedure used in the study to explore the relationship between the predictor variables of GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, EN100 GRADE, EN140 GRADE, OL TEST GRADES, and OL WRITING GRADES; and, the criterion variable OVERALL OL GRADES.

GENDER was not significantly related to how well students performed overall in Online courses, \( r(322) = -0.04, p > .05 \). AGE was not significantly related to how well students performed overall in Online courses, \( r(322) = -0.06, p > .05 \). Ethnicity was not significantly related to how well students performed overall in Online courses, \( r(322) = -0.01, p > .05 \). Accordingly, none of the demographic predictor variables were significantly related to how well students performed overall in Online courses and the null hypothesis was accepted.

UGPA was significantly related to how well students performed overall in Online courses, \( r(271) = 0.41, p < .01 \). By squaring the \( r \) value of .41, the statistic shows that
16.7% of the variance in OVERALL OL GRADES can be explained by the variance in UGPA. Accordingly, the null hypothesis was rejected.

GMAT-VERBAL score was not significantly related to how well students performed in overall Online courses, \( r (283) = .08, p > .05 \). By squaring the \( r \) value of .08, the statistic shows that less than 1% of the variance in OVERALL OL GRADES can be explained by the variance in GMAT-VERBAL score. Accordingly, the null hypothesis was accepted.

GMAT-QUANTITATIVE score was not significantly related to how well students performed in overall Online courses, \( r (283) = .06, p > .05 \). By squaring the \( r \) value of .06, the statistic shows that less than 1% of the variance in OVERALL OL GRADES can be explained by the variance in GMAT-QUANTITATIVE score. Accordingly, the null hypothesis was accepted.

GMAT-ANALYTICAL WRITING score was significantly related to how well students performed in overall Online courses, \( r (278) = .14, p < .05 \), but the relationship was not as significant as the variables correlating at \( p < .01 \). By squaring the \( r \) value of .14, the statistic shows that only 2% of the variance in OVERALL OL GRADES can be explained by the variance in GMAT-ANALYTICAL WRITING score. Accordingly, the null hypothesis was rejected.

GMAT-TOTAL score was not significantly related to how well students performed in overall Online courses, \( r (286) = .11, p > .05 \). By squaring the \( r \) value of .11, the statistic shows that only 1% of the variance in OVERALL OL GRADES can be explained by the variance in GMAT-TOTAL score. Accordingly, the null hypothesis was accepted.
WRITING PROFICIENCY EXAM score was significantly related to how well students performed in overall Online courses, $r (187) = .19, p < .01$. By squaring the $r$ value of .19, the statistic shows that 3.6% of the variance in OVERALL OL GRADES can be explained by the variance in WRITING PROFICIENCY EXAM score. Accordingly, the null hypothesis was rejected.

EN100 GRADE was significantly related to how well students performed in overall Online courses, $r (180) = .26, p < .01$. By squaring the $r$ value of .26, the statistic shows that 6.8% of the variance in OVERALL OL GRADES can be explained by the variance in EN100 GRADE. Accordingly, the null hypothesis was rejected.

EN140 GRADE was significantly related to how well students performed in overall Online courses, $r (189) = .30, p < .01$. By squaring the $r$ value of .30, the statistic shows that 9% of the variance in OVERALL OL GRADES can be explained by the variance in EN140 GRADE. Accordingly, the null hypothesis was rejected.

OL TEST GRADES was significantly related to how well students performed in overall Online courses, $r (95) = .57, p < .01$. By squaring the $r$ value of .57, the statistic shows that 32.8% of the variance in OVERALL OL GRADES can be explained by the variance in OL TEST GRADES. Accordingly, the null hypothesis was rejected.

OL WRITING GRADES was significantly related to how well students performed in overall Online courses, $r (95) = .59, p < .01$. By squaring the $r$ value of .59, the statistic shows that 35.2% of the variance in OVERALL OL GRADES can be explained by the variance in OL WRITING GRADES. Accordingly, the null hypothesis was rejected.
Research Question Three. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?

Table 5 shows the SPSS output of the correlation procedure used in the study to explore the relationship between the predictor variables of GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, EN100 GRADE, EN140 GRADE, OL TEST GRADES, and OL WRITING GRADES; and, the criterion variable OVERALL MBA GPA.

GENDER was not significantly related to how well students performed overall in MBA courses, \( r (322) = -0.02, p > .05 \). AGE was not significantly related to how well students performed overall in MBA courses, \( r (322) = -0.02, p > .05 \). Ethnicity was not significantly related to how well students performed overall in MBA courses, \( r (322) = 0.06, p > .05 \). Accordingly, none of the demographic predictor variables were significantly related to how well students performed overall in MBA courses and the null hypothesis was accepted.
UGPA was significantly related to how well students performed overall in MBA courses, $r (271) = .46, p < .01$. By squaring the $r$ value of .46, the statistic shows that 21.3% of the variance in OVERALL MBA GPA can be explained by the variance in UGPA. Accordingly, the null hypothesis was rejected.

GMAT-VERBAL score was significantly related to how well students performed in overall MBA courses, $r (283) = .20, p < .01$. By squaring the $r$ value of .20, the statistic shows that 3.8% of the variance in OVERALL MBA GPA can be explained by the variance in GMAT-VERBAL score. Accordingly, the null hypothesis was rejected.

GMAT-QUANTITATIVE score was not significantly related to how well students performed in overall MBA courses, $r (283) = .09, p > .05$. By squaring the $r$ value of .09, the statistic shows that less than 1% of the variance in OVERALL MBA GPA can be explained by the variance in GMAT-QUANTITATIVE score. Accordingly, the null hypothesis was accepted.

GMAT-ANALYTICAL WRITING score was significantly related to how well students performed in overall MBA courses, $r (278) = .24, p < .01$. By squaring the $r$ value of .24, the statistic shows that 5.9% of the variance in OVERALL MBA GPA can be explained by the variance in GMAT-ANALYTICAL WRITING score. Accordingly, the null hypothesis was rejected.

GMAT-TOTAL score was significantly related to how well students performed in overall MBA courses, $r (286) = .22, p < .01$. By squaring the $r$ value of .22, the statistic shows that 4.9% of the variance in OVERALL MBA GPA can be explained by the variance in GMAT-TOTAL score. Accordingly, the null hypothesis was rejected.
WRITING PROFICIENCY EXAM score was significantly related to how well students performed in overall MBA courses, \( r (187) = .20, p < .01 \). By squaring the \( r \) value of .20, the statistic shows that 4.1\% of the variance in OVERALL MBA GPA can be explained by the variance in WRITING PROFICIENCY EXAM score. Accordingly, the null hypothesis was rejected.

EN100 GRADE was significantly related to how well students performed in overall MBA courses, \( r (180) = .28, p < .01 \). By squaring the \( r \) value of .28, the statistic shows that 7.6\% of the variance in OVERALL MBA GPA can be explained by the variance in EN100 GRADE. Accordingly, the null hypothesis was rejected.

EN140 GRADE was significantly related to how well students performed in overall MBA courses, \( r (189) = .27, p < .01 \). By squaring the \( r \) value of .27, the statistic shows that 7.4\% of the variance in OVERALL MBA GPA can be explained by the variance in EN140 GRADE. Accordingly, the null hypothesis was rejected.

OL TEST GRADES was significantly related to how well students performed in overall MBA courses, \( r (95) = .49, p < .01 \). By squaring the \( r \) value of .49, the statistic shows that 23.5\% of the variance in OVERALL MBA GPA can be explained by the variance in OL TEST GRADES. Accordingly, the null hypothesis was rejected.

OL WRITING GRADES was significantly related to how well students performed in overall MBA courses, \( r (95) = .59, p < .01 \). By squaring the \( r \) value of .59, the statistic shows that 34.8\% of the variance in OVERALL MBA GPA can be explained by the variance in OL WRITING GRADES. Accordingly, the null hypothesis was rejected.
Research Question Four. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

Table 5 shows the SPSS output of the correlation procedure used in the study to explore the relationship between the predictor variables of GENDER, AGE, ETHNICITY, UPGA, GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, EN100 GRADE, EN140 GRADE, OL TEST GRADES, and OL WRITING GRADES; and, the criterion variables of OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA.

GENDER was not significantly related to how well students performed overall in F2F courses, \( r(322) = .01, p > .05 \), Online courses, \( r(322) = -.04, p > .05 \), or overall MBA courses, \( r(322) = -.02, p > .05 \). AGE was not significantly related to how well students performed overall in F2F courses, \( r(322) = -.02, p > .05 \), Online courses, \( r(322) = -.02, p > .05 \), or overall MBA courses, \( r(322) = -.06, p > .05 \). Ethnicity was not significantly related to how well students performed overall in F2F courses, \( r(322) = .07, p > .05 \).
there were no significantly relationships identified and the null hypothesis was accepted.

UGPA was significantly related to how well students performed overall in F2F courses, \( r(271) = .34, p < .01 \), Online courses, \( r(271) = .41, p < .01 \), and overall MBA courses, \( r(271) = .46, p < .01 \). The effect size of the Pearson correlation coefficient of UGPA with OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA were all in a medium significance range of .3 to .49. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.

GMAT-VERBAL score was significantly related to how well students performed overall in F2F courses, \( r(283) = .21, p < .01 \), and overall MBA courses, \( r(283) = .20, p < .01 \). GMAT-VERBAL score was not significantly related to how well students performed in Online courses, \( r(283) = .08, p > .05 \). The effect size of the Pearson correlation coefficient of GMAT-VERBAL with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small range of .1 to .29. There were significant differences in the significance of the correlations for OVERALL F2F GRADES and OVERALL MBA GPA with GMAT-VERBAL score, and OVERALL OL GRADES with GMAT-VERBAL score. Accordingly, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.
GMAT-QUANTITATIVE score was not significantly related to how well students performed overall in F2F courses, $r(283) = .09, p > .05$, Online courses, $r(283) = .06, p > .05$, and overall MBA courses, $r(283) = .09, p > .05$. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.

GMAT-ANALYTICAL WRITING score was significantly related to how well students performed overall in F2F courses, $r(278) = .24, p < .01$, and overall MBA courses, $r(278) = .24, p < .01$. The effect size of the Pearson correlation coefficient of GMAT-ANALYTICAL WRITING score with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small significance range of .1 to .29. GMAT-ANALYTICAL WRITING score was also significantly related to how well students performed in Online courses, $r(278) = .14, p < .05$ and was in a small significance range of .1 to .29. Since the statistical error factor of correlation coefficient for the GMAT-ANALYTICAL WRITING score with OVERALL OL GRADES was greater than the error factor for the correlation coefficients for GMAT-ANALYTICAL WRITING score with OVERALL F2F GRADES and OVERALL MBA GPA, there was a significant difference in the significance of the correlations and null hypothesis was rejected.

GMAT-TOTAL score was significantly related to how well students performed overall in F2F courses, $r(286) = .23, p < .01$ and overall MBA courses, $r(286) = .22, p < .01$. The effect size of the Pearson correlation coefficient of GMAT-TOTAL score with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small significance range of .1 to .29. GMAT-TOTAL score was not significantly related to how well students performed in overall Online courses, $r(286) = .11, p > .05$. Since GMAT-
TOTAL score was significantly related to both OVERALL F2F GRADES and OVERALL MBA GPA, but not significantly related to OVERALL OL GRADES, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.

WRITING PROFICIENCY EXAM score was significantly related to how well students performed in Online courses, $r (187) = .19, p < .01$, and overall MBA courses, $r (187) = .20, p < .01$. WRITING PROFICIENCY EXAM score was not significantly related to how well students performed in F2F courses, $r (187) = .14, p > .05$. Since WRITING PROFICIENCY EXAM score was significantly related to both OVERALL OL GRADES and OVERALL MBA GPA, but not significantly related to OVERALL F2F GRADES, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.

EN100 GRADE was significantly related to how well students performed overall in F2F courses, $r (180) = .22, p < .01$, Online courses, $r (180) = .26, p < .01$, and overall MBA courses, $r (180) = .28, p < .01$. The effect size of the Pearson correlation coefficient of EN100 GRADE with OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA were all in a small significance range of .1 to .29. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.
EN140 GRADE was significantly related to how well students performed overall in Online courses, $r(189) = .30, p < .01$, and overall MBA courses, $r(189) = .27, p < .01$. The effect size of the Pearson correlation coefficient of EN140 GRADE with OVERALL OL GRADES was in a medium significance range of .3 to .49 and OVERALL MBA GPA was in a small significance range of .1 to .29. EN140 GRADE was also significantly related to how well students performed in F2F courses, $r(189) = .18, p < .05$ and was in a small significance range of .1 to .29. The statistical error factor of the correlation coefficient for EN140 GRADE with OVERALL F2F GRADES was greater than the error factor for the correlation coefficients for EN140 GRADE with OVERALL OL GRADES and OVERALL MBA GPA and the correlation coefficients of EN140 GRADE with OVERALL OL GRADES and OVERALL MBA GPA were in different statistical significance ranges. Accordingly, there was a significant difference in the significance of the correlations and null hypothesis was rejected.

OL TEST GRADES was significantly related to how well students performed overall in F2F courses, $r(95) = .38, p < .01$, Online courses, $r(95) = .57, p < .01$, and overall MBA courses, $r(95) = .49, p < .01$. The effect size of the Pearson correlation coefficient of OL TEST GRADES with OVERALL OL GRADES was in a large significance range of greater than .5. The effect size of the Pearson correlation coefficient of OL TEST GRADES with OVERALL F2F GRADES and OVERALL MBA GPA were both in a medium significance range of .3 to .49. Accordingly, there were significant differences in the significance of the correlations and the null hypothesis was rejected.
OL WRITING GRADES was significantly related to how well students performed overall in F2F courses, $r(95) = .38, p < .01$, Online courses, $r(95) = .59, p < .01$, and overall MBA courses, $r(95) = .59, p < .01$. The effect size of the Pearson correlation coefficient of OL WRITING GRADES with OVERALL OL GRADES and OVERALL MBA GPA were in a large significance range of greater than .5. The effect size of the Pearson correlation coefficient of OL WRITING GRADES with OVERALL F2F GRADES was in a medium significance range of .3 to .49. Accordingly, there were significant differences in the significance of the correlations and the null hypothesis was rejected.

Summary

Using statistical correlation and regression procedures to analyze pre-existing data from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and the Institutional Research department at the University, provided a thorough exploration of the relationship between student demographic and cognitive skill data, and student performance in online, face-to-face, and overall MBA courses at the University. In Chapter Five, the findings, conclusions, inferences, and recommendations for further study will be presented and discussed.
CHAPTER FIVE
Findings, Conclusions, Implications, and Recommendations

This study explored the relationship between students’ demographic and cognitive skill indicator data (predictor variables), and student performance in online, face-to-face, and overall MBA program courses (criterion variables) over a seven-year period (Fall semester of 2006 through the Fall semester of 2013) at the University. Statistical correlation procedures were used to determine if there were any statistically significant relationships between the predictor and criterion variables, as well as, if there were any statistical differences between any significant correlations of predictor and criterion variables.

The findings, conclusions, and implications of the data analysis to theory and practice will be discussed in this chapter. Recommendations for future research will also be presented and discussed.

Summary of the Study

The purposes of this study was to (a) explore the relationship of student cognitive skill indicators (predictor variables) to student performance in online and face-to-face MBA courses (criterion variables); (b) determine if there is a statistically significant correlation between the predictor and criterion variables; and, (c) determine if there is any statistically significant difference between any statistically significant correlations of predictor and criterion variables.

The findings from this research are important to leadership and instructional practice because they provide empirical data about the relationship of student cognitive skills and learning strategies employed; differences in online and face-to-face course
pedagogy, student learning, student assessment; and, student performance. These findings will prove useful in making decisions about MBA program admission requirements, academic advising, and online MBA course planning and design.

The study findings also have implications for future research in the applicability of using GMAT test scores for admission into online programs, the design and use of undergraduate writing intensive course grades to affect and predict student success in online programs, and the design and use of undergraduate writing proficiency exams to predict student success in online programs. Future studies employing larger sample sizes and time-based strategies could increase the reliability and generizability of the findings of this study.

Research Questions

1. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?
2. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?

3. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?
4. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

Research Hypotheses

1. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES.
2. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL OL GRADES.

3. There is no statistically significant correlation between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL MBA GPA.

4. There is no statistically significant difference in the correlation coefficients between students’ GENDER; AGE; ETHNICITY; UGPA; GMAT-VERBAL score; GMAT-QUANTITATIVE score; GMAT-ANALYTICAL WRITING score; GMAT-TOTAL score; WRITING PROFICIENCY EXAM score; EN100 GRADES; EN140 GRADES; OL TEST GRADES; OL WRITING GRADES; and, OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA.
The literature review explored the many learning theories directly and indirectly related to online course research and development, past research on student assessment and performance in online courses, and uses these theories and research to examine the relationship between student preparation and student performance in online courses. The review discussed the minimal empirical research linking traditional learning theory and student cognitive skill factors to student performance in online courses. The review also discussed the minimal empirical research into the validity of using student GMAT scores, UPGA, English competency, and writing samples, which have been valid predictors of student performance in face-to-face undergraduate and graduate coursework, to student performance in online coursework.

Seven-years of pre-existing student data from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and the Institutional Research department at the University, was analyzed using statistical correlation and regression procedures to produce the results of this study. The total population was the 912 students who matriculated in the MBA program at the University from the Fall semester of 2006 through the Fall semester of 2013. The total population was recalculated to account for affect of students matriculating over several years of the study, resulting in a net student population of 393. The study sample was 322 students in the net population who completed both face-to-face and online coursework. Total and net student population data were obtained from the University’s Institutional Research department.

Student predictor variable sample data on Gender, Age, Ethnicity, UGPA, GMAT-Verbal score, GMAT-Quantitative score, GMAT-Analytical Writing Assessment
score, GMAT-Total score, Writing Proficiency Exam score, EN100 grade, EN140 grade; course credit sample data; and, criterion variable sample data on overall F2F grades, overall Online grades, and overall MBA GPA were obtained from the University’s student module of the Ellusian database. Student sample data on Online Test and Writing grades were obtained from Center for Scholarship Teaching and Learning (CSTL) online course database at the University.

In that students in the population and sample had to meet minimum UGPA requirements for acceptance to and retention in the MBA program, grade and score data ranges for several predictor and criterion variables were restricted to a narrow range. Predictor variables with restricted ranges included UGPA where 85% of student grades ranged from 3.0 to 4.0; EN100 where 89% of student grades that ranged from 3.0 to 4.0; EN140 where 86% of student grades that ranged from 3.0 to 4.0; WPE where all student scores ranged from 6 to 11; Online Written Work where 89% of students grades ranged from 85% to 100%; and, Online Test Grades where 83% of student grades ranged from 85% to 100%. All criterion variables had restricted ranges that included F2f MBA GPA where 98% of student grades ranged from 3.0 to 4.0; Online MBA GPA where 96% of student grades ranged from 3.0 to 4.0; and, Overall MBA GPA where 98% of student grades ranged from 3.0 to 4.0. The affect of restricted data ranges reduced the potential variability of variables, thus reducing the potential for significant correlations between criterion and predictor variables. Accordingly, a finding of a significant correlation between a criterion and predictor variables is amplified.
Findings

The study findings will be organized and reported in this section under each research question and respective hypothesis. Findings will reference and discuss the descriptive statistics and data analysis applicable to answering each research question and testing the respective hypothesis.

Summation of Demographic Data

The characteristics of the demographic data provided by the data analysis help define the population, net population, sample, predictor variables and criterion variables, and are important to understanding the overall research results. The following summary provides the characteristics student Gender, Age, Ethnicity, Undergraduate Grade Point Average, GMAT-Verbal score, GMAT-Quantitative score, GMAT-Analytical Writing Assessment score, GMAT-Total score, Writing Proficiency Exam score, EN100 Grade, EN140 Grade, Test Grade Percent in Online MBA courses, Written Work Grade Percent in Online MBA courses, Online MBA Grade Point Average, Face-to-Face MBA Grade Point Average, Overall MBA Grade Point Average, Academic Term Graduated, Predictor and Criterion Variable Sample Sizes, and Number of Attributes per Student. In cases where there was additional attribute data analyzed such student course credits represented in variable data and composite views of two or more variables, that data are discussed under the applicable characteristic.

Study total population. The study total population steadily increased a total of 89% over the seven-year study period. This resulted in a left-skewed population distribution indicating that the majority of the population for study matriculated in the last four years of the study. Although there were students matriculating in all of the
eleven MBA program majors at some time during the study period, 56% of the total population matriculated in the General Management major, which experienced a 90% enrollment increase during the study period. Students in the Accounting and Financial Management majors represented 15% and 12% of the total population respectively and experienced 31% and 138% respective enrollment increases. Accordingly, 83% of the total population was concentrated in three major which together increased 85% during the study period (see Table 1).

Study net population. Although the number of students matriculating in each year of the study period increased 89% over eight years, the number of students graduating per year increased 150%, somewhat mitigating the effect increased MBA program enrollment had on the net population of students matriculating in each study period year. The net population of students, after making adjustments for duplicate student data, was 393. Dividing the total population by the net population indicated that the average student matriculation time in the MBA program was 2.3 years (see Table 2).

Study sample. The overall study sample was 322 and included only those students from the net population that completed both face-to-face and online courses during the study period. The overall study sample of 322 was represented in the data for the Gender, Age, Ethnicity, Overall Online Grades, Overall F2F Grades, and Overall MBA GPA variables. UGPA, GMAT-Verbal score, GMAT-Quantitative score, GMAT-Analytical Writing Assessment score, and GMAT-Total score ranged in sample size from 271 to 286 due to differences in MBA program admission requirement over the study period. Writing Proficiency Exam score, EN100 Grade, and EN140 Grade were only available for students who matriculated as undergraduates at the University and ranged in sample
size from 180 to 189. The sample size for OL Test Grades and OL Writing Grades was 95 and only represented identifiable data that could be accurately extracted from the University’s CSTL data base. The identifiability and accuracy of OL Test and Writing Grade data were found to increase over the study period. Accordingly, the student OL Test and Writing Grade sample distribution was left-skewed with most of the sample data coming from the latter years of the study (see Table 3).

Student gender. The student Gender sample was 56% male and 44% female, and was similar to the 2013 overall student gender distribution for the University’s College of Business which was 59% male and 41% female (see Figure 1).

Student age. The student Age sample was skewed-right in a distribution of ages from 20 to 70. The sample was normally distributed and centered in the 26 to 30 age range which represented 46% of the total sample. Other significant student age groupings were 84 (26%) in the 31 to 35 age range, 50 (16%) in the 20 to 25 age range, and 19 (6%) in the 36 to 40 age range (see Figure 2).

Student ethnicity. The student Ethnicity sample was not diverse with 218 (68%) of the students reporting that they were White and 81 (25%) of the student reporting that they were Non-resident Aliens. Only 23 (7%) of the students reported that they were one of the other 7 ethnic categories (see Figure 3).

Student UGPA. The student UGPA sample of 271 data distribution was somewhat uniform in the range of less than 3.0 to 4.0 with a mean of 3.38. A significant finding was that 40 (15%) students in the sample population had a UGPA of less than 3.0 and were likely provisionally admitted to the MBA program. 27 (10%) students in the sample did not meet the 2013 MBA program admission requirements (GPA times 200 plus GMAT-
Total score) and an additional 51 (16%) students from the overall sample of 322 did not have a UGPA submitted. Accordingly, 78 (24%) students from the overall sample of 322 likely had the MBA program admission standards waived (see Figure 4).

The number of undergraduate credit hours earned by the 271 students in the UGPA sample had a non-symmetrical distribution with an average of 111.4 credit hours earned per student. 199 (74%) of the students in the sample had 120 or more credit hours earned, the number of credit hours required for undergraduate graduation from the University. 72 (26%) of the sample had less than 120 credits, indicating that those students did not graduate from the University (see Figure 5).

*Student GMAT-verbal score.* The student GMAT-Verbal score sample of 283 data distribution was normally distributed in a range from 10.0 to 49.9 with a mean of 27.16. For comparison, the GMAT-Verbal scaled score can range from 0 to 60 and the sample mean was approximately at the 46th percentile ranking for all students taking the GMAT-Verbal (Graduate Management Admission Council, 2014). 205 (72%) students in the sample of 283 scored in a range of 20.0 to 34.9 (see Figure 6).

*Student GMAT-quantitative score.* The student GMAT-Quantitative score sample of 283 data distribution was normally distributed in a range from 10.0 to 54.9 with a mean of 32.1. For comparison, the GMAT-Quantitative scaled score can range from 0 to 60 and the sample mean was approximately at the 27th percentile ranking for all students taking the GMAT-Quantitative (Graduate Management Admission Council, 2014). 197 (70%) students in the sample of 283 scored in a range of 25.0 to 39.9. The same number of students in the sample of 283 had scores posted for both GMAT-Verbal and GMAT-Quantitative scores (see Figure 7).
*Student GMAT-analytical writing assessment score.* The GMAT-Analytical Writing Assessment score sample of 278 data was normally distributed and left-skewed in a range of 20.0 to 60.0 with a mean of 45.9. For comparison, the GMAT- Analytical Writing Assessment scaled score can range from 0 to 60 and the sample mean was approximately at the 47th percentile ranking for all students taking the GMAT-Analytical Writing Assessment (Graduate Management Admission Council, 2014). 174 (63%) students in the sample of 278 scored in a range of 40.0 to 54.9. 5 students with scores posted for GMAT-Verbal and GMAT-Quantitative did not have scores posted for GMAT-Analytic Writing Assessment (see Figure 8).

*Student GMAT-total score.* The GMAT-Total score sample of 286 data was somewhat normally distributed and right-skewed in a range of less than 399.9 to 724.9 with a mean of 502.6. For comparison, the GMAT-Total scaled score can range from 200 to 800 and the sample mean was approximately at the 31st percentile ranking for all students taking the GMAT (Graduate Management Admission Council, 2014). 115 (40%) students in the sample of 286 scored in a range of 400 to 474.9. 3 students had scores posted for GMAT-Total that did not have scores posted for GMAT-Verbal and GMAT-Quantitative. 8 students had scores posted for GMAT-Total that did not have scores posted for GMAT-Analytical Writing Assessment. It can be assumed that more students had GMAT-Total scores posted than GMAT-Verbal, GMAT-Quantitative, or GMAT-Analytical Writing Assessment scores because GMAT-Total scores was one of the admission requirements for the MBA program (see Figure 9).
Student writing proficiency exam score. The Writing Proficiency Exam score sample of 187 data was normally distributed in a range of 6.0 to 10.49 with a mean of 8.4. For comparison, the Writing Proficiency Exam score can range from 0 to 12 with students required to score a minimum of 7 on the exam for graduation from the university. 121 (65%) students in the sample of 187 scored in a range of 8 to 9.49. 4 (2%) students did not score at least 7 on the exam and would have used one of the 3-essay portfolio options to meet the University’s writing proficiency requirement (see Figure 10).

Student EN100 grade. The student EN100 grade sample of 180 data ranged from 1.0 to 4.0 with a mean of 3.4. 94 (52%) students had a 4.0 grade in the course, 67 (37%) had a 3.0 grade in the course, 17 (9%) had a 2.0 grade in the course, and 2 (1%) had a 1.0 grade in the course. It was unknown how the 2 students without a passing grade in EN100 advanced to the EN140 course, but records indicate that both students passed the EN140 course with 2.0 and 4.0 grades respectively.

Student EN140 grade. The student EN140 grade sample of 189 data ranged for 2.0 to 4.0 with a mean of 3.4. 103 (54%) students had a 4.0 grade in the course, 60 (32%) had a 3.0 grade in the course, and 26 (14%) had a 2.0 in the course. It was assumed that the 9 additional students that had a EN140 posted and not an EN100 grade posted successfully completed a comprehensive test for EN100. It can also be assumed that the 187 (58%) students that had a UGPA, Writing Proficiency Exam score, and EN140 grade posted represent the total students from the overall sample of 322 that graduated undergraduate from the University.
Student online test grades. The student Online Test Grade sample of 95 was normally distributed and somewhat left-skewed in a range of less than 70% to 100% with a mean of 88.2%. 53 (56%) students had grades that ranged from 88.1% to 97% (see Figure 13).

The composite view of Online Test and Writing Grades indicated only a minimally less left-skewed distribution (see Figure 15). The composite view of Online Test and Writing Grades and Overall grade percent in online courses with Test and Writing grade data available indicate minimal differences in data distribution.

The number of credits earned by students in the Online Test and Writing Work grade sample was normally distributed and significantly right-skewed in a range of 3 to 21 with a mean of 7.78 (82%) students had earned credits that ranged from 3 to 9, indicating that the number of credit hours in the sample was low (see Figure 16). The mean number of total credits for students in all online MBA courses was 11.7. Comparing the Overall Online MBA GPA credits mean of 11.7 to the Online test and writing work grade sample mean of 7 indicates that nearly 60% of the 95 students’ Test and Written work grade data were obtained for study (see Figure 18).

Exploring this data further, student credits in online courses with Test and Written work data available had a right-skewed data distribution, while all Online MBA GPA student credits had a bi-modal distribution. This indicated that students in the Online Test and Writing grade sample did not share the increasing trend of students not in the sample to take more online courses (see Figure 19).

Finally, comparing the percent of online courses taken by students with Test and Written Work available to all online MBA courses taken by the student indicate a bi-
modal distribution with peaks at the 50 – 59% and 100% points of data acquisition. 21 (22%) students in the sample had 50 – 59% of their total online GPA data captured, while 32 (34%) students in the sample had 100% of their total online GPA data captured. This indicates that a significant percentage of the students’ overall online course data were available for study (see Figure 20).

*Student online writing grades.* The student Online Writing Grade sample of 95 was normally distributed and significantly left-skewed in a range of less than 70% to 100% with a mean of 91.9%. 62 (65%) students had grades that ranged from 91.1% to 100% (see Figure 14). The relationship of the composite view of Online Test and Writing Grades, the number of credits earned by students in the Online Test and Writing work grade sample, the Overall Online MBA GPA credits, and Online Writing grades was discussed in the Student Online Test grades section above.

*Student overall online MBA GPA.* The student Overall Online MBA GPA sample of 322 was unevenly distributed in a range of less than 3.0 to 4.0 with a mean of 3.6. 126 (39%) had grades that ranged from 3.91 to 4.0 while the other 196 (61%) students had grades that ranged from less than 3.0 to 3.9 in an uneven distribution (see Figure 21). Comparing this sample with an uneven distribution and a significant number of students with grade points higher than 3.9, with the Overall MBA GPA sample with a left-skewed distribution, indicates that some students performed better in online courses than they performed in overall MBA courses. Considering that the mean GPA for Online courses and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students performed worse in online courses than they performed in overall MBA courses.
Overall, the grade distribution for Online and F2F MBA GPA’s were very similar with uneven distributions and peaks at the 3.91 to 4.0 range (see Figure 25).

The number of Online MBA credits earned by students in the sample was normally distributed and right-skewed with a mean of 10.5 which indicated that all of the students in the sample had completed an average of approximately 10.5 (26%) of their 40 required MBA credits in online courses. The differences in the Overall MBA GPA credit distribution (left-skewed) and the Online MBA GPA credit distribution (right-skewed) may explain the differences in the Overall MBA GPA and Online MBA GPA grade distributions (see Figure 22).

**Student overall F2F MBA GPA.** The student Overall F2F MBA GPA sample of 322 was unevenly distributed and left-skewed in a range of less than 3.0 to 4.0 with a mean of 3.6. 81 (25%) had grades that ranged from 3.91 to 4.0 while the other 241 (75%) students had grades that ranged from less than 3.0 to 3.9 in an uneven distribution (see Figure 23). Comparing this sample with an uneven distribution and a significant number of students with grade points higher than 3.9, with the Overall MBA GPA sample with a left-skewed distribution, indicates that some students performed better in F2F courses than they performed in overall MBA courses. Considering that the mean GPA for F2F courses and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students performed worse in online courses than they performed in overall MBA courses (see Figure 21). Overall, the grade distribution for Online and F2F MBA GPA’s were very similar with uneven distributions and peaks at the 3.91 to 4.0 range (see Figure 25).
The number of F2F MBA credits earned by students in the sample was somewhat normally distributed with a mean of 20.4 which indicated that all of the students in the sample had completed an average of approximately 20.4 (51%) of their 40 required MBA credits in online courses. The differences in the F2F MBA GPA credit distribution (uneven and left-skewed) and the Online MBA GPA credit distribution (normal and right-skewed) may explain the differences in the F2F MBA GPA and Online MBA GPA grade distributions (see Figure 24).

*Student overall MBA grade point average.* The student Overall MBA GPA sample of 322 was normally distributed and left-skewed in a range of less than 3.0 to 4.0 with a mean of 3.6. 61 (19%) had grades that ranged from 3.91 to 4.0 while the other 261 (81%) students had grades that ranged from less than 3.0 to 3.9 with a normal distribution (see Figure 27). The left-skewed normal distribution of the Overall MBA GPA sample with a mean of 3.6 was dissimilar to the uniform distribution of the UGPA sample with a mean of 3.4 (see Figure 4) and indicated that student performance increased 6% in MBA versus undergraduate coursework. Comparing the normally distributed and left-skewed Overall MBA GPA and the uneven sample distributions of Online and F2F Grades (see Figures 21 & 23) with significant numbers of students with grade points higher than 3.9, indicated that some students performed better in Online and F2F courses than they performed in overall MBA courses. Considering that the mean GPA for Online, F2F, and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students performed worse in Online and F2F courses than they performed in overall MBA courses (see Figures 25 & 27).
The number of Overall MBA GPA credits earned by students in the sample was normally distributed and left-skewed with a mean of 30.9 which indicated that all of the students in the sample had completed an average of approximately 30.9 (77%) of their 40 required MBA credits in online courses. The differences in the Online MBA GPA credit distribution (normal and right-skewed), F2F MBA GPA credit distribution (uneven and left-skewed) and the Overall MBA GPA credit distribution (normal and left-skewed) may explain the differences in the Online, F2F, and Overall MBA GPA grade distributions (see Figures 26 & 28).

*Student academic term graduated.* Figure 29 indicated a left-skewed, somewhat normal distribution of 215 (67%) students graduating during the eight-year study period. Although 67% of the students in the sample of 322 graduated during the study period, Figure 28 indicated that only 10 students in the Overall MBA GPA sample completed the 40 hours of required MBA coursework for graduation during the study period. Accordingly, most graduating students completed the required coursework outside of the study period, indicating a longer MBA program matriculation time than the estimated 2.3 year matriculation time calculated by simply dividing the total population of 912 by the net population of 393.

*Number of attributes per student.* Figure 30 indicated the number of attributes available per student for study. The number of attributes included the thirteen predictor variables, three criterion variables, and the year the student graduated. The data was left-skewed and normally distributed with a mean of 13.3 attributes per student, and indicate that each student had an average of 78% of the total attribute data available for study, while 305 (95%) students had at least 50% of the total attribute data available for study.
Research Question One. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?

Student Gender, \( r(322) = -0.01, p > 0.05 \), Age, \( r(322) = -0.02, p > 0.05 \), and Ethnicity, \( r(322) = 0.07, p > 0.05 \), did not significantly correlate with Overall F2F Grades at \( p < 0.05 \). Accordingly, there was no gender, age, or ethnicity bias found in the results and the null hypothesis was accepted (see Table 5).

Student UGPA, \( r(271) = 0.34, p < 0.01 \), significantly correlated with Overall F2F Grades at \( p < 0.01 \), was in a medium correlation coefficient significance range of 0.3 to 0.49, and had a mean of 3.4. The two variables shared 11.7% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-Verbal score, \( r(283) = 0.21, p < 0.01 \), significantly correlated with Overall F2F Grades at \( p < 0.01 \), was in a small correlation coefficient significance range of 0.1 to 0.29, and had a mean of 27.2. The two variables shared 4.5% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Student GMAT-Quantitative score, \( r (283) = .09, p > .05 \), did not significantly correlate with Overall F2F Grades at \( p < .05 \), and had a mean of 32.1. The two variables shared less than 1% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).

Student GMAT-Analytical Writing score, \( r (278) = .24, p < .01 \), significantly correlated with Overall F2F Grades at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 45.9. The two variables shared 5.9% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-Total score, \( r (286) = .23, p < .01 \), significantly correlated with Overall F2F Grades at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 502.6. The two variables shared 5.4% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Writing Proficiency Exam score, \( r (187) = .14, p > .05 \), did not significantly correlate with Overall F2F Grades at \( p < .05 \), and had a mean of 8.4. The two variables shared less than 2% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).

Student EN100 Grade, \( r (180) = .22, p < .01 \), significantly correlated with Overall F2F Grades at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 3.4. The two variables shared 4.7% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Student EN140 Grade, \( r (189) = .18, p < .05 \), significantly correlated with Overall F2F Grades at \( p < .05 \), but the correlation was not as significant as variables correlating at \( p < .01 \). The statistic was in the small correlation coefficient significance range of .1 to .29 and had a mean of 3.4. The two variables shared 3.3% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Test Grades, \( r (95) = .38, p < .01 \), significantly correlated with Overall F2F Grades at \( p < .01 \), was in a medium correlation coefficient significance range of .3 to .49, and had a mean of 88 percent. The two variables shared 14.1% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Writing Grades, \( r (95) = .38, p < .01 \), significantly correlated with Overall F2F Grades at \( p < .01 \), was in a medium correlation coefficient significance range of .3 to .49, and had a mean of 92 percent. The two variables shared 14.1% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Research Question Two. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in online MBA courses (OVERALL OL GRADES) at the University?

Student Gender, $r (322) = -.04$, $p > .05$, Age, $r (322) = -.06$, $p > .05$, and Ethnicity, $r (322) = -.01$, $p > .05$, did not significantly correlate with Overall Online Grades at $p < .05$. Accordingly, there was no gender, age, or ethnicity bias found in the results and the null hypothesis was accepted (see Table 5).

Student UGPA, $r (271) = .41$, $p < .01$, significantly correlated with Overall Online Grades at $p < .01$, was in a medium correlation coefficient significance range of .3 to .49, and had a mean of 3.4. The two variables shared 16.7% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-Verbal score, $r (283) = .08$, $p > .05$, did not significantly correlate with Overall Online Grades at $p < .05$, and had a mean of 27.2. The two variables shared less than 1% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).
Student GMAT-Quantitative score, $r (283) = .06, p > .05$, did not significantly correlate with Overall Online Grades at $p < .05$, and had a mean of 32.1. The two variables shared less than 1% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).

Student GMAT-Analytical Writing score, $r (278) = .14, p < .05$, significantly correlated with Overall Online Grades at $p < .05$, but the correlation was not as significant as variables correlating at $p < .01$. The statistic was in the small correlation coefficient significance range of .1 to .29 and had a mean of 45.9. The two variables shared 2% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-Total score, $r (286) = .11, p > .05$, did not significantly correlate with Overall Online Grades at $p < .05$, and had a mean of 502.6. The two variables shared only 1% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).

Student Writing Proficiency Exam score, $r (187) = .19, p < .01$, significantly correlated with Overall Online Grades at $p < .01$, was in a small correlation coefficient significance range of .1 to .29, and had a mean of 8.4. The two variables shared 3.6% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student EN100 Grade, $r (180) = .26, p < .01$, significantly correlated with Overall Online Grades at $p < .01$, was in a small correlation coefficient significance range of .1 to .29, and had a mean of 3.4. The two variables shared 6.8% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Student EN140 Grade, \( r(189) = .30, p < .01 \), significantly correlated with Overall Online Grades at \( p < .01 \), was in a medium correlation coefficient significance range of .3 to .49, and had a mean of 3.4. The two variables shared 9% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Test Grades, \( r(95) = .57, p < .01 \), significantly correlated with Overall Online Grades at \( p < .01 \), was in a large correlation coefficient significance range of greater than .5, and had a mean of 88 percent. The two variables shared 32.8% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Writing Grades, \( r(95) = .59, p < .01 \), significantly correlated with Overall Online Grades at \( p < .01 \), was in a large correlation coefficient significance range of greater than .5, and had a mean of 92 percent. The two variables shared 35.2% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Research Question Three. Is there a statistically significant correlation between students’ gender, age, ethnicity, undergraduate grade point average (UGPA), GMAT-verbal score, GMAT-quantitative score, GMAT-analytical writing score, GMAT-total score, writing proficiency exam score, undergraduate grades in writing intensive courses (EN100 grade and EN140 grade), grades on tests in online courses (OL test grades), grades on written work in online courses (OL writing grades); and, overall student MBA course grades (overall MBA GPA) at the University?

Student gender, \( r(322) = -0.02, p > 0.05 \), age, \( r(322) = -0.02, p > 0.05 \), and ethnicity, \( r(322) = 0.06, p > 0.05 \), did not significantly correlate with overall MBA GPA at \( p < 0.05 \). Accordingly, there was no gender, age, or ethnicity bias found in the results and the null hypothesis was accepted (see Table 5).

Student UGPA, \( r(271) = 0.46, p < 0.01 \), significantly correlated with overall MBA GPA at \( p < 0.01 \), was in a medium correlation coefficient significance range of 0.3 to 0.49, and had a mean of 3.4. The two variables shared 21.3% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-verbal score, \( r(283) = 0.20, p < 0.01 \), significantly correlated with overall MBA GPA at \( p < 0.01 \), was in a small correlation coefficient significance range of 0.1 to 0.29, and had a mean of 27.2. The two variables shared 3.8% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Student GMAT-Quantitative score, \( r(283) = .09, p > .05 \), did not significantly correlate with Overall MBA GPA at \( p < .05 \), and had a mean of 32.1. The two variables shared less than 1% of total variance. Accordingly, the null hypothesis was accepted (see Table 5).

Student GMAT-Analytical Writing score, \( r(278) = .24, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in the small correlation coefficient significance range of .1 to .29, and had a mean of 4.6. The two variables shared 5.9% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student GMAT-Total score, \( r(286) = .22, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in the small correlation coefficient significance range of .1 to .29, and had a mean of 502.6. The two variables shared 4.9% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Writing Proficiency Exam score, \( r(187) = .20, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 8.4. The two variables shared 4.1% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student EN100 Grade, \( r(180) = .28, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 3.4. The two variables shared 7.6% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Student EN140 Grade, \( r (189) = .27, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in a small correlation coefficient significance range of .1 to .29, and had a mean of 3.4. The two variables shared 7.4% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Test Grades, \( r (95) = .49, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in a medium correlation coefficient significance range of .3 to .49, and had a mean of 88 percent. The two variables shared 23.5% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).

Student Online Writing Grades, \( r (95) = .59, p < .01 \), significantly correlated with Overall MBA GPA at \( p < .01 \), was in a large correlation coefficient significance range of greater than .5, and had a mean of 92 percent. The two variables shared 34.8% of total variance. Accordingly, the null hypothesis was rejected (see Table 5).
Research Question Four. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT- QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

GENDER was not significantly related to how well students performed overall in F2F courses, \( r(322) = -.01, p > .05 \), Online courses, \( r(322) = -.04, p > .05 \), or overall MBA courses, \( r(322) = -.02, p > .05 \). AGE was not significantly related to how well students performed overall in F2F courses, \( r(322) = -.02, p > .05 \), Online courses, \( r(322) = -.06, p > .05 \), or overall MBA courses, \( r(322) = -.02, p > .05 \). Ethnicity was not significantly related to how well students performed overall in F2F courses, \( r(322) = .07, p > .05 \), Online courses, \( r(322) = -.01, p > .05 \), or overall MBA courses, \( r(322) = .06, p > .05 \). Accordingly, there were no significantly relationships identified and the null hypothesis was accepted.

UGPA was significantly related to how well students performed overall in F2F courses, \( r(271) = .34, p < .01 \), Online courses, \( r(271) = .41, p < .01 \), and overall MBA courses, \( r(271) = .46, p < .01 \). The effect size of the Pearson correlation coefficient of UGPA with OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL
MBA GPA were all in a medium significance range of .3 to .49. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.

GMAT-VERBAL score was significantly related to how well students performed overall in F2F courses, $r(283) = .21, p < .01$, and overall MBA courses, $r(283) = .20, p < .01$. GMAT-VERBAL score was not significantly related to how well students performed in Online courses, $r(283) = .08, p > .05$. The effect size of the Pearson correlation coefficient of GMAT-VERBAL with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small range of .1 to .29. There were significant differences in the significance of the correlations for OVERALL F2F GRADES and OVERALL MBA GPA with GMAT-VERBAL score, and OVERALL OL GRADES with GMAT-VERBAL score. Accordingly, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.

GMAT-QUANTITATIVE score was not significantly related to how well students performed overall in F2F courses, $r(283) = .09, p > .05$, Online courses, $r(283) = .06, p > .05$, and overall MBA courses, $r(283) = .09, p > .05$. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.

GMAT-ANALYTICAL WRITING score was significantly related to how well students performed overall in F2F courses, $r(278) = .24, p < .01$, and overall MBA courses, $r(278) = .24, p < .01$. The effect size of the Pearson correlation coefficient of GMAT-ANALYTICAL WRITING score with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small significance range of .1 to .29. GMAT-
ANALYTICAL WRITING score was also significantly related to how well students performed in Online courses, $r(278) = .14, p < .05$ and was in a small significance range of .1 to .29. Since the statistical error factor of correlation coefficient for the GMAT-ANALYTICAL WRITING score with OVERALL OL GRADES was greater than the error factor for the correlation coefficients for GMAT-ANALYTICAL WRITING score with OVERALL F2F GRADES and OVERALL MBA GPA, there was a significant difference in the significance of the correlations and null hypothesis was rejected.

GMAT-TOTAL score was significantly related to how well students performed overall in F2F courses, $r(286) = .23, p < .01$ and overall MBA courses, $r(286) = .22, p < .01$. The effect size of the Pearson correlation coefficient of GMAT-TOTAL score with OVERALL F2F GRADES and OVERALL MBA GPA were all in a small significance range of .1 to .29. GMAT-TOTAL score was not significantly related to how well students performed in overall Online courses, $r(286) = .11, p > .05$. Since GMAT-TOTAL score was significantly related to both OVERALL F2F GRADES and OVERALL MBA GPA, but not significantly related to OVERALL OL GRADES, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.

WRITING PROFICIENCY EXAM score was significantly related to how well students performed in Online courses, $r(187) = .19, p < .01$, and overall MBA courses, $r(187) = .20, p < .01$. WRITING PROFICIENCY EXAM score was not significantly related to how well students performed in F2F courses, $r(187) = .14, p > .05$. Since WRITING PROFICIENCY EXAM score was significantly related to both OVERALL OL GRADES and OVERALL MBA GPA, but not significantly related to OVERALL
F2F GRADES, there was a significant difference in the significance of the correlations and the null hypothesis was rejected.

EN100 GRADE was significantly related to how well students performed overall in F2F courses, $r (180) = .22, p < .01$, Online courses, $r (180) = .26, p < .01$, and overall MBA courses, $r (180) = .28, p < .01$. The effect size of the Pearson correlation coefficient of EN100 GRADE with OVERALL F2F GRADES, OVERALL OL GRADES, and OVERALL MBA GPA were all in a small significance range of .1 to .29. Accordingly, there were no significant differences in the significance of the correlations and the null hypothesis was accepted.

EN140 GRADE was significantly related to how well students performed overall in Online courses, $r (189) = .30, p < .01$, and overall MBA courses, $r (189) = .27, p < .01$. The effect size of the Pearson correlation coefficient of EN140 GRADE with OVERALL OL GRADES was in a medium significance range of .3 to .49 and OVERALL MBA GPA was in a small significance range of .1 to .29. EN140 GRADE was also significantly related to how well students performed in F2F courses, $r (189) = .18, p < .05$ and was in a small significance range of .1 to .29. The statistical error factor of the correlation coefficient for EN140 GRADE with OVERALL F2F GRADES was greater than the error factor for the correlation coefficients for EN140 GRADE with OVERALL OL GRADES and OVERALL MBA GPA and the correlation coefficients of EN140 GRADE with OVERALL OL GRADES and OVERALL MBA GPA were in different statistical significance ranges. Accordingly, there was a significant difference in the significance of the correlations and null hypothesis was rejected.
OL TEST GRADES was significantly related to how well students performed overall in F2F courses, $r(95) = .38, p < .01$, Online courses, $r(95) = .57, p < .01$, and overall MBA courses, $r(95) = .49, p < .01$. The effect size of the Pearson correlation coefficient of OL TEST GRADES with OVERALL OL GRADES was in a large significance range of greater than .5. The effect size of the Pearson correlation coefficient of OL TEST GRADES with OVERALL F2F GRADES and OVERALL MBA GPA were both in a medium significance range of .3 to .49. Accordingly, there were significant differences in the significance of the correlations and the null hypothesis was rejected.

OL WRITING GRADES was significantly related to how well students performed overall in F2F courses, $r(95) = .38, p < .01$, Online courses, $r(95) = .59, p < .01$, and overall MBA courses, $r(95) = .59, p < .01$. The effect size of the Pearson correlation coefficient of OL WRITING GRADES with OVERALL OL GRADES and OVERALL MBA GPA were in a large significance range of greater than .5. The effect size of the Pearson correlation coefficient of OL WRITING GRADES with OVERALL F2F GRADES was in a medium significance range of .3 to .49. Accordingly, there were significant differences in the significance of the correlations and the null hypothesis was rejected.
Conclusions

Study conclusions are organized and discussed in this section under the summation of demographic data, each research question and respective hypothesis. The summation of demographic data conclusions are organized into groupings of related categories and variables for discussion and comments. Conclusions for the summation of demographic data, and each research question and hypothesis include discussion and comments referenced to the study and literature findings.

Summation of Demographic Data

Study total population. The total population for study was $N = 912$. 83% of the students in the total population were General Management, Accounting, and Financial Management majors (see Table 1). An 89% increase of students in the university MBA program total population over the seven-year study period indicated that the majority of the students in the total population matriculated in the last four years of the study.

Study net population and student academic term graduated. Increases in total population over the seven-year study period were not reflected in the net population of $N = 393$ due to a corresponding 150% increase in students graduating in each study period year. The increase in students graduating was indicated in the student academic term graduated sample distribution of $N = 215$. Dividing the total population by the net population indicated that the average student matriculation time in the MBA program was 2.3 years (see Table 2).

Although 67% of the students in the net population sample of 322 graduated during the study period, only 10 students in the Overall MBA GPA sample completed the 40 hours of required MBA coursework for graduation during the study period. This data
indicate that most graduating students completed the required coursework outside of the study period, and that the MBA program matriculation time was likely longer than the estimated 2.3 year matriculation time calculated by simply dividing the total population of 912 by the net population of 393 (see Figures 28 and 29).

**Study sample.** The overall study sample was N = 322 and included only those students from the net population that completed both face-to-face and online courses during the study period. Predictor variables sample sizes ranged from 95 to 286, while all criterion variable sample sizes were 322. The literature suggests that for correlation coefficients to be reliable, sample sizes need to be in the range of 10 to 15 participants per variable (Field, 2009). In that each correlation procedure in this study was performed using a maximum of one predictor variable and three criterion variables, all sample sizes exceeded the 60 participants required for the resultant correlation coefficients to be reliable. Summation of demographic data conclusion discussions and comments on the individual predictor and criterion variables are presented in the following sections.

**Student gender.** The student gender sample of N = 322 was 56% male and 44% female. This sample distribution was representative of the University’s 2013 College of Business gender distribution of 59% male and 41% female (see Figure 1), indicating that the results of the study may be generalized over the University’s College of Business.

**Student age.** 50 (16%) students in the age sample of N = 322 were in the 20 to 25 age range and likely continued their graduated work in the MBA program immediately after undergraduate graduation. 272 (84%) students were over 26 years of age and began their graduate work in the MBA program after working several years after undergraduate
graduation (see Figure 2). The relative age maturity of the sample, with a mean age of 30.6, indicated that most students had the opportunity to apply and gain additional knowledge. This may explain why the students’ MBA GPA of 3.6 was 6% higher than the students’ UGPA of 3.4 (see Figure 4).

*Student ethnicity.* 218 (68%) students in the ethnicity sample of N = 322 were White and 81 (25%) students were Non-resident Aliens. Only 23 (7%) of the students were one of the other 7 ethnic categories (see Figure 3). The lack of diversity in the sample will make it difficult to generalize the correlation results of this variable to more diverse populations.

*Student UGPA.* The student UGPA sample of N = 271 grades ranged from less than 3.0 to 4.0, with a mean of 3.38. 199 (74%) students in the sample had the total of 120 or more credit hours earned required for undergraduate graduation from the university (see Figure 5). The sample size, combined with the significant numbers of credit hours per student in the sample, increased the validity of the study results using the UGPA data.

A significant finding was that 40 (15%) students in the sample population had a UGPA of less than 3.0, of which 27 (10%) students would not have met the 2013 MBA program admission requirements (GPA times 200 plus GMAT-Total score). Another 51 (19%) students did not have a UGPA submitted. Accordingly, 78 (24%) students from the overall sample of 322 likely were provisionally admitted or had the MBA program admission standards waived (see Figure 4). This data indicates that a significant number of students who did not meet the MBA program admission requirements relative to combined UGPA and GMAT-Total score were academically successful. Accordingly, the
study found that the MBA program admission requirements may be more stringent than necessary to predict student success (see Appendices A – E).

Student UGPA was selected for study because the literature indicated that UGPA was a valid predictor of student success in graduate business programs (Kunzel, Crede, & Thomas, 2007; Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997), and accordingly would provide a valid benchmark to compare study results. A finding that student UGPA was a valid predictor of student success in the university MBA program would align this study with the literature.

*Student GMAT-verbal score.* The student GMAT-Verbal score sample of N = 283, with a mean of 27.16 (see Figure 6), was approximately at the 46th percentile ranking for all students taking the GMAT-Verbal (Graduate Management Admission Council, 2014). The GMAT-Verbal sample score was the second highest GMAT section percentile ranking for students with GMAT scores posted.

Student GMAT-Verbal scores were selected for study because the literature indicated that GMAT-Verbal scores were a valid cognitive skill predictor of student success in graduate business programs (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although the GMAT-Verbal score was not currently an individual criteria for MBA program admission (see Appendices A – E), the contribution of the GMAT-Verbal score to the overall GMAT score and the significant sample size made the GMAT-Verbal score a reliable student cognitive writing
skill predictor variable for study of its relationship to student performance in the MBA program.

*Student GMAT-quantitative score.* The student GMAT-Quantitative score sample of \( N = 283 \), with a sample mean of 32.11 (see Figure 7), was approximately at the 27th percentile ranking for all students taking the GMAT- Quantitative (Graduate Management Admission Council, 2014). The GMAT-Quantitative sample score was the lowest GMAT section percentile ranking for students with GMAT scores posted.

Student GMAT-Quantitative scores were selected for study because the literature indicated that GMAT-Quantitative scores were a valid cognitive mathematical skill predictor of student success in graduate business programs (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although the GMAT-Quantitative score was not a student cognitive verbal or writing skill indicator, or currently individual criteria for MBA program admission (see Appendices A – E), it was selected for study because of its contribution to the overall GMAT score.

The GMAT-Quantitative score also provided a frame of reference for exploring the relationship of the GMAT-Verbal, GMAT-Analytical Writing Assessment, Online Test Grades, and Online Writing Grades predictor variables to the Online, F2F, and Overall MBA GPA criterion variables. The contribution of the GMAT-Quantitative score to the overall GMAT score and the significant sample size made the GMAT-Quantitative score a reliable student cognitive mathematical skill predictor variable for study of its relationship to student performance in the MBA program.
Student GMAT-analytical writing assessment score. The student GMAT-Analytical Writing Assessment score sample of N = 278, with a sample mean of 45.86 (see Figure 8), was approximately at the 47th percentile ranking for all students taking the GMAT-Analytical Writing Assessment (Graduate Management Admission Council, 2014). The GMAT-Analytical Writing Assessment sample score was the highest GMAT section percentile ranking for students with GMAT scores posted.

Student GMAT-Analytical Writing Assessment scores were selected for study because the literature indicated that GMAT-Analytical Writing Assessment scores were a valid cognitive writing skill predictor of student success in graduate business programs (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although the GMAT-Analytical Writing Assessment score was not currently an individual criteria for MBA program admission (see Appendices A – E), the contribution of the GMAT-Analytical Writing Assessment score to the overall GMAT score and the significant sample size made the GMAT-Analytical Writing Assessment score a reliable student cognitive writing skill predictor variable for study of its relationship to student performance in the MBA program.

Student GMAT-total score. The student GMAT-Total score sample of N = 286, with a sample mean of 502.6 (see Figure 9), was approximately at the 31st percentile ranking for all students taking the GMAT-Total (Graduate Management Admission Council, 2014). Student GMAT-Total scores were selected for study because the literature indicated that GMAT-Total scores were a valid predictor of student success in graduate business programs (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish
& Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997), and were also criteria for MBA program admission (see Appendices A – E).

The differences in the percentile rankings for the GMAT-Verbal (46th), GMAT-Quantitative (27th), GMAT-Analytical Writing Assessment (47th), and GMAT-Total (31st) scores data indicate they may have different relationships with student performance in Online, F2F, and Overall MBA program courses. A finding that the GMAT-Total score was not significantly related to student performance would invalidate its use in MBA program admission criteria. A finding that GMAT-Verbal, GMAT-Quantitative, or GMAT-Analytical Writing Assessment scores were significantly related to student performance in the MBA program would validate their use as a MBA program admission criteria. Either of these findings would be significant considering the sample sizes of each variable made them reliable predictor variables for study of their relationship to student performance in the MBA program.

Student writing proficiency exam score. The Writing Proficiency Exam score sample of N = 187 had a mean of 8.4 in a range of 6.0 to 10.49 (see Figure 10). A minimum score of 7 on the exam was required for undergraduate graduation from the University, unless the student is seeking a second bachelor degree or the student transfers into the university with 94 or more completed credit hours. Students with scores of less than 7 on the exam have the option of meeting the requirement by retaking the exam or choosing one of the writing portfolio options (see Appendix F). 4 (2%) students scored less than 7 on the exam and would have used one of the 3-essay portfolio options to meet the university’s writing proficiency requirement (see Figure 10)
Student Writing Proficiency Exam scores were selected for study because of their value as a cognitive writing skill indicator. The significant sample size made the Writing Proficiency Exam score a reliable student cognitive writing skill predictor variable for study of its relationship to student performance in the MBA program.

Student EN100 grade. The student EN100 Grade sample of N = 180 had a mean of 3.4 and a grade range of 1.0 to 4.0. 188 (99%) of the students had a passing grade of at least 2.0 in the course. 2 (1%) had a 1.0 grade in the course. University records indicated that the 2 students without a passing grade in EN100 advanced to the EN140 course and passed the EN140 course with 2.0 and 4.0 grades respectively (see Figure 11).

EN100 was a writing intensive English Composition course taken by all undergraduate students at the University and was selected for study because student grades in the course would be valid cognitive writing skill indicator. The significant sample size made the EN100 grades a reliable student cognitive writing skill predictor variable for study of its relationship to student performance in the MBA program.

Student EN140 grade. The student EN140 Grade sample of N = 189 had a mean of 3.4 and a grade range of 2.0 to 4.0. All students had a passing grade of at least 2.0 in the course (see Figure 12). The data indicate that the 9 additional students that had an EN140 posted and not an EN100 grade posted successfully completed a comprehensive test for EN100. The data also indicate that the 187 (58%) students that had a UGPA, Writing Proficiency Exam score, and EN140 grade posted represent the total students from the overall sample of N = 322 that graduated undergraduate from the university (see Figures 5, 10 & 12).
EN140 was a writing intensive English Composition II/Rhetoric and Critical Thinking course taken by all undergraduate students at the University and was selected for study because student grades in the course would be valid cognitive writing skill indicator. The significant sample size made the EN140 grades a reliable student cognitive writing skill predictor variable for study of its relationship to student performance in the MBA program.

*Student online test grades.* The student Online Test Grade sample of $N = 95$ had a mean of 88.2% and a grade range of less than 70% to 100% (see Figure 13). The composite view of Online Test and Writing grades indicated that both variables had similar data distributions (see Figure 15).

The combined Online Test and Writing Grades mean was 7 credits, while overall Online MBA had a mean of 11.7 credits (see Figure 19). This indicated that nearly 60% of the 95 students’ Test and Written Work grade data was obtained for study (see Figure 18). Differences in the data distributions for Tests and Written work student credits sample (right-skewed) and all Online MBA GPA student credits sample (bi-modal), indicate that students in the Online Test and Writing grade sample did not share the increasing trend of students not in the sample to take more online courses (see Figure 19).

The bi-modal data distribution of the percent of online courses taken by students with Test and Written Work data available to all online MBA courses taken by the student, with peaks at the 50 – 59% and 100% points of data acquisition, indicate that a significant percentage of the students’ overall online course data were available for study (see Figure 20). Further comparison of this sample with the student Online Test and Writing Grade sample distribution (left-skewed), indicated that most of the Online Test
and Writing Grade sample data were from the latter years of the study (see Table 3). The adequate sample size made the Online Test grades a reliable student cognitive skill predictor variable for study of its relationship to student performance in the MBA program.

*Student online writing grades.* The student Online Writing Grade sample of N = 95 had a mean of 91.9% and a grade range of less than 70% to 100% (see Figure 14). The composite view of Online Test and Writing Grades indicated that both variables had similar data distributions (see Figure 15).

The relationship of the composite view of Online Test and Writing Grades, the number of credits earned by students in the Online Test and Writing Work grade sample, the Overall Online MBA GPA credits, and Online Writing Grades was discussed in the Student Online Test grades section above. Accordingly, the student Online Writing Grade sample distribution (left-skewed) also indicated that most of the sample data was from the latter years of the study (see Table 3). The adequate sample size made the Online Writing Grades a reliable student cognitive skill predictor variable for study of its relationship to student performance in the MBA program.

*Student overall online MBA GPA.* The student Overall Online MBA GPA sample of N = 322 had a mean of 3.6 and a grade range of less than 3.0 to 4.0. 126 (39%) students had grades that ranged from 3.91 to 4.0 while 196 (61%) students had grades that ranged from less than 3.0 to 3.9 in an uneven distribution (see Figure 21).

The overall Online MBA GPA sample distribution (uneven and left-skewed), with a significant number of students with grade points higher than 3.91, compared to the Overall MBA GPA sample distribution (normal and left-skewed), indicated that some
students performed better in online courses than they performed in overall MBA courses. Considering that the mean GPA for Online courses and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students also performed worse in online courses than they performed in overall MBA courses (see Figures 21 & 27). Overall, the grade distribution for Online and F2F MBA GPA’s were very similar with uneven distributions and peaks at the 3.91 to 4.0 range (see Figure 25).

The number of Online MBA GPA credits earned by students in the sample had a mean of 10.5 which indicated that all of the students in the sample had completed an average of approximately 26% of their 40 required MBA credits in online courses. The differences in the Overall MBA GPA credit distribution (left-skewed) and the Online MBA GPA credit distribution (right-skewed) may explain the differences in the Overall MBA GPA and Online MBA GPA grade distributions (see Figures 21, 22, 27 & 28). The significant sample size made the Online MBA GPA a reliable MBA program student performance criterion variable for study of its relationship to student demographic and cognitive skill predictor variables.

*Student overall F2F MBA GPA.* The student Overall F2F MBA GPA sample of N = 322 had a mean of 3.6 and a grade range of less than 3.0 to 3.9. 81 (25%) students had grades that ranged from 3.91 to 4.0 while the 241 (75%) students had grades that ranged from less than 3.0 to 3.9 in an uneven distribution (see Figure 23).

The student Overall F2F MBA GPA sample distribution (uneven and left-skewed), with a significant number of students with grade points higher than 3.91, compared with the Overall MBA GPA sample distribution (normal and left-skewed), indicated that some students performed better in online courses than they performed in
overall MBA courses (see Figures 23 & 27). Considering that the mean GPA for Online courses and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students also performed worse in online courses than they performed in overall MBA courses (see Figure 21). Overall, the grade distribution for Online and F2F MBA GPA’s were very similar with uneven distributions and peaks at the 3.91 to 4.0 range (see Figure 25).

The number of F2F MBA GPA credits earned by students in the sample had a mean of 20.4 which indicated that all of the students in the sample had completed an average of approximately 51% of their 40 required MBA credits in online courses. The differences in the Overall MBA GPA credit distribution (left-skewed) and the F2F MBA GPA credit distribution (normal) may explain the differences in the Overall MBA GPA and F2F MBA GPA grade distributions (see Figures 23, 24, 27 & 28). The significant sample size made the F2F MBA GPA a reliable MBA program student performance criterion variable for study of its relationship to student demographic and cognitive skill predictor variables.

*Student overall MBA grade point average.* The student Overall MBA GPA sample of N = 322 had a mean of 3.6 and a grade range of less than 3.0 to 4.0. 61 (19%) students had grades that ranged from 3.91 to 4.0, while the other 261 (81%) students had grades that ranged from less than 3.0 to 3.9 with a left-skewed, normal distribution (see Figure 27). The left-skewed normal distribution of the Overall MBA GPA sample with a mean of 3.6 was dissimilar to the uniform distribution of the UGPA sample with a mean of 3.4 (see Figure 4) and indicated that student performance increased 6% in MBA versus undergraduate coursework.
The student Overall MBA GPA sample distribution (normal and left-skewed), with a significant number of students with grade points higher than 3.91, compared with the Overall F2F and Online MBA GPA sample distributions (uneven and left-skewed), indicated that some students performed better in F2F and Online courses than they performed in overall MBA courses (see Figures 25 & 27). Considering that the mean GPA for Online, F2F, and Overall MBA courses was relatively identical at 3.6, the data also indicate that some students performed worse in Online and F2F courses than they performed in overall MBA courses (see Figures 25 & 27).

The number of Overall MBA GPA credits earned by students in the sample had a mean of 30.9 which indicated that all of the students in the sample had completed an average of approximately 77% of their 40 required MBA credits in online courses. The differences in the Online MBA GPA credit distribution (normal and right-skewed), F2F MBA GPA credit distribution (uneven and left-skewed) and the Overall MBA GPA credit distribution (normal and left-skewed) may explain the differences in the Online, F2F, and Overall MBA GPA grade distributions (see Figures 25, 26, 27 & 28). The significant sample size made the Overall MBA GPA a reliable MBA program student performance criterion variable for study of its relationship to student demographic and cognitive skill predictor variables.
Number of attributes per student. Figure 30 indicated the number of attributes available per student for study. The number of attributes included the thirteen predictor variables, three criterion variables, and the year the student graduated. The data was left-skewed and normally distributed with a mean of 13.3 attributes per student, and indicate that each student had an average of 78% of the total attribute data available for study. 305 (95%) students had at least 50% of the total attribute data available for study which indicate that each individual student’s data was included in an average of more than half of all correlations.
Research Question One. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face MBA courses (OVERALL F2F GRADES) at the University?

Table 6

Overall F2F Grades (criterion variable)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>322</td>
<td>NA</td>
<td>3.4835</td>
<td>-0.010</td>
</tr>
<tr>
<td>AGE</td>
<td>322</td>
<td>30.59</td>
<td>6.6884</td>
<td>-0.017</td>
</tr>
<tr>
<td>ETHNICITY</td>
<td>322</td>
<td>NA</td>
<td>3.0647</td>
<td>0.067</td>
</tr>
<tr>
<td>UGPA</td>
<td>271</td>
<td>3.38</td>
<td>0.4393</td>
<td>.342**</td>
</tr>
<tr>
<td>GMAT-VERBAL</td>
<td>283</td>
<td>27.16</td>
<td>6.9978</td>
<td>.212**</td>
</tr>
<tr>
<td>GMAT-QUANTITATIVE</td>
<td>283</td>
<td>32.11</td>
<td>7.2792</td>
<td>0.090</td>
</tr>
<tr>
<td>GMAT-ANALYTICAL WRITING</td>
<td>278</td>
<td>45.86</td>
<td>8.6952</td>
<td>.243**</td>
</tr>
<tr>
<td>GMAT-TOTAL</td>
<td>286</td>
<td>502.57</td>
<td>71.9195</td>
<td>.233**</td>
</tr>
<tr>
<td>WRITING PROFICIENCY EXAM</td>
<td>187</td>
<td>8.42</td>
<td>0.8229</td>
<td>0.142</td>
</tr>
<tr>
<td>EN100 GRADE</td>
<td>180</td>
<td>3.40</td>
<td>0.7053</td>
<td>.217**</td>
</tr>
<tr>
<td>EN140 GRADE</td>
<td>189</td>
<td>3.41</td>
<td>0.7206</td>
<td>.181*</td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td>95</td>
<td>0.88</td>
<td>0.0679</td>
<td>.376**</td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td>95</td>
<td>0.92</td>
<td>0.0734</td>
<td>.375**</td>
</tr>
</tbody>
</table>

*  Significant Correlation at p < .05
** Significant Correlation at p < .01
NA = Nominal Data with no relative Mean
Student Gender, Age, and Ethnicity did not significantly correlate with Overall F2F Grades at $p < .05$. Accordingly, there was no gender, age, or ethnicity bias found in the correlation with Overall F2F Grades and the null hypothesis was accepted (see Table 6). This finding was not consistent with the literature which suggested that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003).

Student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score significantly correlated with Overall F2F Grades at $p < .01$. Accordingly, the null hypothesis was rejected (see Table 6). Overall F2F Grades shared 11.7%, 4.5%, 5.9%, and 5.4% of total variance with student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score respectively. These findings indicated that there was a statistical relationship between student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score and Overall F2F grades, meaning that as a student’s UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score increased, their performance in F2F MBA courses increased.

The findings were consistent with the literature relating to statistically significant relationships of student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and overall MBA GPA. In their meta-analysis on the validity of Graduate Management Admission Test scores from 1997 to 2004 at 173 universities, Talento-Miller and Rudner found that the relationship of UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and overall MBA GPA was
statistically significant (2008). The study indicated that Overall MBA GPA shared 8.0%, 10.4%, 3.4%, and 21.1% of total variance with student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score respectively (Talento-Miller & Rudner, 2008). Several other studies also found significant relationships student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although these studies analyze the correlation between student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and Overall MBA GPA, and not Overall F2F Grades, they provided a good benchmark to analyze the findings relative to this research question. The significance of the findings indicated that student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score were all valid predictors of student success in F2F MBA courses at the University.

Student GMAT-Quantitative score did not significantly correlate with Overall F2F Grades at $p < .05$. This means that there was no significant relationship between a student’s GMAT-Quantitative score and their performance in F2F MBA courses. Accordingly, the null hypothesis was accepted (see Table 6).

The finding indicated that the two variables shared less than 1% of total variance, and was not consistent with the literature relating to statistically significant relationships between GMAT-Quantitative score and overall MBA GPA. In their meta-analysis on the validity of Graduate Management Admission Test scores from 1997 to 2004 at 173 universities, Talento-Miller and Rudner found that the relationship of GMAT-Quantitative score and overall MBA GPA was statistically significant (2008). The
Talento-Miller and Rudner study also indicated that Overall MBA GPA shared 11.0% of total variance with GMAT-Quantitative score (2008). Several other studies also found significant relationship between GMAT-Quantitative score and MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although these studies analyze the correlation between student GMAT-Quantitative score and Overall MBA GPA, and not Overall F2F Grades, they provided a good benchmark to analyze the findings relative to this research question. In comparison with the literature, the absence of a significant relationship between Overall F2F Grades and GMAT-Quantitative score was a significant finding of this study. Accordingly, student GMAT-Quantitative score was not a valid predictor of student success in F2F courses at the University.

Student Writing Proficiency Exam score did not significantly correlate with Overall F2F Grades at $p < .05$. Accordingly, the null hypothesis was accepted (see Table 6). The two variables shared less than 2% of total variance. This means that there was no relationship between student Writing Proficiency Exam score and F2F MBA courses, and a student’s Writing Proficiency Exam score was not a valid predictor of student success in F2F courses at the University.

Student EN100 Grade significantly correlated with Overall F2F Grades at $p < .01$. The two variables shared 4.7% of total variance. This indicated that there was a statistical relationship between student EN100 grades and student Overall F2F grades, meaning that as a student’s EN100 grade increased, their performance in F2F MBA courses increased. Accordingly, the null hypothesis was rejected (see Table 6).
Student EN140 Grade significantly correlated with Overall F2F Grades at $p < .05$, but the correlation was not as significant as EN100 Grade which correlated at $p < .01$. The two variables shared 3.3% of total variance. This indicated that there was a statistical relationship between student EN140 grades and student Overall F2F grades, meaning that as a student’s EN140 grade increased, their performance in F2F MBA courses increased. Accordingly, the null hypothesis was rejected (see Table 6). While the findings indicated that student EN100 Grade had a stronger relationship with student F2F grades, than EN140 Grade, both variables were valid predictors of student success in F2F MBA courses at the University.

Student Online Test Grades and Online Writing Grades significantly correlated with Overall F2F Grades at $p < .01$. Both variables shared 14.1% of total variance with Overall F2F Grades. This indicated that there was a statistical relationship between student Online Test grades and Online Writing Grades, and student Overall F2F grades, meaning that as a student’s Online Test grade or Online Writing grade increased, their performance in F2F MBA courses increased. Accordingly, the null hypothesis was rejected (see Table 6). The significance of the findings indicated that student Online Test Grades and Online Writing Grades were both valid predictors of student success in F2F MBA courses at the University.
Research Question Two. Is there a statistically significant correlation between students’
GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-
VERBAL score, GMAT- QUANTITATIVE score, GMAT-ANALYTICAL WRITING
score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate
grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on
tests in online courses (OL TEST GRADES), grades on written work in online courses
(OL WRITING GRADES); and, overall student grades in online MBA courses
(OVERALL OL GRADES) at the University?

Table 7

Overall Online Grades (criterion variable)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>322</td>
<td>NA</td>
<td>3.4835</td>
<td>-0.042</td>
</tr>
<tr>
<td>AGE</td>
<td>322</td>
<td>30.59</td>
<td>6.6884</td>
<td>-0.056</td>
</tr>
<tr>
<td>ETHNICITY</td>
<td>322</td>
<td>NA</td>
<td>3.0647</td>
<td>-0.010</td>
</tr>
<tr>
<td>UGPA</td>
<td>271</td>
<td>3.38</td>
<td>0.4393</td>
<td>.409**</td>
</tr>
<tr>
<td>GMAT-VERBAL</td>
<td>283</td>
<td>27.16</td>
<td>6.9978</td>
<td>0.078</td>
</tr>
<tr>
<td>GMAT-QUANTITATIVE</td>
<td>283</td>
<td>32.11</td>
<td>7.2792</td>
<td>0.059</td>
</tr>
<tr>
<td>GMAT-ANALYTICAL WRITING</td>
<td>278</td>
<td>45.86</td>
<td>8.6952</td>
<td>.143*</td>
</tr>
<tr>
<td>GMAT-TOTAL</td>
<td>286</td>
<td>502.57</td>
<td>71.9195</td>
<td>0.110</td>
</tr>
<tr>
<td>WRITING PROFICIENCY EXAM</td>
<td>187</td>
<td>8.42</td>
<td>0.8229</td>
<td>.189**</td>
</tr>
<tr>
<td>EN100 GRADE</td>
<td>180</td>
<td>3.40</td>
<td>0.7053</td>
<td>.260**</td>
</tr>
<tr>
<td>EN140 GRADE</td>
<td>189</td>
<td>3.41</td>
<td>0.7206</td>
<td>.300**</td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td>95</td>
<td>0.88</td>
<td>0.0679</td>
<td>.573**</td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td>95</td>
<td>0.92</td>
<td>0.0734</td>
<td>.593**</td>
</tr>
</tbody>
</table>

* Significant Correlation at $p < .05$
** Significant Correlation at $p < .01$

NA = Nominal Data with no relative Mean
Student Gender, Age, and Ethnicity did not significantly correlate with Overall Online Grades at $p < .05$. Accordingly, there was no gender, age, or ethnicity bias found in the correlation with Overall Online Grades and the null hypothesis was accepted (see Table 7). This finding was not consistent with the literature which suggested that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003).

Student UGPA and GMAT-Analytical Writing score significantly correlated with Overall Online Grades at $p < .01$ and $p < .05$ respectively. Accordingly, the null hypothesis was rejected (see Table 7). Overall Online Grades shared 16.7% of total variance with student UGPA, and only 2.0% of total variance with GMAT-Analytical Writing score. These findings indicated that there was a statistical relationship between student UGPA and GMAT-Analytical Writing score, and Overall Online grades, meaning that as a student’s UGPA or GMAT-Analytical Writing score increased, their performance in Online MBA courses increased.

The findings were consistent with the literature relating to statistically significant relationships of student UGPA and GMAT-Analytical Writing score, and overall MBA GPA. In their meta-analysis on the validity of Graduate Management Admission Test scores from 1997 to 2004 at 173 universities, Talento-Miller and Rudner found that the relationship of UGPA and GMAT-Analytical Writing score, and overall MBA GPA was statistically significant (2008). The study indicated that Overall MBA GPA shared 8.0% and 3.4% of total variance with student UGPA and GMAT-Analytical Writing score respectively (Talento-Miller & Rudner, 2008). Several other studies also found
significant relationships student UGPA and GMAT-Analytical Writing score, and MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although these studies analyze the correlation between student UGPA and GMAT-Analytical Writing score, and Overall MBA GPA, and not Overall Online Grades, they provided a good benchmark to analyze the findings relative to this research question. While the findings indicated that student UGPA had a stronger relationship with student Online grades, than GMAT-Analytical Writing score, both variables were valid predictors of student success in Online MBA courses at the University.

Student GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score did not significantly correlate with Overall Online Grades at $p < .05$. This means that there was no significant relationship between a student’s GMAT-Verbal, GMAT-Quantitative, or GMAT-Total score and their performance in Online MBA courses. Accordingly, the null hypothesis was accepted (see Table 7).

The finding indicated that GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score shared less only 0.6%, 0.3%, and 1.2% of total variance with Overall Online Grades respectively, and was not consistent with the literature relating to statistically significant relationships between GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score and overall MBA GPA. In their meta-analysis on the validity of Graduate Management Admission Test scores from 1997 to 2004 at 173 universities, Talento-Miller and Rudner found that the relationship of GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score, and overall MBA GPA was statistically significant (2008). The Talento-Miller and Rudner study also indicated that Overall MBA GPA shared 10.4%,
11.0%, and 21.1% of total variance with GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score respectively (2008). Several other studies also found significant relationship between GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score and Overall MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Although these studies analyze the correlation between student GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score, and Overall MBA GPA, and not Overall Online Grades, they provided a good benchmark to analyze the findings relative to this research question. In comparison with the literature, the absence of a significant relationship between Overall Online Grades and GMAT-Verbal, GMAT-Quantitative, and GMAT-Total score was a significant finding of this study. Accordingly, student GMAT-Verbal, GMAT-Quantitative, and GMAT-Total scores were not valid predictors of student success in Online courses at the University.

Student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade significantly correlated with Overall Online Grades at $p < .01$. Accordingly, the null hypothesis was rejected (see Table 7). The three variables shared 3.6%, 6.8%, and 9.0% of total variance respectively with Overall Online Grades. This indicated that there was a statistical relationship between student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade, and student Overall Online grades, meaning that as a student’s Writing Proficiency Exam score, EN100 Grade, and EN140 Grade increased, their performance in Online MBA courses increased. The significance of the findings indicated that student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade were all valid predictors of student success in Online MBA courses at the University.
Student Online Test Grades and Online Writing Grades significantly correlated with Overall F2F Grades at $p < .01$. The two variables shared 32.8% and 35.2% of total variance respectively with Overall Online Grades. This indicated that there was a statistical relationship between student Online Test grades and Online Writing Grades, and student Overall Online grades, meaning that as a student’s Online Test grade or Online Writing grade increased, their performance in Online MBA courses increased. Accordingly, the null hypothesis was rejected (see Table 6). The significance of the findings indicated that student Online Test Grades and Online Writing Grades were both valid predictors of student success in Online MBA courses at the University.
Research Question Three. Is there a statistically significant correlation between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student MBA course grades (OVERALL MBA GPA) at the University?

Table 8

Overall MBA GPA (criterion variable)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>322</td>
<td>NA</td>
<td>3.4835</td>
<td>-.017</td>
</tr>
<tr>
<td>AGE</td>
<td>322</td>
<td>30.59</td>
<td>6.6884</td>
<td>-.016</td>
</tr>
<tr>
<td>ETHNICITY</td>
<td>322</td>
<td>NA</td>
<td>3.0647</td>
<td>.057</td>
</tr>
<tr>
<td>UGPA</td>
<td>271</td>
<td>3.38</td>
<td>0.4393</td>
<td>.461**</td>
</tr>
<tr>
<td>GMAT-VERBAL</td>
<td>283</td>
<td>27.16</td>
<td>6.9978</td>
<td>.195**</td>
</tr>
<tr>
<td>GMAT-QUANTITATIVE</td>
<td>283</td>
<td>32.11</td>
<td>7.2792</td>
<td>.088</td>
</tr>
<tr>
<td>GMAT-ANALYTICAL WRITING</td>
<td>278</td>
<td>45.86</td>
<td>8.6952</td>
<td>.243**</td>
</tr>
<tr>
<td>GMAT-TOTAL</td>
<td>286</td>
<td>502.57</td>
<td>71.9195</td>
<td>.221**</td>
</tr>
<tr>
<td>WRITING PROFICIENCY EXAM</td>
<td>187</td>
<td>8.42</td>
<td>0.8229</td>
<td>.202**</td>
</tr>
<tr>
<td>EN100 GRADE</td>
<td>180</td>
<td>3.40</td>
<td>0.7053</td>
<td>.275**</td>
</tr>
<tr>
<td>EN140 GRADE</td>
<td>189</td>
<td>3.41</td>
<td>0.7206</td>
<td>.272**</td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td>95</td>
<td>0.88</td>
<td>0.0679</td>
<td>.485**</td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td>95</td>
<td>0.92</td>
<td>0.0734</td>
<td>.590**</td>
</tr>
</tbody>
</table>

* Significant Correlation at p < .05  
** Significant Correlation at p < .01  
NA = Nominal Data with no relative Mean
Student Gender, Age, and Ethnicity did not significantly correlate with Overall MBA GPA at $p < .05$. Accordingly, there was no gender, age, or ethnicity bias found in the correlation with Overall MBA GPA and the null hypothesis was accepted (see Table 8). This finding was not consistent with the literature which suggested that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003).

Student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score significantly correlated with Overall MBA GPA at $p < .01$. Accordingly, the null hypothesis was rejected (see Table 8). Overall MBA GPA shared 21.3%, 3.8%, 5.9%, and 4.9% of total variance with student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score respectively. These findings indicated that there was a statistical relationship between student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score and Overall MBA GPA, meaning that as a student’s UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score increased, their performance in overall MBA courses increased.

The findings were consistent with the literature relating to statistically significant relationships of student UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and Overall MBA GPA. In their meta-analysis on the validity of Graduate Management Admission Test scores from 1997 to 2004 at 173 universities, Talento-Miller and Rudner found that the relationship of UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score, and Overall MBA GPA was
statistically significant (2008). The study indicated that Overall MBA GPA shared 8.0%,
10.4%, 3.4%, and 21.1% of total variance with student UGPA, GMAT-Verbal score,
GMAT-Analytical Writing score, and GMAT-Total score respectively (Talento-Miller &
Rudner, 2008). Several other studies also found significant relationships between student
UGPA, GMAT-Verbal score, GMAT-Analytical Writing score, and GMAT-Total score,
and MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer,
2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). The
significance of the findings indicated that student UGPA, GMAT-Verbal score, GMAT-
Analytical Writing score, and GMAT-Total score were all valid predictors of student
success in overall MBA courses at the University.

Student GMAT-Quantitative score did not significantly correlate with Overall
MBA GPA at $p < .05$. This means that there was no significant relationship between a
student’s GMAT-Quantitative score and their performance in overall MBA courses.
Accordingly, the null hypothesis was accepted (see Table 8).

The finding indicated that the two variables shared less than 1% of total variance,
and was not consistent with the literature relating to the statistically significant
relationship between GMAT-Quantitative score and Overall MBA GPA. In their meta-
analysis on the validity of Graduate Management Admission Test scores from 1997 to
2004 at 173 universities, Talento-Miller and Rudner found that the relationship of
GMAT-Quantitative score and overall MBA GPA was statistically significant (2008).
The Talento-Miller and Rudner study also indicated that Overall MBA GPA shared
11.0% of total variance with GMAT-Quantitative score (2008). Several other studies also
found significant relationship between GMAT-Quantitative score and MBA GPA (Fish &
In comparison with the literature, the absence of a significant relationship between Overall MBA GPA and GMAT-Quantitative score was a significant finding of this study. Accordingly, student GMAT-Quantitative score was not a valid predictor of student success in MBA courses at the University.

Student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade significantly correlated with Overall MBA GPA at \( p < .01 \). Accordingly, the null hypothesis was rejected (see Table 8). The three variables shared 4.4\%, 7.6\%, and 7.4\% of total variance respectively with Overall MBA GPA. This indicated that there was a statistical relationship between student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade, and student Overall MBA GPA, meaning that as a student’s Writing Proficiency Exam score, EN100 Grade, and EN140 Grade increased, their performance in overall MBA courses increased. The significance of the findings indicated that student Writing Proficiency Exam score, EN100 Grade, and EN140 Grade were all valid predictors of student success in overall MBA courses at the University.
Student Online Test Grades and Online Writing Grades significantly correlated with Overall MBA GPA at $p < .01$. The two variables shared 23.5% and 34.8% of total variance respectively with Overall MBA GPA. This indicated that there was a statistical relationship between student Online Test grades and Online Writing Grades, and student Overall MBA GPA, meaning that as a student’s Online Test grade or Online Writing grade increased, their performance in overall MBA courses increased. Accordingly, the null hypothesis was rejected (see Table 8). The significance of the findings indicated that student Online Test Grades and Online Writing Grades were both valid predictors of student success in overall MBA courses at the University.
Research Question Four. Is there a statistically significant difference in the correlation coefficients between students’ GENDER, AGE, ETHNICITY, undergraduate grade point average (UGPA), GMAT-VERBAL score, GMAT-QUANTITATIVE score, GMAT-ANALYTICAL WRITING score, GMAT-TOTAL score, WRITING PROFICIENCY EXAM score, undergraduate grades in writing intensive courses (EN100 GRADE and EN140 GRADE), grades on tests in online courses (OL TEST GRADES), grades on written work in online courses (OL WRITING GRADES); and, overall student grades in face-to-face courses (OVERALL F2F GRADES), overall student grades in online courses (OVERALL OL GRADES), and overall student grades (OVERALL MBA GPA) in MBA courses at the University?

Table 9

F2F Grades, Online Grades, and Overall MBA GPA (criterion variables)

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>F2F Grades Pearson Correlation</th>
<th>Online Grades Pearson Correlation</th>
<th>Overall MBA GPA Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>322</td>
<td>NA</td>
<td>3.4835</td>
<td>-0.010</td>
<td>-0.042</td>
<td>-0.017</td>
</tr>
<tr>
<td>AGE</td>
<td>322</td>
<td>30.59</td>
<td>6.6884</td>
<td>-0.017</td>
<td>-0.056</td>
<td>-0.016</td>
</tr>
<tr>
<td>ETHNICITY</td>
<td>322</td>
<td>NA</td>
<td>3.0647</td>
<td>0.067</td>
<td>-0.010</td>
<td>0.057</td>
</tr>
<tr>
<td>UGPA</td>
<td>271</td>
<td>3.38</td>
<td>0.4393</td>
<td>.342**</td>
<td>.409**</td>
<td>.461**</td>
</tr>
<tr>
<td>GMAT-VERBAL</td>
<td>283</td>
<td>27.16</td>
<td>6.9978</td>
<td>.212**</td>
<td>.078</td>
<td>.195**</td>
</tr>
<tr>
<td>GMAT-QUANTITATIVE</td>
<td>283</td>
<td>32.11</td>
<td>7.2792</td>
<td>0.090</td>
<td>.059</td>
<td>.088</td>
</tr>
<tr>
<td>GMAT-ANALYTICAL</td>
<td>278</td>
<td>45.86</td>
<td>8.6952</td>
<td>.243**</td>
<td>.143*</td>
<td>.243**</td>
</tr>
<tr>
<td>WRITING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAT-TOTAL WRITING</td>
<td>286</td>
<td>502.57</td>
<td>71.9195</td>
<td>.233**</td>
<td>.110</td>
<td>.221**</td>
</tr>
<tr>
<td>PROFICIENCY EXAM</td>
<td>187</td>
<td>8.42</td>
<td>0.8229</td>
<td>0.142</td>
<td>.189**</td>
<td>.202**</td>
</tr>
</tbody>
</table>

* Significant Correlation at p < .05
** Significant Correlation at p < .01
NA = Nominal Data with no relative Mean
Table 9

*F2F Grades, Online Grades, and Overall MBA GPA (Continued)*

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>F2F Grades Pearson Correlation</th>
<th>Online Grades Pearson Correlation</th>
<th>Overall MBA GPA Pearson Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN100 GRADE</td>
<td>180</td>
<td>3.40</td>
<td>0.7053</td>
<td>.217**</td>
<td>.260**</td>
<td>.275**</td>
</tr>
<tr>
<td>EN140 GRADE</td>
<td>189</td>
<td>3.41</td>
<td>0.7206</td>
<td>.181*</td>
<td>.300**</td>
<td>.272**</td>
</tr>
<tr>
<td>OL TEST GRADES</td>
<td>95</td>
<td>0.88</td>
<td>0.0679</td>
<td>.376**</td>
<td>.573**</td>
<td>.485**</td>
</tr>
<tr>
<td>OL WRITING GRADES</td>
<td>95</td>
<td>0.92</td>
<td>0.0734</td>
<td>.375**</td>
<td>.593**</td>
<td>.590**</td>
</tr>
</tbody>
</table>

* Significant Correlation at p < .05
** Significant Correlation at p < .01

Student Gender, Age, and Ethnicity did not significantly correlate with Overall F2F Grades, Overall Online Grades, or Overall MBA GPA at p < .05. Accordingly, there was no gender, age, or ethnicity bias or statistically significant differences found in the correlations with Overall F2F Grades, Overall Online Grades, or Overall MBA GPA and the null hypothesis was accepted (see Table 9). This finding was not consistent with the literature which suggested that student writing skills and learning strategies negatively affect student performance of minorities and lower socio-economic groups in classroom tests and Scholastic Aptitude Test scores (Burke & Dunn, 2002; Freedle, 2003).

Student UGPA significantly correlated with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA at p < .01 and there were no statistically significant differences between correlation coefficients. Student UGPA shared 11.7%, 16.7%, and 21.3% of total variance with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively. Accordingly, the null hypothesis was accepted (see Table
These findings indicated that there was a significant statistical relationship between student UGPA and Overall F2F Grades, Overall Online Grades, and Overall MBA GPA. Combined with the findings from other empirical studies in the literature that there is a significant relationship between student UGPA and Overall MBA GPA, it was concluded that student UGPA was also a valid predictor of student success in overall MBA courses at the University (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997).

Student GMAT-Verbal score significantly correlated with Overall F2F Grades and Overall MBA GPA at $p < .01$, but did not significantly correlate with Overall Online Grades. Student GMAT-Verbal score shared 4.5% and 3.8% of total variance with Overall F2F Grades and Overall MBA GPA respectively, but shared less than 1% of total variance with Overall Online Grades. Accordingly, there were statistically significant differences between correlation coefficients and the null hypothesis was rejected (see Table 9).

The finding that there was a significant statistical relationship between student GMAT-Verbal score and Overall MBA GPA was consistent with the literature which indicated that student GMAT-Verbal score was a valid predictor of student success in overall MBA courses (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). However, the finding that there was a statistically significant relationship between student GMAT-Verbal score and Overall F2F Grades, and not Overall Online Grades casts doubt on the validity of using student GMAT-Verbal
score to predict student success in MBA programs that include online coursework. Accordingly, it was a significant finding that while student GMAT-Verbal score was a valid predictor of student success in F2F and overall MBA courses at the University, it was not a valid predictor of student success in Online courses.

Student GMAT-Quantitative score did not significantly correlate with Overall F2F Grades, Overall Online Grades, or Overall MBA GPA at $p < .05$ and there were no statistically significant differences between correlation coefficients. Student GMAT-Quantitative score shared only 0.8%, 0.4%, and 0.8% of total variance with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively. Accordingly, the null hypothesis was accepted (see Table 9).

The finding indicated that there was no significant statistical relationship between student GMAT-Quantitative score, and Overall F2F Grades, Overall Online Grades, or Overall MBA GPA, was not consistent with the literature which indicated that student GMAT-Quantitative score was a valid predictor of student success in overall MBA courses (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). The Talento-Miller and Rudner study indicated that GMAT-Quantitative score shared 11.0% of total variance with Overall MBA GPA (2008). Several other studies also found significant relationship between GMAT-Quantitative score and Overall MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). In comparison with the literature, the absence of a significant relationship between GMAT-Quantitative score and Overall F2F Grades, Overall Online Grades, or
Overall MBA GPA and was a significant finding of this study. Accordingly, student GMAT-Quantitative score was not a valid predictor of student success in F2F, Online, or Overall MBA courses at the University.

Student GMAT-Analytical Writing score significantly correlated with Overall F2F Grades and Overall MBA GPA at $p < .01$, but correlated less significantly with Overall Online Grades at $p < .05$. Student GMAT-Analytical Writing score shared 5.9% of total variance with Overall F2F Grades and Overall MBA GPA, but shared only 2.1% of total variance with Overall Online Grades. Accordingly, there were statistically significant differences between correlation coefficients and the null hypothesis was rejected (see Table 9).

The finding that there was a significant statistical relationship between student GMAT-Analytical score and Overall F2F Grades and Overall MBA GPA was consistent with the literature which indicated that student GMAT-Analytical Writing score was a valid predictor of student success in overall MBA courses (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). The Talento-Miller and Rudner study indicated that GMAT-Analytical Writing score shared 3.4% of total variance with Overall MBA GPA (2008). Several other studies also found significant relationships between student GMAT-Analytical Writing score and MBA GPA (Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997).
However, the finding that there was a weaker statistically significant relationship between student GMAT-Analytical Writing score and Overall Online Grades, than with Overall F2F Grades and Overall MBA GPA, lessens the validity of using student GMAT-Analytical Writing score to predict student success in MBA programs that include Online coursework. This finding challenges the theory that a student’s ability to write effectively has a greater affect in student performance in Online versus F2F MBA courses. This was not an anticipated finding since the literature suggested that a student’s ability to write effectively would affect their performance in Online coursework (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Accordingly, it was a significant finding that while student GMAT-Analytical Writing score was a valid predictor of student success in F2F and overall MBA courses at the University, it was not as valid a predictor of student success in Online courses.

Student GMAT-Total score significantly correlated with Overall F2F Grades and Overall MBA GPA at $p < .01$, but did not significantly correlate with Overall Online Grades. Student GMAT-Total score shared 5.4% and 4.9% of total variance with Overall F2F Grades and Overall MBA GPA respectively, but shared only 1.2% of total variance with Overall Online Grades. Accordingly, there were statistically significant differences between correlation coefficients and the null hypothesis was rejected (see Table 9).

The finding that there was a significant statistical relationship between student GMAT-Total score and Overall MBA GPA was consistent with the literature which indicated that student GMAT-Total score was a valid predictor of student success in overall MBA courses (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller,
2006; Wright & Palmer, 1997). However, the finding that there was a statistically significant relationship between student GMAT-Total score and Overall F2F Grades, and not Overall Online Grades casts doubt on the validity of using student GMAT-Total score to predict student success in MBA programs that include Online coursework. Accordingly, it was a significant finding that while student GMAT-Total score was a valid predictor of student success in F2F and overall MBA courses at the University, it was not a valid predictor of student success in Online courses.

Student Writing Proficiency Exam score significantly correlated with Overall Online Grades and Overall MBA GPA at $p < .01$, but did not significantly correlate with Overall F2F Grades. Student Writing Proficiency Exam score shared 3.6% and 4.1% of total variance with Overall Online Grades and Overall MBA GPA respectively, but shared only 2.0% of total variance with Overall F2F Grades. Accordingly, there were statistically significant differences between correlation coefficients and the null hypothesis was rejected (see Table 9).

The finding that there was a significant statistical relationship between student Writing Proficiency Exam score and Overall Online Grades was consistent with the literature which suggested that a student’s ability to write effectively would affect their performance in online coursework (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). This finding indicated that student Writing Proficiency Exam score would be a valid predictor of students’ success in online courses at the University. However, the finding that there was not a statistically significant relationship between student Writing Proficiency Exam score and Overall F2F Grades casts doubt on the validity of using student Writing Proficiency Exam score to predict student success in
MBA programs that do not include online coursework. Accordingly, it was a significant finding that while student Writing Proficiency Exam score was a valid predictor of student success in Online and overall MBA courses at the University, it was not a valid predictor of student success in F2F courses.

Student EN100 GRADE significantly correlated with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA at \( p < .01 \) and there were no statistically significant differences between correlation coefficients. Student EN100 Grade shared 4.7\%, 6.7\%, and 7.6\% of total variance with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively. Accordingly, the null hypothesis was accepted (see Table 9).

The finding that there was a significant statistical relationship between student EN100 Grade and Overall Online Grades was consistent with the literature which suggested that a student’s ability to write effectively would affect their performance in Online coursework (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Further, the finding that the student EN100 Grade shared 43\% more total variance with Overall Online Grades (6.7\%) than Overall F2F Grades (4.7\%) supports the theory that a student’s ability to write effectively has a greater affect in student performance in Online versus F2F MBA courses. Accordingly, it was a significant finding that while student EN100 Grade was a valid predictor of student success in Online and overall MBA courses at the University, it was not as valid a predictor of student success in F2F courses.
Student EN140 Grade significantly correlated with Overall Online Grades and Overall MBA GPA at $p < .01$, but correlated less significantly with Overall F2F Grades at $p < .05$. Student EN140 Grade shared 9.0% and 7.4% of total variance with Overall Online Grades and Overall MBA GPA respectively, but shared only 3.3% of total variance with Overall F2F Grades. Accordingly, there were statistically significant differences between correlation coefficients and the null hypothesis was rejected (see Table 9).

The finding that there was a significant statistical relationship between student EN140 Grade and Overall Online Grades was consistent with the literature which suggested that a student’s ability to write effectively would affect their performance in online coursework (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Further, the finding that the student EN140 Grade shared 173% more total variance with Overall Online Grades (9.0%) than Overall F2F Grades (3.3%) supports the theory that a student’s ability to write effectively has a greater affect in student performance in Online versus F2F MBA courses. Accordingly, it was a significant finding that while student EN140 Grade was a valid predictor of student success in Online and overall MBA courses at the University, it was not as valid a predictor of student success in F2F courses.

Student Online Test Grades and student Online Writing Grades both significantly correlated with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA at $p < .01$ and there were no statistically significant differences between correlation coefficients. Student Online Test Grades shared 14.1%, 32.8%, and 23.5% of total variance with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively.
respectively. Online Writing Grades shared 14.1%, 35.2%, and 34.8% of total variance with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively. Accordingly, the null hypothesis was accepted in both cases (see Table 9).

In that Online Test Grades and Online Writing Grades were a component of Overall Online Grades and Overall MBA GPA, and not Overall F2F Grades, it was expected for this research to indicate that the variables would share a greater total variance with Overall Online Grades and Overall MBA GPA than Overall F2F Grades. It was not expected for this research to indicate that there was statistically no significant difference in the relationship that Online Test Grades and Online Writing Grades shared with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA respectively. This finding resulted from student performance in Online Tests and Online Writing assignments in Online courses being similar with means of 0.882 and 0.919 respectively, and student performance in Overall F2F Grades, Overall Online Grades, and Overall MBA GPA having almost identical means of 3.605, 3.609, and 3.613 respectively.

The literature suggested that dependence on written communication in online courses, students’ use of different learning styles for multiple-choice exams versus written assignments, and a student’s ability to write effectively may be the major differences in how students learn and perform in online versus face-to-face courses (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). Foundational online learning theories that also suggested that both online and face-to-face courses share the same basic social cognitive learning theory, students and instructors employ different cognitive learning skills in online versus face-to-face course in pedagogy and assessment (Keegan, 1986; Holmberg, 1996; Carroll, 2000).
The finding that there was no significant statistical difference in the relationship between student Online Test Grades and Overall Online Grades and the each individual criterion variable was significant in that it was not consistent with the literature. The results of this study suggested that changes in Online course pedagogy may have effectively mitigated the affect differences in student learning styles and cognitive skills have on student performance in Online versus F2F coursework. Accordingly, it was a significant finding that while student Online Test Grades and Online Writing Grades (predictor variables) were both valid predictors of student success in F2F, Online, and overall MBA courses (criterion variables) at the University, there was virtually no statistical difference in the relationship that the predictor variables shared with each criterion variable.
Implications

Overall, this study did not indicate that cognitive skill factors, related to a student’s ability to write effectively, had any significant affect on their performance in F2F versus Online MBA courses at the University. This finding was not consistent with the literature that suggested that in an Online learning environment, where the primary mode of communication was writing, a student’s ability to write effectively should have had a significant effect on their academic performance (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009). However, from a foundational learning theory perspective, students and instructors are evidently employing different cognitive learning skills in online versus face-to-face course in pedagogy and assessment that are effectively mitigating any expected differences in student performance in F2F versus Online courses (Keegan, 1986; Holmberg, 1996; Carroll, 2000). Based on this finding, it appears that Online course development and pedagogy has progressed to the point at the University, where student cognitive skills and differences in learning styles have been mitigated.

Overall, this finding was supported by the results of this study which indicated that, although there were differences in the statistical significance of relationships between predictor and criterion variables, student Overall F2F Grades, Overall Online Grades, and Overall MBA GPA were nearly identical at approximately 3.61. The results also indicated that student performance in Tests and Writing Assignments in online courses was similar with mean grades of 88.2 and 91.9 respectively. This finding further suggests that the University should “stay the course” in its approach to Online course
development and pedagogy, as its approach appears to be mitigating the effect of course delivery methods on student performance.

The most significant finding of the study was the statistically significant differences found in the relationship between predictor variables in use for MBA program admission and the criterion variables indicating student performance. As expected, student UGPA significantly correlated with Overall F2F Grades, Overall Online Grades, and Overall MBA GPA at $p < .01$. This finding was consistent with the literature in which all studies indicated a significant relationship between student UGPA and student performance in MBA courses (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). Accordingly, student UGPA was a valid predictor of student performance in F2F and Online MBA program courses at the University.

Unexpectedly, the research indicated that while student GMAT-Verbal score and GMAT-Total score significantly correlated with student F2F Grades and Overall MBA GPA at $p = .01$, they did not significantly correlate with student Online Grades at $p < .05$. The research also indicated that while student GMAT-Analytical Writing Assessment score significantly correlated with student F2F Grades and Overall MBA GPA at $p < .01$, the statistical correlation with student Online Grades was weaker at $p < .05$. Student GMAT-Quantitative score was not significantly related to student F2F Grades, Online Grades, or Overall MBA GPA. While the statistically significant correlation of student GMAT-Verbal and GMAT-Total score with student F2F Grades and Overall MBA GPA was consistent with the literature, the finding of no statistically significant correlation of student GMAT-Verbal score and GMAT-Total score with student Online Grades, and a
weaker relationship of student GMAT-Analytical Writing Assessment with student Online Grades was not consistent with the literature (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997). The finding that student GMAT-Quantitative score did not significantly correlate with student F2F Grades, Online Grades, or Overall MBA GPA was also not consistent with the literature (Talento-Miller & Rudner, 2008; Fish & Wilson, 2009; Fish & Wilson, 2007; Kass, Grandzol & Bommer, 2012; Siegert, 2008; Sireci & Talento-Miller, 2006; Wright & Palmer, 1997).

While the student GMAT-Verbal score, GMAT-Analytical Writing Assessment score, and GMAT-Total score are valid admission requirements and predictors of student success in F2F courses and overall MBA courses at the University, they are less valid admission requirements and predictors of student success in Online MBA program courses at the University. Considering that the student GMAT-Quantitative score had no statistical relationship to student performance in student F2F, Online, or Overall MBA GPA, and student GMAT-Analytical Writing Assessment had a weaker relationship with student Online Grades than F2F Grades, the implications for practice are that the University MBA program may need to rethink the use of GMAT-Total score in their MBA program general admission requirements, and specifically in their Online-only MBA program.
The study findings also indicated that student Writing Proficiency Exam score and EN140 Grades significantly correlated with student Online Grades and not student F2F Grades. The implication for practice is that the University may need to alternatively consider the predictive validity of these variables in the admission requirements for Online-only MBA applicants who matriculated undergraduate from the University.
Future Research

This study explored the relationship of student Gender, Age, Ethnicity, UGPA, GMAT-Verbal score, GMAT-Quantitative score, GMAT-Analytical Writing score, GMAT-Total score, Writing Proficiency Exam score, EN100 Grade, EN140 Grade, Online Test Grades, and Online Writing Grades (predictor variables), with Overall Online Grades, Overall F2F Grades, and Overall MBA GPA (criterion variables). Seven-years of pre-existing student data from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and the Institutional Research department at the University, was analyzed using statistical correlation and regression procedures to produce the results of this study. The total population was the 912 students who matriculated in the MBA program at the university from the Fall semester of 2006 through the Fall semester of 2013. After adjustments were made to account for duplicate data and include only those students who complete both F2F and Online courses in the MBA program at the University, the study sample was 322.

Although Online courses have been offered at the University since 2000, differences in the coding of student identification numbers, defining what constituted an online course, and course records in the CSTL database made it impossible to extract reliable data prior to the Fall of 2006. However, the reliability of this study would be enhanced by future research that includes data from subsequent years of the MBA program.
In that this study only included data from the University, the findings cannot be
generalized over other populations. Similar research, using samples of data from other
universities, would increase this study’s validity and enable the findings to be generalized
over other populations. Future research into the relationship of student GMAT-Total
score and student performance in Online MBA courses is particularly important in that
this study found no relationship between the variables. Increasing the validity of this
finding and discovering that the finding can be generalized, would have a profound
impact on the validity of using student GMAT-Total score as an admission requirement
for predicting student success in all Online MBA programs.

This study also indicated that there was statistically no difference in student
performance in Online versus F2F MBA courses with mean grades of 3.605 and 3.609
respectively. Student Test and Written Work Grades in Online courses also had similar
grade means of 0.882 and 0.919 respectively. Student GMAT-Analytical Writing score
also had a less significant relationship with Online MBA courses than F2F MBA courses.
These findings were not consistent with the literature that indicated that students’ ability
to write effectively should have had an impact on their performance in Online versus F2F
courses (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski,
2009). Student Writing Proficiency Exam score and EN140 Grade statistically correlated
with Overall Online Grades at \( p < .01 \) and not Overall F2F Grades at \( p < .05 \), EN100
Grade significantly correlated with both Overall Online Grades and Overall F2F Grades
at \( p < .01 \). These mixed results indicated some relationship exists between students’
ability to write effectively and performance in Online courses.
Based on these mixed findings, inconsistent with the literature which indicated that students’ ability to write effective should have an impact on their performance in Online courses (Scouller, 2006; Gray, 2002; Liang & Creasy, 2004; Ferguson & Tyrjankowski, 2009), it appears that Online course development and pedagogy has progressed to the point at the University, where student cognitive skills and differences in learning styles have been mitigated. Foundational learning theory has shown that students and instructors employing different cognitive learning skills in online versus face-to-face courses in pedagogy and assessment (Keegan, 1986; Holmberg, 1996; Carroll, 2000). Accordingly, future research is needed to determine how differences in students’ ability to write effectively are mitigated by Online course design, pedagogy, and assessment at the University. This could be accomplished by designing a time-based study comparing changes in student Online course performance over time with changes in course design, faculty training, course quality metrics, and learning management system usage in Online MBA courses at University over the same period of time.
Summary

The purpose of this study was to (a) explore the relationship of student cognitive skill indicators (predictor variables) to student performance in online and face-to-face MBA courses (criterion variables) at a Midwestern United States University conferring undergraduate and graduate degrees in a variety of academic fields; (b) determine if there is a statistically significant correlation between the predictor and criterion variables; and, (c) determine if there is any statistically significant difference between any statistically significant correlations of predictor and criterion variables. The hypotheses were that there would be no significant relationship between predictor variables and student performance in Online or F2F courses, and that there would be no significant differences between any significantly correlating predictor and criterion variables.

A sample of 322 students were studied using seven-years of data (Fall 2006 – Fall 2013) from the Center for Scholarship Teaching and Learning (CSTL) online course database, the student module of Ellusian database used by the University Registrar’s office, and the Institutional Research department at the University. Statistical correlation and regression procedures were used to analyze the data. Issues of reliability, validity, and generalizability were identified and addressed in Chapter 3, making the findings useful in course design, pedagogy; and, predicting student success in online MBA courses.

Contrary to the literature, this study did not conclusively indicate that students’ ability to write effectively had any relationship to students’ performance in Online versus F2F courses in the MBA program at the University. This finding, combined with the foundational learning theory research, suggests that Online course design, pedagogy, and
assessment may be mitigating the affect differences in student writing skills and learning has on student performance in Online versus F2F courses. Further time-based research is warranted to determine if this true.

The study found significant differences in the relationship of student GMAT-Verbal score, GMAT-Analytical Writing score and GMAT-Total score, and student performance in Online versus F2F MBA courses. Student GMAT-Verbal score and GMAT-Total score significantly correlated with student performance in F2F MBA courses at $p = .01$, but did not significantly correlate with Online MBA courses. Student GMAT-Analytical Writing score significantly correlated with student performance in F2F MBA courses at $p = .01$, but only correlated with student performance in Online MBA courses at $p < .05$. These findings suggest that the use of GMAT scores in making MBA program admission decisions may not be appropriate. This study indicated that GMAT scores definitely were not valid predictors of student success in Online MBA courses at the University.

Finally, this study indicated that students with UGPA’s less than 3.0, and students with combined UGPA’s and GMAT scores outside the threshold of the requirements for regular MBA program admittance, performed successfully. Comparing this finding with the findings that student Writing Proficiency Exam scores and EN140 Grades of students who matriculated undergraduate at the University were also valid predictors of student success in Online MBA program courses; and, the finding that GMAT scores were not valid predictors of student performance in Online MBA program courses; suggest that the use of UGPA and GMAT scores for MBA program admission requirements should be reviewed and possibly revised.
BIBLIOGRAPHY


=73de7c68-233a-4e10-8ce0-58b1146611a5%40sessionmgr4001&hid=4211&bdata=JkF1dGhUeXBIPWlwLG  
Nvb2tpZSx1cmwsdWlkJnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#db=a9  
h&AN=26885985

Freedle, R. O. (2003). Correcting the SAT’s ethnic and social-class bias: a method for  
12, 2010 from  
http://proxy.mul.missouri.edu:2691/content/8465k88616hn4757/fulltext.pdf.

CBS College Publishing.

content-area course form academic skill level. Community College Review, 36(2),  
89-115. Retrieved February 15, 2011 from  
http://crw.sagepub.com/content/36/2/89.full.pdf+html

Retrieved February 15, 2011 from  
80cf-7632-4593-8358-faa761b9add7%40sessionmgr13&vid=3


APPENDIX A

2006-2007 Requirements for MBA Program Admission at the Midwest University

Admission Criteria

Individuals admitted to the MBA program must have an undergraduate degree from an AACSB accredited business program or have satisfactorily completed the equivalent course work from an accredited institution. Students without the foundation knowledge base in business and economics, yet meeting other admission requirements, may receive provisional admission to the MBA program. Regular admission status may be granted upon completion of prerequisite coursework. All students must provide a GMAT test score. All international students must provide a TOEFL score of 550 (written) or 213 (computer).

Additional Admissions Criteria

1. All applicants need to meet the following formula score:
   
   GPA (on a 4.0 scale) x 200 plus GMAT score equal to 1000 or above
   
   OR
   
   GMAT score of at least 400 with a GPA (on a 4.0 scale) in last 60 hours of college credit x 200 plus GMAT score equal to 1000 or above.

2. Grade of at least "C" on all undergraduate foundation (prerequisite) courses required for regular admission to the MBA program.

3. All foundation (prerequisite) undergraduate courses need to be completed prior to enrollment in MBA required core or MBA elective courses.

4. Under extraordinary circumstances, students not satisfying the admission requirements outlined above may be admitted on a conditional basis upon the recommendation of the Graduate Programs Committee, the Director of the MBA program and endorsement of the Dean of the Donald L. Harrison College of Business.

5. Students currently possessing a graduate degree MAY be allowed to substitute a nationally recognized test score (e.g. LSAT, MCAT, GRE, etc.) for a GMAT test score.
APPENDIX B

2008-2009 Requirements for MBA Program Admission at the Midwest University

Admission Criteria

Individuals admitted to the MBA program must have an undergraduate degree from an AACSB accredited business program or have satisfactorily completed the equivalent coursework from an accredited institution. Students without the foundation knowledge base in business and economics, yet meeting other admission requirements, may receive provisional admission to the MBA program. Regular admission status may be granted upon completion of prerequisite coursework. All students must provide a GMAT test score. All international students must provide a TOEFL score of 550 (written) or 213 (computer) or 79 (Internet).

Additional Admissions Criteria

1. All applicants need to meet the following formula score:

   GPA (on a 4.0 scale) x 200 plus GMAT score equal to 1000 or above

   OR

   GPA (on a 4.0 scale) in last 60 hours of college credit x 200 plus GMAT score equal to 1000 or above.

2. GMAT score of at least 400

3. Grade of at least "C" on all undergraduate foundation (prerequisite) courses required for regular admission to the MBA program.

4. All foundation (prerequisite) undergraduate courses need to be completed prior to enrollment in MBA required core or MBA elective courses.

5. Under extraordinary circumstances, students not satisfying the admission requirements outlined above may be admitted on a conditional basis upon the recommendation of the Graduate Programs Committee, the Director of the MBA program and endorsement of the Dean of the Donald L. Harrison College of Business.

6. Students currently possessing a graduate degree MAY be allowed to substitute a nationally recognized test score (e.g. LSAT, MCAT, GRE, etc.) for a GMAT test score. A score above the 50th percentile is expected.
APPENDIX C

2009-2010 Requirements for MBA Program Admission at the Midwest University

Admission Criteria

Individuals admitted to the MBA program must have an undergraduate degree from an AACSB accredited business program or have satisfactorily completed the equivalent course work from an accredited institution. Students without the foundation knowledge base in business and economics, yet meeting other admission requirements, may receive provisional admission to the MBA program. Regular admission status may be granted upon completion of prerequisite coursework. All students must provide a GMAT test score. All international students must provide a TOEFL score of 550 (written) or 213 (computer) or 79 (Internet).

Addional Admissions Criteria

1. All applicants need to meet the following formula score:
   GPA (on a 4.0 scale) x 200 plus GMAT score equal to 1000 or above
   OR
   GPA (on a 4.0 scale) in last 60 hours of college credit x 200 plus GMAT score equal to 1000 or above.

2. GMAT score of at least 400

3. Grade of at least "C" on all undergraduate foundation (prerequisite) courses required for regular admission to the MBA program. All foundation (prerequisite) under graduate courses need to be completed prior to enrollment in MBA required core or MBA elective courses.

4. Under extraordinary circumstances, students not satisfying the admission requirements outlined above may be admitted on a conditional basis upon the recommendation of the Graduate Programs Committee, the Director of the MBA program and endorsement of the Dean of the Donald L. Harrison College of Business.

5. Students currently possessing a graduate degree MAY be allowed to substitute a nationally recognized test score (e.g. LSAT, MCAT, GRE, etc.) for a GMAT test score. A score above the 50th percentile is expected.
APPENDIX D

2010-2011 Requirements for MBA Program Admission at the Midwest University

Admission Criteria

Individuals admitted to the MBA program must have an undergraduate degree from an AACSB accredited business program or have satisfactorily completed the equivalent course work from an accredited institution. Students without the foundation knowledge base in business and economics, yet meeting other admission requirements, may receive provisional admission to the MBA program. Regular admission status maybe granted upon completion of prerequisite coursework. All students must provide a GMAT test score. All international students must provide a TOEFL score of 550 (written) or 213 (computer) or 79 (Internet).

Additional Admissions Criteria

1. All applicants need to meet the admissions requirement of the graduate school and meet the following (satisfy the formula):

   Overall Grade Point Average - GPA (on a 4 point scale) times 200 plus GMAT equal to 1000 or above

   OR

   Grade Point Average - GPA (on a 4 point scale) in last 60 hours of college credit times 200 plus GMAT score equal to 1000 or above.

2. GMAT score of at least 450

3. Grade of at least “C” on all undergraduate foundation (prerequisite) course required

Provisional Admission Criteria

1. All applicants need to meet the admissions requirements of the graduate school and meet the following:

   Overall Grade Point Average - GPA (on a 4 point scale) times 200 plus GMAT score equal to 1000 or above

   OR

   Grade Point Average - GPA (on a 4 point scale) in last 60 hours of college credit times 200 plus GMAT score equal to 1000 or above.
APPENDIX D

(continued)

2010-2011 Requirements for MBA Program Admission at the Midwest University

2. GMAT score of at least 400, yet below 450

3. Grade of at least “C” on all undergraduate foundation (prerequisite) courses required.

4. Provisional admitted students must complete their first 9 hours of course work, including at least 6 hours at the 600 level, with a grade “B” or better. Students not meeting this requirement are subject to dismissal from the program.
APPENDIX E

2013-2014 Requirements for MBA Program Admission at the Midwest University

Admission Criteria

Individuals admitted to the MBA program must have an undergraduate degree from an AACSB accredited business program or have satisfactorily completed the equivalent course work from an accredited institution. Students without the foundation knowledge base in business and economics, yet meeting other admission requirements, may receive provisional admission to the MBA program. Regular admission status may be granted upon completion of prerequisite coursework. All students must provide a GMAT test score. In addition to the criteria established for general admission to graduate studies are the following departmental criteria:

Regular Admission

1. Overall GPA on a 4 point scale times 200 plus GMAT equal to 1000 or above

OR

GPA of 3.0 on a 4 point scale with a Graduate Record Exam Score (GRE) of 147 for both Verbal Reasoning and Quantitative Reasoning and Analytical Writing of 3.5 or higher. (When it is not possible to interpret academic eligibility by way of transcript, the graduate business program reserves the right to request further evidence of academic eligibility.)

2. GMAT score of at least 500

3. Grade of at least “C” on all undergraduate foundation (prerequisite) courses. (All undergraduate requirements for admission must be satisfied before enrolling in the MBA required core, or MBA elective courses.)
APPENDIX E

(continued)

2013-2014 Requirements for MBA Program Admission at the Midwest University

Probationary Admission

1. All applicants must have the following:

   Overall GPA on a 4 point scale times 200 plus GMAT score equal to 1000 or above

   OR

   GPA of 3.0 on a 4 point scale with a Graduate Record Exam Score (GRE) of 144 for both Verbal Reasoning and Quantitative Reasoning and Analytical Writing of 3.5 or higher. (When it is not possible to interpret academic eligibility by way of transcript, the graduate business program reserves the right to request further evidence of academic eligibility).

2. GMAT score of at least 430, yet below 500

3. Grade of at least “C” on all undergraduate foundation (prerequisite) courses. (All undergraduate requirements for admission must be satisfied before enrolling in the MBA required core or MBA elective courses).

4. Students admitted on probation must complete their first 9 hours of course work, including at least 6 hours at the 600 level, with a grade “B” or better. Students not meeting this requirement are subject to dismissal from the program.
APPENDIX F

The Writing Proficiency Exam (WP003) Requirements at the Midwest University

College graduates entering the work force must be competent writers. Thus, the University insists not only that students earn credit in freshman composition, but also that they pass a writing proficiency exam after completing 75 credit hours of coursework. All students, with the exception of those pursuing a second bachelor’s degree or those transferring to Southeast with 94 or more credit hours, must complete the Writing Proficiency exam to be eligible to graduate.

The WP003 is a two-part exam given in the same format as the final examination for freshman composition (WP002). During Part I, students are given 50 minutes to write an essay of approximately two pages. Part II of the exam requires the student to write a persuasive essay of approximately two pages with a 70-minute time frame. In Part II, students are given two to three pages of source material to refer to while writing. The exam is holistically scored by a group of readers chosen from a variety of academic departments.

If you do not pass the Writing Proficiency Exam, you may take the exam again in a subsequent semester; you may appeal your score; or you may submit a portfolio of your writing. If a student does not receive a score of 7 or greater on WP003, he or she will meet with a Writing Associate from the Center for Writing Excellence, who will explain the following options:

1. The student can retake WP003. WP003 can be retaken any number of times; however, a student can take the exam only once each semester.

2. The student can appeal the score. A student can choose to write an appeal letter requesting that the exam be scored again, explaining on what basis the student feels the rescoring is justified. This option is appropriate for students who receive a score of 6.5.

3. The revision option is an opportunity for the student to show proficiency in writing that may have been hindered by testing issues, such as anxiety, time constraints, etc. This option is appropriate for students who receive a score of 6.5.

4. The student can complete an Option A portfolio. The Option A portfolio consists of three timed essays: the parts 1 and 2 of WP003 and an additional source-based argumentative essay; please note that the first two parts will be a different topic than the regular WP003 exams. The student has up to three hours to complete each essay. The Option A portfolio is offered on three consecutive afternoons twice each semester. This option is appropriate for students who, because of text anxiety, learning disability, etc., require additional time to write their essays.
APPENDIX F

(continued)

The Writing Proficiency Exam (WP003) Requirements at the Midwest University

5. The student can complete an Option C portfolio. The Option C portfolio is a semester-long project consisting of five essays the student writes and/or revises under the supervision of a Writing Associate from the Center for Writing Excellence. A student completing this portfolio must meet with the supervising Writing Associate at least eight times during the semester. Because the Option C portfolio is time-consuming and labor-intensive, it should be chosen only as a last resort.
APPENDIX G

Correlation and Comparability Table

**Overall Face-to-Face (F2F) MBA Course Grade Correlations**
- Gender and Overall F2F MBA Course Grades
- Age and Overall F2F MBA Course Grades
- Ethnicity and Overall F2F MBA Course Grades
- UGPA and Overall F2F MBA Course Grades
- GMAT-Verbal score and Overall F2F MBA Course Grades
- GMAT-Quantitative score and Overall F2F MBA Course Grades
- GMAT-Analytical Writing Assessment score and Overall F2F MBA Course Grades
- GMAT-Total Score and Overall F2F MBA Course Grades
- Writing Proficiency Exam score and Overall F2F MBA Course Grades
- EN100 Grades and Overall F2F MBA Course Grades
- EN140 Grades and Overall F2F MBA Course Grades
- Test Grades in Online courses and Overall F2F MBA Course Grades
- Written Work Grades in Online courses and Overall F2F MBA Course Grades

**Overall Online MBA Course Grade Correlations**
- Gender and Overall OL MBA Course Grades
- Age and Overall OL MBA Course Grades
- Ethnicity and Overall OL MBA Course Grades
- UGPA and Overall OL MBA Course Grades
- GMAT-Verbal score and Overall OL MBA Course Grades
- GMAT-Quantitative score and Overall OL MBA Course Grades
- GMAT-Analytical Writing Assessment score and Overall OL MBA Course Grades
- GMAT-Total Score and Overall OL MBA Course Grades
- Writing Proficiency Exam score and Overall OL MBA Course Grades
- EN100 Grades and Overall OL MBA Course Grades
- EN140 Grades and Overall OL MBA Course Grades
- Test Grades in Online courses and Overall OL MBA Course Grades
- Written Work Grades in Online courses and Overall OL MBA Course Grades
APPENDIX G
(continued)

Correlation and Comparability Table

Overall MBA Grade Point Average Correlations
- Gender and Overall MBA GPA
- Age and Overall MBA GPA
- Ethnicity and Overall MBA GPA
- UGPA and Overall MBA GPA
- GMAT-Verbal score and Overall MBA GPA
- GMAT-Quantitative score and Overall MBA GPA
- GMAT-Analytical Writing Assessment score and Overall MBA GPA
- GMAT-Total Score and Overall MBA GPA
- Writing Proficiency Exam score and Overall MBA GPA
- EN100 Grades and Overall MBA GPA
- EN140 Grades and Overall MBA GPA
- Test Grades in Online courses and Overall MBA GPA
- Written Work Grades in Online courses and Overall MBA GPA

Overall Face-to-Face Course Grade, Overall Online Course Grade, and Overall MBA Grade Point Average Comparability Analysis of the Mean Correlations
- Gender and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- Age and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- Ethnicity and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- UGPA and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- GMAT-Verbal score and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- GMAT-Quantitative score and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- GMAT-Analytical Writing Assessment score and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- GMAT-Total Score and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- Writing Proficiency Exam score and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- EN100 Grades and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- EN140 Grades and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- Test Grades in Online courses and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
- Written Work Grades in Online courses and Overall F2F Grade, Overall OL Grade, and Overall MBA GPA
James Kenneth Cook was born December 11, 1952 in Ypsilanti, Michigan, attended public school in Westland, Michigan, and attended Michigan State University in East Lansing, Michigan where he was a student-athlete (football) and received a Bachelor of Landscape Architecture Degree in 1975. After working for two years in the field of Landscape Architecture at the City of Lansing, Michigan, he worked at Ford Motor Company Michigan Truck plant for 3 years as a Labor Relations Representative, and Maytag Corporation for 25 years where he served as Labor Relations Manager (7 years at the Galesburg Refrigeration Products manufacturing plant) and Human Resources Director (15 years at the Herrin Laundry Products plant and 3 years at the Maytag Laundry Products manufacturing plant). Cook is a certified as Senior Professional in Human Resources (SPHR).

In 2004, Cook became the Human Resources Director for Southeast Missouri State University in Cape Girardeau, Missouri where he currently works and has taught courses in Human Resources. He received a Master of Arts in Higher Education Administration in 2007 from Southeast Missouri State University and an Ed.D. in Education Leadership from the University of Missouri-Columbia in 2015. Cook has been married for 42 years to Susan Cook, an elementary school counselor, and they have two grown children, Dr. Jennifer Cook and Jeffery Cook-McCormac.