

THE RELATIONSHIP BETWEEN THE AGGREGATED UNIVERSITY AVERAGE GRE  
AND THE COMPLETION OF A DOCTORAL DEGREE IN EDUCATION

by

Terri Lynn Wallace

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University, Lynchburg, VA

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APPROVED BY:

Beth Ackerman, Ed.D., Committee Chair

Joseph Fontanella, Ed.D., Committee Member

Terry Elam, Ph.D., Committee Member

Rebecca Lunde, Ed.D., Research Consultant

## ABSTRACT

A significant amount of research has been documented on both attrition and retention of doctoral students. The attrition of doctoral students is a loss to society and academia when the prospective scholar does not complete the rigors of the dissertation journey. The time and money invested by the graduate students and the university is of no true value unless the terminal degrees are completed. The correlation study investigated the relationship between average admissions Graduate Record Examinations (GRE) scores and the completion of doctoral degrees in education. There is a very limited amount of research on the completion of doctoral degrees in education. This study used archival aggregated data of 51 universities that conferred doctoral degrees in education in the years of 2015 and 2016. The study disaggregated the GRE scores of each of the 51 universities to further study the individual relationship of the verbal reasoning, quantitative reasoning, and analytical sections of the GRE scores to the completion of the doctoral degree in education. The current study desired to fill the gap by investigating the relationship of the average admissions GRE scores and the completion of Doctor of Education degrees. Pearson's correlation found that the verbal reasoning, quantitative reasoning, and analytical writing average admissions GRE scores, at the university level, do have a significant correlation to the completion of a doctoral degree in education at the 51 universities in the study during the years of 2015 and 2016.

*Keywords:* conferred doctoral degrees in education, Graduate Record Examinations (GRE), university level aggregated data, degree completion, disaggregated GRE scores at the university level.

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### **List of Abbreviations**

All but Dissertation (ABD)

Carnegie Initiative on the Doctorate (CID)

Carnegie Project on the Education Doctorate (CPED)

Community of Inquiry (CoI)

Composite Scores (CS)

Council of Graduate Schools (CGS)

Doctor Degree of Education University (DDEDU)

Educational Testing Service (ETS)

Grade Point Average (GPA)

Graduate Grade Point Average (GGPA)

Graduate Record Examinations (GRE) Graduate Record Exam Analytical Writing (GREA)

Graduate Record Examinations Quantitative Reasoning (GREQ)

Graduate Record Examinations Verbal Reasoning (GREV)

Graduate Record Examinations Verbal Reasoning and Quantitative Reasoning combined (GREVQ)

Graduate Record Examinations Verbal Reasoning, Quantitative Reasoning, and Analytical Writing combined (GREVQA)

Institutional Review Board (IRB)

Master of Business Administration (MBA)

Master of Public Administration (MPA)

National Center for Educational Statistics (NCES)

National Opinion Research Center (NORC)

National Science Foundation (NSF)

Resilience Attitude Scale (RAS)

Survey of Earned Doctorates (SED)

Time to Degree (TTD)

Undergraduate Grade Point Average (UGGPA)

## **CHAPTER ONE: INTRODUCTION**

### **Overview**

Chapter One discusses the background of many trends that have surfaced over the past decade in the research of both attrition and retention rates of doctoral degree students and its relationship with the completion of the education doctoral degree (Chavis, Lee, & Acosta, 2008; Gardner, 2010; Hildebrant, 2011; Hultgren, 2008; Lim, Dannels, & Watkins, 2008; Spaulding & Rockinson-Szapkiw, 2012; Terrell, Snyder, & Dringus, 2009). Chapter One includes the problem statement, the purpose of this study, and recommended research by preceding studies. In conclusion of Chapter One, the introduction of research questions and definitions relevant to the study are listed. There is a myriad of studies on the relationship of the GRE scores to many doctoral degree programs, but there is a void in the amount of recent scholarly research in the area of the relationship of the GRE scores to the completion of the doctoral degree in education (Rockinson-Szapkiw, Bray, & Spaulding, 2015). The focus of this study is a review of one important trend in the completion of the doctoral degree, the requirement of GRE scores in the admissions process for most doctoral programs.

### **Background**

A significant amount of research has been documented on both retention and attrition of doctoral students (Chavis et al., 2008; Gardner, 2010; Hildebrant, 2011; Hultgren, 2008; Lim et al., 2008; Spaulding & Rockinson-Szapkiw, 2012; Sutton, 2014; Terrell et al., 2009; Terrell, Snyder, Dringus, & Maddrey, 2012). The previous literature showed that even with the trend of developing many different instruments to gauge and improve the doctoral students' experience during the degree process, the retention rates of doctoral students were consistently decreasing (Lott, Garner, & Powers, 2009/2010; Spaulding & Rockinson-Szapkiw, 2012; National Science

Foundation [NSF], 2009; Tinto, 2008). Many trends have developed into a myriad of innovative programs, initiatives, and complex research studies on the many different attributes of doctoral degree completion (Allum & Okahana, 2015; Council of Graduate Schools [CGS], 2014; Gardner, 2008; Grasso, Barry, & Valentine, 2009; Kuncel, Hezlett, & Ones, 2001).

Unfortunately, over half of doctoral students who attend brick and mortar programs never complete their terminal degree (Terrell et al., 2009). Researchers also found that an even higher percentage of online doctoral students never complete their terminal degree (Moody, 2004; Rovai, 2002a; Terrell et al., 2009).

The doctoral student that has built a solid foundation from engaging in the disciplines of maintaining an above average entrance grade point average (GPA), GRE scores, and involvement within a mentoring community is better prepared for the crucial changes that evolve during the dissertation journey (Bruce, Stoodley, & Pham, 2009; Chavis et al., 2008; Cockrell, 2008; Columbaro, 2009; Deggs, Grover, & Kacirek, 2010; Ehrenburg, Jakubsonb, Groena, So, & Price, 2007; Groena, Jakubsonb, Ehrenburg, Condieb, & Liub, 2008; Lovitts, 2005; Mohan, 2010; Terrell et al., 2009). The rigors of the dissertation journey consist of several pivotal stages for the doctoral student (McAlpine, 2012). Stage one is identified as the entry adjustment stage in the doctoral student's dissertation journey (McAlpine, 2012). Another pivotal point in the doctoral degree is the completion of classwork and the research journey begins. The notion of tenacity sustaining interest over time is a defining aspect in the difference between self-control, contentious decisions, or short feedback loops to attain the goal (Allen, Shockley, & Poteat, 2010; Cross, 2013, 2014). The final stage is the dissertation stage. The researchers have revealed that a significantly high amount of the doctoral students who successfully reach the point of all but dissertation (ABD) to begin the dissertation journey often never complete the

desired terminal degree (Rockinson-Szapkiw, 2011). A doctoral student may adjust well in stage one and become integrated into the community during the dissertation journey but stumble in the final stage of obtainment of the doctoral degree in late stage attrition (Lovitts, 2008; McAlpine, 2012; Rovai, 2002a; Terrell et al., 2009; Willis & Carmichael, 2011). Therefore, attrition of the doctoral student may occur in many distinct stages.

A trend in the research of the completion of the doctoral degree has been to evaluate the importance of the graduate student's GRE scores as a predictor of the student's ability to complete the doctoral degree program (Allum & Okahana, 2015; CGS, 2014; Gardner, 2008; Grasso et al., 2009; Kuncel et al., 2010; Moneta-Koehler, Brown, Petric, Evans, & Chalkley, 2017; Pacheco, Noel, Porter, & Appleyard, 2015; Rockinson-Szapkiw et al., 2015; Wang, 2013). GRE scores have been established as an indicator in measuring the abilities of the doctoral student to attain a graduate education (Young, Klieger, Bochenek, Li, & Cline, 2014). It is important to evaluate the abilities of the prospective doctoral student during the admissions process, and one purpose of investigating the predictive abilities of the GRE scores is to reinforce or negate the importance of the students' GRE scores during the admissions process of the doctoral degree (Cassuto, 2015; Clayton, 2016; Jaschik, 2016; Moneta-Koehler et al., 2017; Posselt, 2016; Wang, 2013). An insignificant amount of recent scholarly research has been found with a focus on the relationship of the GRE scores to the completion of a doctoral degree in the area of education programs (Rockinson-Szapkiw et al., 2015). No recent scholarly literature was revealed to cover the aggregated average GRE scores at the university level. The GRE scores are important for the admissions of the doctoral student and their relationship to the completion of the terminal degree is the focus of this study.

## **Problem Statement**

The problem with the attrition of doctoral students in education is a loss to society and academia when the prospective scholar does not complete the rigors of the dissertation journey. The time and money invested by the graduate students and the university is of no true value unless the terminal degrees are completed (Lovitts, 2005, 2008; Tinto, 1987, 1988, 2005). The literature has proven that doctoral programs have spent resources to improve the programs through re-evaluating the student's needs to promote a sense of community and increasing awareness of the importance of doctoral student retention (Lovitts, 2008; Rovai, 2002a; Terrell et al., 2009; Willis & Carmichael, 2011). Among the factors related to doctoral students' completion of their terminal degree, recent literature investigates the predictability of GRE scores in the incremental years' GPA achievement abilities (Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013). Unfortunately, those predictive abilities decrease incrementally as the student progresses into each year of the program (Wang, 2013).

Research on scholarly literature for doctoral preparation of educators has brought several trends to the surface. Doctoral students in education have a longer median time to degree (TTD) than doctoral students in other fields, and this gives predictive variables a longer span of time to diminish in importance (NSF, 2009, 2015; Wao & Onwuegbuzie, 2011). Another trend is that doctoral degrees in education have seen a decrease in the quantity of degrees conferred from 2004 to 2014, showing a significant decrease from 16% to 9% of the total yearly conferred doctoral degrees (National Center for Educational Statistics [NCES], 2018; NSF, 2009, 2015). The third trend found in the research of literature is the attrition rates of doctoral degree students in education are found to be higher than other doctoral degree disciplines, as high as 50% to 70%

for some doctoral education programs (Ivankova & Stick, 2007; Rockinson-Szapkiw et al., 2015; Rockinson-Szapkiw, Spaulding, & Bade, 2014).

These trends in doctoral degree programs are focal points in recent scholarly research in other doctoral degree programs. Science, nursing, STEM, economics, business, mathematics, and engineering doctoral degrees use GRE composite scores as a benchmark for admission into competitive programs (Allum & Okahana, 2015; CGS, 2014; Gardner, 2008; Grasso et al., 2009; Hall et al., 2016; Kuncel, Wee, Serafin, & Hezlett, 2010; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Rockinson-Szapkiw et al., 2015; Wao, 2010; Wang, 2013; Young et al., 2014). Multiple studies have focused on the importance of the admissions focus on the GRE scores' predictive abilities in doctoral studies for completion of programs and completion GPAs (Brown, 2011; Bleske-Rechek & Browne, 2014; Kuncel & Hezlett, 2007; Kuncel et al, 2001; Kuncel et al., 2010; Stock, Siegfried, & Finegan, 2011). Brown (2011) examined the records of 256 nursing students and found the completers of the program had higher GPAs that could be predicted by their entrance GRE scores and GPAs, but the study did not find GRE scores as predictors of completion of the program. A business graduate program was the focus of study that found GRE scores' ability to forecast completion GPAs (Young et al., 2014). Many other studies have found a significant predictive relationship to GRE scores and doctoral degrees along with meta-analytic investigations on the validity of GRE scores as predictors (Bleske-Rechek & Browne, 2014; Kuncel & Hezlett, 2007; Kuncel et al., 2001; Kuncel et al., 2010; Stock et al., 2011). The problem is that recent literature has left a void of research on the relationship of GRE scores at the university level and the completion of the doctoral degree in education.

### **Purpose Statement**

The purpose of the study is to attempt to fill the void of current research on the relationship of the GRE scores at the university level to the completion of the doctoral degree in education. The correlation study investigated the relationship between the predictor variables of the aggregated average GRE scores, disaggregated into the following categories: GRE Verbal Reasoning (GREV); GRE Quantitative Reasoning (GREQ); GRE Verbal reasoning and Quantitative Reasoning combined (GREVQ); GRE Analytical Writing (GREA); GRE Verbal Reasoning, Quantitative Reasoning, and Analytical Writing combined (GREVQA); and the criterion variable of the conferred doctoral degrees in education at the university level of 51 universities in the years of 2015 and 2016. This study examined the degree of relationship between the variables but does not establish a causation of the variable relationship (Gall, Gall, & Borg, 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017). The GRE test is divided into the three categories of quantitative reasoning, verbal reasoning, and analytical writing. The quantitative reasoning test measures the computation skills in arithmetic, algebra, geometry, and data analysis. The verbal reasoning test is to establish the ability to analyze, synthesize, and evaluate relationships and concepts in written material. The analytical writing test measures the ability to articulate critical thinking skills (Educational Testing Service [ETS], 2016/2017; Pacheco et al., 2015). This study examined the variables of the aggregated GRE test scores from 51 universities as disaggregated variables of the independent categories of verbal, quantitative, and analytical writing and the variables of the combined categories of GREVQ and GREVQA. The GRE test is deemed an important asset in predicting the probability of success in a graduate student, and the scores are a significant part of the consideration for

admissions into many doctoral degree education programs (Allum & Okahana, 2015; CGS, 2014; Kena et al., 2015).

### **Significance of Study**

There is research over a large span of doctoral degree programs but a very limited amount of research on doctoral degree programs in education GRE admissions scores that has been established as an indicator in measuring the abilities of the student to attain a doctoral degree in education (Rockinson-Szapkiw, et al., 2015; Young, et al., 2014; Wang, 2013). The relationship of the variables in this study are important to both the education institutions admitting graduate students into the doctoral degree programs in education and the prospective graduate student considering and preparing for a doctoral degree in education. The GRE scores in the areas of quantitative, analytical writing, and verbal are all evaluated during the admissions process (Darolia, Potochnick, & Menifield, 2014; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013). Recent research has left a gap in the investigation of the relationship of the GRE to the completion of a doctoral degree in education (Rockinson-Szapkiw et al., 2015). This research study investigates the importance of the aggravated average GRE scores at the university level in relationship to the conferred education doctoral degrees in the years of 2015 and 2016.

### **Research Questions**

**RQ1:** Is there a significant correlation between the average combined GRE Verbal and GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ2:** Is there a significant correlation between average GRE Verbal scores and the number of completed doctoral degrees in education at the university level?

**RQ3:** Is there a significant correlation between average GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ4:** Is there a significant correlation between average GRE Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

**RQ5:** Is there a significant correlation between the combined average GRE Verbal, Quantitative, and Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

### **Definitions**

1. *Aggregated data* – Aggregated data is presented in a numerical form to represent large numbers of individuals in a group or at the university level; therefore, all the data represented is a numerical form of information from the university (Rockinson-Szapkiw et al., 2015).
2. *Attrition* – Attrition is the loss of students who quit the educational program they are enrolled in and do not complete the degree program (Lovitts, 1996, 2001, 2008).
3. *All but dissertation (ABD)* – All but dissertation is the end of the classroom examinations and the beginning of the dissertation process in a doctoral degree program (Lovitts, 2008; Rovai, 2002a; Terrell et al., 2009; Willis & Carmichael, 2011).
4. *Carnegie Project on the Education Doctorate (CPED)* – CPED is the Andrew Carnegie Foundation’s program dedicated to promoting the improvements and evolving initiatives in doctoral education (Judd, 2016).
5. *Counsel of Graduate Schools* - CGS conducted a seven-year (2004-2010) survey of doctoral programs in the US with the goal to produce the most comprehensive useful data on the attrition of Ph.D. programs (CSG, 2014).

6. *Disaggregated data* – Data that has been broken down into individual units for the purpose of grouping the data for analysis (Rockinson-Szapkiw et al., 2015).
7. *Graduate Record Examinations* – GRE is a standardized test that is accepted for admissions into many graduate programs. The GRE is administered by ETS and was developed in 1949 for the United States testing of admission of students into graduate schools (ETS, 2017; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013).
8. *GRE Verbal Score* – The verbal reasoning test on the GRE is calculated as a separate score from the other tests on the examination. The verbal reasoning test is to establish the ability to analysis, synthesize, and evaluate relationships and concepts in written material (ETS, 2017; Pacheco et al., 2015).
9. *GRE Quantitative Score* – The quantitative reasoning test on the GRE is calculated as a separate score from the other tests on the examination. The quantitative reasoning test measures the computation skills in arithmetic, algebra, geometry, and data analysis (ETS, 2017; Pacheco et al., 2015).
10. *GRE Analytical Writing Score* – The analytical writing test on the GRE is calculated as a separate score from the other tests on the examination. The analytical writing test measures the ability to articulate critical thinking skills (ETS, 2017; Pacheco et al., 2015).
11. *Grade point average* - The GPA of the doctoral student's master's degree is a focal point of obtaining entrance into many doctoral programs (Allum & Okahana, 2015; CGS, 2014; Pacheco et al., 2015; Wang, 2013).
12. *National Science Foundation Ranking of Earned Doctorates* - The NSF of Earned Doctorate Degree Survey is a published survey that nationally ranks doctoral degree

programs by the number of conferred doctoral degrees each year (Kena et al., 2015; NSF, 2014, 2015).

13. *Predictors* – The use of one variable to predict the outcome of another variable. GRE scores have been researched to establish their abilities to predict if a doctoral student will complete the terminal degree (Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013).
14. *Ph.D. Completion Project* - The CGS's Ph.D. Completion Project promotes reduced attrition rates and reduced TTD averages (Glenn, 2010).
15. *Retention* – Retention is the retaining of the doctoral degree student to the graduation of the degree program (Lovitts, 2008; Rovai, 2002a; Terrell et al., 2009; Willis & Carmichael, 2011).
16. *Survey of Earned Doctorates (SED)* – SED provides significant data information on graduate student completion (Lederman, 2016).
17. *Time to Degree* – The amount of time it takes a doctoral student to start and finish the doctoral degree requirements to graduate (NSF, 2013).
18. *Tinto's Model of Institutional Departure* – Tinto developed a model of the student's steps of departure from the education institution (Tinto, 1988).
19. *US News and World Report Graduate School Rankings* – The US News and World Report Graduate School Ratings are a publicly published rating with the option to pay for more detailed information on each graduate school evaluated. There are six distinct categories that are rated and evaluated on individual methodologies according to the needs of the graduate programs (Smith-Barrow, 2016).

## CHAPTER TWO: LITERATURE REVIEW

### Overview

The literature review investigates the recent scholarly research available in the relationship of the admissions acceptance GRE scores and the perspective universities conferring Doctor of Education degrees. The limited availability of published scholarly research in this discipline leaves a gap on which this study focused. Chapter Two discusses the conceptual framework and the available scholarly research on GRE scores and the trends of a myriad of programs derived to reduce attrition to increase the retention of doctoral students in many fields.

Previous studies have surfaced on multiple levels of changes made in many doctoral programs to improve the retention of these potential scholars (Allum & Okahana, 2015; CGS, 2014; NSF, 2014, 2015). Historically, many universities have used GRE scores and master's GPAs as admissions tools to evaluate the proficiencies of students applying to the doctoral program (Bleske-Rechek & Browne, 2004; Blue, 2008; Brown, 2011; Darolia et al., 2014; Grasso & Valentine, 2009; Kuncel et al., 2010; Lederman, 2016; Pacheco et al., 2015; Perez, 2011; Rockinson-Szapkiw et al., 2015; Vaquera, 2008; Vladimir, 2010; Wang, 2013; Wao, 2010). The literature review did not find recent scholarly studies on the relationship of the GRE scores to the completion of the doctoral degree in education based upon the universities' admissions aggregated average GRE scores at the university level. The academic years of 2015 and 2016 were the most recently archived data available at the time the literature review research was conducted. There was little recent research available with a focus on doctoral degrees in education and the relationship to the average GRE scores required for the admission into the programs (Rockinson-Szapkiw et al., 2015).

A prospective doctoral degree student must diligently prepare for the rigors of the degree program (Cassuto, 2016; Clayton, 2016; Di Pierro, 2012; Johnson, 2015; Kumar & Dawson, 2012). For the prospective student, the requirements must be met before obtaining entrance in the doctoral degree program (Wang, 2013). Their previous academic accomplishments are required to point in the direction of the student's ability to complete the rigors of the doctoral degree program and be conferred with the doctoral degree (Lovitts, 2008). Multiple studies have addressed the question of the relationship and the ability of these variables to predict the student's ability to complete the terminal degree (Allum & Okahana, 2015; CGS, 2008, 2012, 2014; Glenn, 2010; Kena et al., 2015). These factors have been the focal point of research literature over the past few decades.

### **Conceptual Framework**

There are many conceptual models developed over the span of three decades to determine the intrinsic details of the high attrition rates in doctoral candidates. These models link to improvements in the historically high attrition rates in traditional doctoral programs in residential institutes (Lovitts, 2001, 2005, 2008; Tinto, 1987, 1988, 2005). Tinto's Model of Institutional Departure states that, to persist, students need integration into formal (academic performance) and informal (faculty/staff interactions) academic systems and formal (extracurricular activities) and informal (peer-group interactions) social systems (Lovitts, 1996, 2001, 2005, 2008; Tinto, 1987, 1988, 2005; Wao, 2010). Tinto's model of departure takes into consideration what the student brought into the degree program in the form of previous educational achievements, scholastic endeavors, scholarship abilities, and skills (Wao, 2008). The education doctoral student brings into the degree program the variables in this research study of GRE scores in

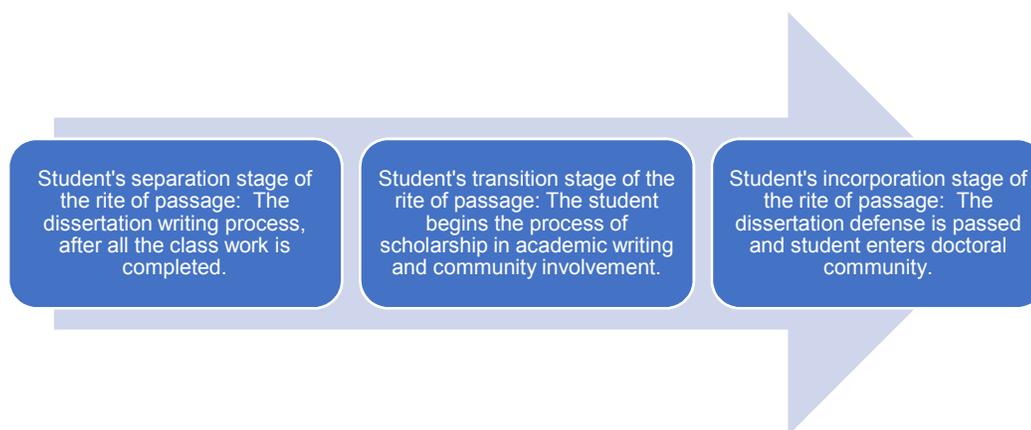
verbal, quantitative, and analytical writing along with undergraduate GPA (UGGPA), graduate GPA (GGPA), and other important academic achievements.

Tinto (1988) elaborated on three stages in the rites of passage; these so-called rites of passage refer to as the stages of separation, transition, and incorporation (as cited in Van Gennep, 1909, p. 440). For the purpose of this study, the researcher considered the separation stage of the doctoral study to be when the doctoral student completed all their classes and passed the exam. This is the beginning stage in the rite of passage. Unfortunately, many doctoral students in the dissertation stage often struggle and fail. The ABD is a separation from what they have previously known as academia in which they enter the community of scholarship (Glatthorn & Joyner, 2005). Although doctoral attrition can be attributed to various stages during the doctorate, a high rate of the attrition is attributed to doctoral degrees at the ABD stage of the journey (Rockinson-Szapkiw et al., 2015).

The doctoral community is a society based on research and scholarship, and the doctoral dissertation is the epitome of entry-level research and the achievement of scholarship. The second stage in the rites of passage is the transition stage (Lovitts, 2005; Sader, 2013; Tinto, 1988). The dissertation journey must include access into many doors to prepare the doctoral candidate for the critical entry point into the doctoral community and to complete the transition stage in preparation to enter the third stage of incorporation (Lovitts, 2005, Sader, 2013; Tinto, 1988; Van Gennep, 1909). For the purpose of this study, the researcher considered the publishing of academic writings and community involvement during the dissertation as the incorporation stage. Community engagement helps the doctoral student to function more effectively within the doctoral communities and is a significant link to the scholarly obtainment

of positions in academia (Jaeger, Tuchmayer, & Morin, 2014). Community involvements can assist the doctoral student through the doctoral journey.

The importance of entering the community for a doctoral candidate is significantly important to the career and success in completing the terminal degree. The third stage in the rites of passage is incorporation (Lovitts, 2005; Sader, 2013; Tinto, 1988). A small nucleus of experts establishes the guidelines and qualifications for the rites of passage into the doctoral cultural community (Kiley, 2009). For the purpose of this study, the researcher considered the incorporation stage as the dissertation defense being passed and graduation scheduled for the doctoral candidate to enter the doctoral community when conferred with a doctoral degree in education (see Figure 1).



*Figure 1.* Flowchart of the three stages of the rites of passage.

Doctoral degree students bring substantial background tools into a doctoral program of GRE scores, UGGPA, scholastic achievements, and other intellectual assets to face the many difficulties in a doctoral degree program (Lovitts, 2008). Theoretical and practical applications of independent research were examined and what led doctoral degree students to achieve this level in academia was investigated (Lovitts, 2008). Lovitts' (2008) emphasis of this article focused on a previous study she conducted in 2005 on creativity of a focus group discussion at a

high-level- Ph.D.-productive faculty on critical-transition. The factors that surfaced in the research are attributes of practicality, determination, and conception of the big picture of the completion of the dissertation journey (Lovitts, 2008). Lovitts went on to write about the difficulties students face in achieving the coveted independent researcher level of academia.

Smith, Marney, Nelson, Abel, and Abel (2006) wrote about the difficulties in the doctoral candidate transitioning into an independent scholar, noting that the lack of milestones within the dissertation journey may cause confusion and frustrations for the doctoral degree student. The doctoral degree student must learn the code and practices of research to engage in scholarly research. The engagement of scholarly research helps to develop a professional attitude that incorporates identity and develops a drive for education (Christensen & Lund, 2014). This level of academia begins in the transition stage of the rites of passage but propels the doctoral candidate through the incorporation stage through integration into researching, publishing, and community involvement.

The doctoral student that has built a solid foundation from engaging in the disciplines of maintaining an above average entrance GPA, acceptance level GRE scores, and involvement within a mentoring community is better prepared for the crucial changes that evolve during the dissertation journey. The notion of tenacity sustaining interest over extended periods of time is a defining aspect in the difference between self-control, contentious decisions, or short feedback loops to attain the goal (Cross, 2013, 2014). In the ABD stage, many have fallen by the wayside during this late stage attrition (Lovitts, 2008; Rovai, 2002a; Terrell et al., 2009; Willis & Carmichael, 2011). A doctoral student may adjust well in stage one and become integrated into the community during the dissertation journey but stumble in the final stage of obtainment of the doctoral degree.

## Related Literature

### Historical Trends in Doctor of Education Degree

A review of literature in the historical trends of doctorate in education programs found three major areas of relevance. The first trend is the TTD is longer for the Doctor of Education student than for most other doctoral degree programs (NSF, 2015). The second trend is the significant decrease in the quantity of doctoral degrees in education being conferred than in previous years. The third trend is the attrition rates for doctoral students in education are higher than other doctoral programs (NSF, 2015).

In an historical analysis, Ampaw and Jaeger (2012) highlighted the CGS (2008) report of 57% of doctoral students completing their degree within a 10-year period. Ten years is still a shorter period than many doctoral degree students in education can achieve at an 11.7-year average (NSF, 2015). In this study, academic ability was evaluated based on the student's UGGPA and the student's GRE scores (Ampaw & Jaeger, 2012).

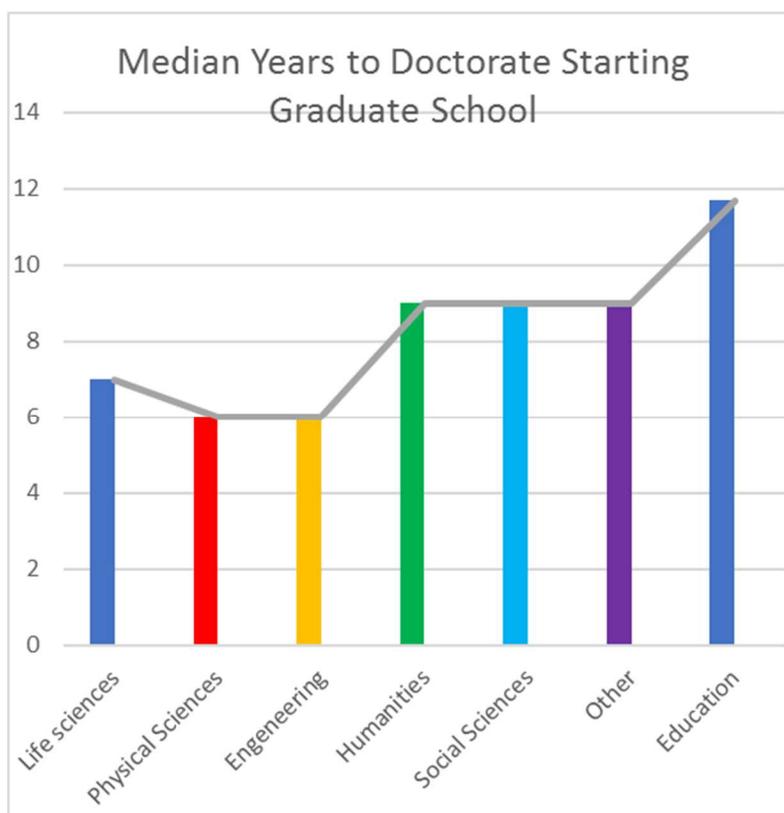
Historically, this has been an accepted measurement of the students' academic abilities to perform in the rigor of the academic community (Bleske-Rechek & Browne, 2004; Blue, 2008; Brown, 2011; Darolia et al., 2014; Grasso & Valentine, 2009; Kuncel et al., 2010; Lederman, 2016; Pacheco et al., 2015; Perez, 2011; Rockinson-Szapkiw et al., 2015; Vaquera, 2008; Vladimir, 2010; Wang, 2013; Wao, 2010). Attrition leads to more recruitment of students without a base of experience and knowledge; therefore, the doctoral degree programs are continually starting at the beginning of the training process with new students (Ampaw & Jaeger, 2012). The importance of the admission process and recruitment of the doctoral degree in education programs links to the importance of the completion of the doctoral degree in education.

## **Time to Degree**

The TTD has been a topic in doctoral degree literature over a couple decades. The median TTD for all accumulative broad fields of study is an average of 7.3 years from starting graduate school (NSF, 2015). In contrast, the TTD for a doctoral degree in education increases to an average of 11.7 years from starting graduate school (NSF, 2015). A longer TTD means more cost and more time invested in the degree for the doctoral student endeavoring to obtain a doctoral degree in education.

A study by Stock et al. (2011) investigated completion rates and TTD in a doctoral program in economics. In the eight-year longitudinal research study, 586 students participated in 27 economics Ph.D. degree programs (Stock et al., 2011). The largest amount of attrition was within the first two years of the study with the final attrition rate being approximately 38%. The study used archival data of the economics programs that were the largest in the US at the time, and the sample of doctoral programs in economics produced 42% of the Ph.D.s in economics from the years of 1998 to 2001 (Stock et al., 2011). The study also states that attrition rates decreased with a shorter TTD; in fact, students were more likely to complete the degree in the doctoral degree in economics falling into less than one third of the attrition rate category with 88% of the sample completing the doctoral degree in economics within an eight-year period (Stock et al., 2011). The researchers also found that the quantitative GRE scores were significant in the prediction of completing the doctoral degree in a previous study (Stock, Finegan, & Siegfried, 2009). This study did not find any significant value in the GRE predicting the TTD or giving an indication of how long the student would work to complete the terminal degree. Therefore, a doctoral student in education is more likely to be a non-completer and increase the

attrition rates for the doctoral degree program in education because of the increased TTD of a significant 11.7 average years in the doctoral degree of education (NSF, 2015; see Figure 2).



*Figure 2.* Bar chart of the median years to doctorate starting graduate school (NSF, 2015).

*Note.* This graph was developed in Word by the researcher. The data was adapted from Table 31 Median Years to Doctorate by broad field of study: Fields since starting graduate school for academic year of 2015 (NSF, 2015). Courtesy of NSF. The data prepared on this website is government funded and free to the public: <https://www.nsf.gov/policies/reuse.jsp>

Many factors come into play in the completion of the doctoral degree in education. Some of those factors were investigated in a quantitative study of the methodology choice of doctoral candidates in education (Rockinson-Szapkiw et al., 2015). In the study, Rockinson-Szapkiw et al. (2015) used archival data of 307 candidates of doctoral education in a blended program, online and brick and mortar classes, where the entire dissertation was an online experience only. The results of the study found that GRE analytical writing scores combined with the methodology choice were the strongest predictors of TTD. In this study, the participants that

chose a qualitative research study combined with strong GRE analytical writing scores were significantly stronger in their completion time of their doctoral degree in education (Rockinson-Szapkiw et al., 2015). The important link between GRE scores, methodology, and the amount of time a doctoral education student invested in the completion of the terminal degree were evident in this study (Rockinson-Szapkiw et al., 2015). The GRE analytical writing scores combined with the methodology choice proved to be a positive factor in TTD.

A ten-year longitudinal study of 1,688 doctoral students in Australia used archival data of the Austrian Faculty of Sciences (Vladimir, 2010). The study reviewed literature and found three groups of factors to a timely completion of the doctoral degree at the Austrian Faculty of Sciences (Vladimir, 2010). The first factor encompassed the quality of the student's academic abilities and financial situation (Vladimir, 2010). The second factor involved the quality of supervision for the student, which would include university advisors (Vladimir, 2010). The third factor comprised the resources and facilities available to the doctoral student, which included analytical facilities and expertise (Vladimir, 2010).

Research found that students that had scholarships had a shorter TTD and had 33% completion rates compared with other doctoral degree students (Vladimir, 2010). This would include all three factors, the student's financial situation, faculty supervision, and analytical facilities with expertise (Vladimir, 2010). The research indicates that the funding of the scholarships is allocated to the best and the brightest researchers. The research sought to use the findings to assist programs with attrition rates as high as 85% to develop a framework to improve student retention rates (Vladimir, 2010). This study fully encompassed the spectrum of the student, the advisors, and the program at the university to emphasize the factors required to produce a timely completion of a doctoral degree. The quality of the student pursuing a doctoral

degree in education is equally important as the quality of the advisor and the university's doctoral degree program in education.

An integral part of the university's doctoral degree program is the admission requirements into the program to screen eligibility of the students involved in the doctoral degree program. Darolia et al.'s (2014) study of 223 students entering a Master of Public Administration (MPA) evaluated the admissions requirements of GRE scores, UGGPAs, and the type of undergraduate institution in relationship to the student completion of the master's degree in early and midcareer students. The value of the admissions requirements was examined in this research study (Darolia et al., 2014).

The GRE scores, UGGPA, and the type of undergraduate university were all proven to be strong indicators of correlation with academic performance. The research also examined the point in the students' academic career when entering the programs as an indicator of the completion of the degree program (Darolia et al., 2014). Dividing the participants into subgroups of early and midcareer, the study found that the midcareer participants had a longer TTD than the early career participants (Darolia et al., 2014).

There are various aspects of life that go into the TTD for each student, and the GRE scores, along with other variables studied, correlate with student performance relating to completion of the degree (Darolia et al., 2014). The GRE scores and UGGPA are also admissions requirements for many doctoral degree programs. The GRE scores are vital during the admissions process of the doctoral degree in education, therefore emphasizing the importance of scholastic abilities of doctoral candidates to perform in a rigorous program of doctorate in education.

Academic goals are a strong predictor of educational achievement. In a mixed research investigation, Onwegbuzie and Wao (2011) found three out of four students cited academic goals as their reason for pursuing a doctoral degree in education. These researchers chose the doctoral degree of education because it had persistently been the longest TTD over other fields of study (Onwegbuzie & Wao, 2011). The study investigated 1,028 students between 1990 and 2006, in which the doctoral student was integrated into five separate domains (Onwegbuzie & Wao, 2011). Those domains included academic, social, economic, personal, and external factors in relationship to TTD of their doctoral degree in education (Onwegbuzie & Wao, 2011).

This study found that all factors are related, but that institutional factors had the strongest influence and personal factors had the lowest influence in the students' TTD. The study brought to the forefront the importance of the institutional factors in the doctoral degree students' TTD and the completion of the degree. A research focus on the factors at the university level of the doctoral degree in education is imperative to investigate the impact on the completion of the terminal degree.

### **Decreased Enrollment in Doctoral Education Programs**

The second historical trend is a decrease in doctoral degree in education program enrollment from previous years (NCES, 2018; NSF, 2009, 2014, 2015). Between 2013 and 2015, graduate enrollment was reported flat as total graduate enrollment had only grown by 1.1% between fall 2014 and fall 2015 and enrollment for doctoral education programs at 0.1% (Allum & Okahana, 2014; Okahana, Feaster, & Allum, 2016; Patel, 2015). Doctoral education enrollment is considered flat and is not on the rise.

Even master's degrees in education saw a change in degree obtainment at -6.2% (Okahana et al., 2016). The one-year rate of change from fall 2014 to fall 2015 for graduate

education applications in education changed by -.09% and the average annual rate of change from fall 2009 to fall 2014 was -3.2% (Allum & Okahana, 2014; Okahana et al., 2016). On the broad spectrum, the one-year rate of change from fall 2014 to fall 2015 for doctoral degree enrollment decreased overall by 4.3% in the CGS report when there had only been a -0.3% one-year rate of change from fall 2013 to fall 2014 in the CGS report (Allum & Okahana, 2014; Okahana et al., 2016). The increase in the percentage of conferred doctoral degrees in education is not in direct relationship to enrollment increases; on the contrary, enrollments in doctoral degree programs in education are not on the rise.

### **High Attrition Rates in Doctor of Education Programs**

The third historical trend is attrition rates for doctoral degree students in education are higher than other doctoral degree programs (NSF, 2015). There were 11,772 doctoral degrees in education conferred in 2015 and that was 9.3% of the total doctoral degrees conferred in the U.S. in 2015 (NCES, 2018; NSF, 2015). Education conferred the lowest percentage of total doctoral degrees for a year since 1985, showing a decrease in 2015 of 1.7% from 2014 (NSF, 2015).

Even though statistics for a 10-year period, 2004-2005 to 2014-2015, identified conferred doctoral degrees increased by 33%, doctoral degrees in education only increased by 19%, showing a decrease in the quantity of doctoral degrees in education being conferred (NCES, 2018). The increase is contradicted by a decrease from 16% to 9% in total yearly conferred doctoral degrees in education (NSF, 2009, 2015). Therefore, the 19% increase is only over the comparison of the one-year span within the 10 years of separation for the conferred doctoral degrees; the 9% decrease is over the average of the yearly conferred doctoral degrees.

### **Ph.D. Completion and Attrition Project**

The Ph.D. completion and attrition has become a focus of doctoral degree education over the past 15 years (CGS, 2014; National Opinion Research Center (NORC), 2016; NSF 2015, 2016). It has been noted that SED provides significant data information on graduate student completion (Lederman, 2016). The SED is funded by the National Science Foundation and five other federally-funded organizations or departments, such as the National Aeronautics and Space Administration, U.S. Department of Agriculture, the U.S. Department of Education, the National Institute of Health, and the National Endowment of the Humanities (Lederman, 2016). The SED is conducted by the NORC at the University of Chicago (NORC, 2016). In the 2015 SED, conferred doctoral degrees rose by 1.9% in 2015 from 2014 (NSF, 2016).

The CGS (2014) conducted a seven-year (2004-2010) survey of doctoral programs in the U.S. with the goal to produce the most comprehensive useful data on the attrition of Ph.D. programs. The CGS's Ph.D. Completion Project promotes reduced attrition rates and reduced TTD averages (Glenn, 2010). The CGS's fourth in the series of reports on Ph.D. completion has published six key factors that influence the student completion of doctoral programs. Those key factors were listed as selection, mentoring, financial support, program environment, research mode of field, and processes and procedures (CGS, 2010; Glenn, 2010).

This report was different from previous reports on data analysis of quantitative statistics of graduate education. The CGS reported on the programs that some universities had used to assist their doctoral students to complete the terminal degree (CGS, 2010; Glenn, 2010). These programs included providing mentorship programs, improving advising programs, increasing the availability of financial assistance, and allowing students access to experience research earlier in

the doctoral programs (CGS, 2010; Glenn, 2010). The programs used at the universities are funded through grants by educational foundations.

**Andrew W. Mellon Foundation.** The Andrew W. Mellon Foundation funded a historical review of reforms in doctoral education, recent initiatives and prospects over the past 25 years in their commitment to improving doctoral education (Judd, 2016). Some of the challenges listed in the historical review were admission and attrition (Weisbuch & Cassuto, 2016). In the realm of admissions, the review listed faculty seeking to clone themselves, value was not given to ingenuity or a wide range of goals, and the use of the GRE indiscriminately (Cassuto, 2016; Jaschik, 2016; Posselt, 2016; Weisbuch & Cassuto, 2016). These views of the admissions process have been at the forefront of multiple publications.

In reference to attrition, the report stated that some programs were guilty of admitting larger amounts of students to cover the more than 50% that would just quit before finishing the doctoral degree programs (Weisbuch & Cassuto, 2016). The report also listed qualifying exams, such as the GRE, as a barricade instead of a preparation for entrance into the dissertation journey. The writers listed portfolios to exhibit scholarly skills as an entrance requirement (Weisbuch & Cassuto, 2016). The report also listed some reforms in doctoral education for 1990-2005 (Weisbuch & Cassuto, 2016). The Graduate Education Initiative was funded by the Andrew W. Mellon Foundation and endeavored to improve the finishing doctoral degree stretch by reducing TTD, doctoral degree attrition, improving effectiveness (Weisbuch & Cassuto, 2016). The report was informative and filled with many acknowledged Doctor of Education challenges and considerations for change.

**Carnegie Project on the Education Doctorate.** The CPED is funded by the Carnegie Foundation and the Council of Academic Deans. It has a goal of better establishing the Ed.D. as

the choice degree of professional educators (CPED, 2014). The CPED's goal is to establish the Ed.D. as the professional practice preparation for educational practitioner's terminal degree (CPED, 2014). CPED wanted to establish a defining difference between the Ed.D. and the Education Ph.D. Two universities participating in the CPED incorporated a client-based research project that added a higher level of research intensity to the Ed.D. (Taylor & Storey, 2011).

Kumar, Dawson, Black, Cavanaugh, and Sessums (2011) conducted the study where the framework of the cohort program developed was the Community of Inquiry (CoI). Data was collected through an online survey and answers were scored on a 5-point Likert-type scale in this quantitative study. Sixteen out of twenty-six students completed the online survey. The study was conducted in accordance with the University of Florida's participation in CPED from 2007-2010. The study was an inquiry into ways to better the Ed.D. and strengthen the degree's effectiveness in the professional practice of the education doctorate. The study illuminated the importance and usefulness of the CoI framework to build a community in an online cohort program instruction for the Ed.D. (Kumar et al., 2011).

**Carnegie Initiative on the Doctorate.** The Carnegie Initiative on the Doctorate (CID) was another program funded by the Carnegie Foundation. This program focused on an internal review by promoting the self-evaluation of faculty members to improve doctoral degree programs (Weisbush & Cassuto, 2016). This program is part of the Carnegie Foundation for the Advancement of Teaching.

## **GRE**

This study has identified three trends in the academia utilization of GRE scores. The first trend is the use of GRE scores as admissions requirements in most doctoral degree programs; the

second trend is the use of GRE scores for predictors of academic achievement; and, the third trend is the use of GRE scores as a predictor of doctoral degree completion (Bleske-Rechek & Browne, 2013; Kuncel & Hezlett, 2007; Kuncel et al. 2001; Kuncel et al., 2010; Miller & Stassun, 2014; Pacheco et al., 2015; Stock et al., 2011; Wao, Ries, Flood, Lavy, & Ozbek, 2016). Admissions committees often use GRE scores to filter doctoral degree program applications below their departments' GRE score cutoff line (Miller & Stassun, 2014; Posselt, 2016). ETS does not advise using cutoff lines for the GRE scores in the admissions process (Clayton, 2016; ETS, 2017; Miller & Stassun, 2014; Posselt, 2016).

The GRE provides graduate program committees with a threshold measurement to assess the prospective graduate student's abilities to succeed in the rigors of a graduate program (Cassuto, 2016; Clayton, 2016; Jaschik, 2016; Posselt, 2016). Some research has proven GRE scores as predictors to GPAs and completion of doctoral degree programs in many fields of study (Kuncel & Hezlett, 2007; Kuncel et al. 2001; Kuncel et al., 2010; Stock et al., 2011). GRE scores have not proven to have a strong indicator of success in bio-medics, STEM, engineering, and a few other scientific doctoral degree programs (Miller & Stassun, 2014; Pacheco et al., 2015; Wao et al., 2016).

**Admissions requirement.** The first trend of GRE score creditability is the importance of the GRE scores as an admissions requirement into many doctoral degree programs. Nationally, GRE scores are considered a strong predictor in the students' academic abilities and are used as a valuable tool in the admissions process into some of the most prestigious doctoral programs (Cassuto, 2016; Jaschik, 2016; Posselt, 2016). Many of the doctoral degree admissions websites list GRE scores as only a small part of the review process, when numerous admissions committees use the GRE scores to filter through the large amount of applications (Posselt, 2016).

Admissions into elite doctoral programs have a strong priority on GRE scores as one method of minimizing the number of applicants processed in the admissions final round of consideration (Cassuto, 2016; Clayton, 2016; Jaschik, 2016; Posselt, 2016; Weisbuch & Cassuto, 2016).

A majority of doctoral programs require the GRE test scores for admission into their programs, but there has been controversy over the wide use of GRE scores for admissions into all doctoral programs. Some researchers have found that gender, socioeconomic status, and ethnicity may not have the same advantages of acceptance into doctoral degree programs because they are not the students to have high scores on the GRE tests (Bleske-Rechek & Browne, 2013; Pacheco et al., 2015). Pacheco et al. (2015), who used composite scores (CS) to predict Biomedical Ph.D. program success of Puerto Rican students in addition to the GRE scores or GPAs, concluded that the GRE scores were not a valuable predictive tool in the admission of 57 students between 2002 and 2011, that were successful in the Biomedical Ph.D. program and therefore is not a productive admission tool. The researchers noted that their Puerto Rican residential students' scores were below the 15th percentile on the GRE (Pacheco et al., 2015). The CS for the 57 students evaluated research experience, degrees, publications, and advanced coursework of each student's personal academic experience (Pacheco et al., 2015). The admission committees used the CS of each applicant to rank their recommendations for acceptance into the Biomedical Ph.D. program (Pacheco et al., 2015). The findings concluded that the GRE scores did not prove predictive value to completion past the third year of the biomedical Ph.D. program (Pacheco et al., 2015). Contrary to the GRE scores, the CS did predict the ability of the biomedical doctoral student to complete the doctoral degree in biomedical past the third year (Pacheco et al., 2015). The study did not find the GRE scores as a

valuable admissions tool as the CS constructed by the researchers, but the GRE scores did prove to have predictive value up to the third year of the 57 participants in the study (Pacheco et al., 2015).

Gender and ethnicity of GRE test takers have become a focal point in the admissions of graduate students. Bleske-Rechek and Browne (2014) investigated the underrepresented students in a STEM graduate program. The study used aggregated GRE scores from the ETS archival database, disaggregated into individual years from 2002-2007 and disaggregated individual scores on the verbal, quantitative, and analytical writing tests (Bleske-Rechek & Browne, 2013). GRE data showed a mean gap in quantitative reasoning in gender scores. The research expounded on the validity of GRE quantitative scores predicting success in graduate STEM training. The researchers elaborated on the importance of including a GRE quantitative score level for gender and ethnicity. The researchers noted that GRE test takers are increasing in diversity. The researchers suggested admissions committees consider the gap in GRE quantitative score means for gender and ethnic differences (Bleske-Rechek & Browne, 2013). These two studies have developed some important research in the diverse needs of representation in the admission process into doctoral degree programs (Bleske-Rechek & Browne, 2013; Pacheco et al., 2015).

**Predictor of academic achievement.** The second trend in GRE score is the ability to predict academic achievement. The GRE is predictive of intellectual abilities, but there may be many other variables needed to be considered in the prediction of academic performance and stamina (Pacheco et al., 2015). In one study of GRE scores and research methodology choices in education doctorates, the researchers found there was no indication that GRE scores correlate to the completion or methodology choice of the doctoral candidate (Rockinson-Szapkiw et al.,

2015). A study by Wang (2013) investigated GRE and GPA at one Midwestern university from 2000-2011 of multiple programs in both masters and doctoral degree levels in engineering. The study used archival data of 1,083 students over the 11-year period, but the data was not present for all the students, so each test performed had a different number of variables involved in the findings (Wang, 2013). The study found that GRE scores are a predictor of GPA in the first and second years and total GGPA of the doctoral program (Wang, 2013). The quantitative and verbal GRE scores are valid predictors of GGPA's, but each test had different patterns in the predicting GGPA's (Wang, 2013). The implications of the study verified GRE scores are a good predictor for graduate admissions, encompassing masters and doctoral program admissions requirements (Wang, 2013).

Wao et al.'s (2016) correlation study of 329 students in construction management graduate programs investigated the predictive ability of the GRE scores to the GGPA. Wao et al. felt strongly that the only purpose of the GRE testing was to measure the academic abilities of the graduate students. The hypothesis was that higher GRE scores would predict higher GGPA's (Wao et al., 2016). The results were a weak indicator of GRE scores to GGPA's (Wao et al., 2016). The quantitative GRE score showed a stronger predictive value than the verbal GRE or the combined GRE scores of the GGPA's (Wao et al., 2016). The study did indicate GRE scores were high, the graduation rates were high, and the retention rates were also high, but the desire of the study was to predict the grades of the completers. The admissions requirements of the construction management graduate programs were successful in producing high completion rates, but the study desired high graduation GPAs and did not show as strong of a relationship as the researchers anticipated (Wao et al., 2016).

In a biomedical Ph.D. program, a study by Moneta-Koehler et al. (2017) investigated the predictor of GRE scores to first-year and graduate GPAs and multiple other variables of archival data on 683 students from 2003-2011. Some of the students had already graduated with Ph.D.s at the time of the use of their archival data records (Moneta-Koehler et al., 2017). The research study examined multiple variables that included publishing, presentations, independent grants and fellowships, TTD, passing the qualifying exam, GGPA, and first-year GPA in correlation with the GRE scores (Moneta-Koehler et al., 2017). GRE scores moderately predicted the first-year GPAs, weakly predicted the second-year GPAs, and did not predict the successful graduation of the doctoral degree in biomedical (Moneta-Koehler et al., 2017). The desire of the researchers was to examine the predictive value of GRE scores on the preparation of the biomedical doctoral candidate to perform scholarly biomedical research (Moneta-Koehler et al., 2017). The UGGPA did predict completion of the Ph.D. in the study (Moneta-Koehler et al., 2017).

The study by Young et al. (2014) of 30 Master of Business Administration student groups across several universities, investigated the validity of scores of the GRE revised general test to the ability to forecast performance. The results from the 30 student groups were then averaged and weighted by sample groups (Young et al., 2014). The GRE revised quantitative test showed predictive value in both the first-year GPA at .39 increase and a .37 increase in MBA GGPA (Young et al., 2014). Two of the institutions in the study did not use analytical writing scores in their admissions requirements and predictive values were not present in the institutes that did use the analytical writing test for admissions requirements, so the numbers were different in the test including GRE analytical writing tests (Young et al., 2014). The GRE revised verbal test did show predictive values in this study, with the GRE revised quantitative

test the single best predictor of success in MBA GPA (Young et al., 2014). The GRE quantitative and the GRE verbal scores were significant predictors of both the first-year GPA and cumulative GPA for an MBA (Young et al., 2014).

Moore (2013) conducted a research study on the predictors of GRE scores and GPAs on the Praxis exam in language-speech pathology at three state supported Kentucky institutes. The verbal, quantitative, and analytical writing GRE scores and GPAs all proved to have significant predictive abilities on the Praxis exam (Moore, 2013). Other predictors were also tested in this research. This study used archival data of 280 graduate students' records from the years of 2008-2012 (Moore, 2013). The Praxis exam evaluated candidates of language-speech pathology programs for licensure to obtain the necessary credentials in the language-speech pathology field (Moore, 2013). The success of this program was in the predictive ability of the GRE and GPA admissions requirements.

### **Predictor of Doctoral Degree Completion**

The GRE has been the focal point of research over the past few decades. Some research studies have had a measure of success in using the GRE scores as a predictor of doctoral degree completion (Kuncel & Hezlett, 2007; Kuncel et al., 2001). GRE scores have been found successful in predicting the completion of the doctoral degrees in some programs and are accepted as an important part of the admissions process in most doctoral degree programs.

In a Hispanic-serving University, a dissertation research study investigated the predictive value of GRE scores to the variables of GPA and graduate completion in sequential mixed methods design (Perez, 2011). The quantitative phase one analyzed the GRE scores to the variables of graduation rate and GGPA. The qualitative phase two interviewed 11 students from phase one to better understand the characteristics of student behaviors in the success of the

graduate programs (Perez, 2011). The study specified that both the verbal and quantitative GRE scores were predictors of graduate success but did not find GRE scores to be predictors of doctoral program success (Perez, 2011). In phase two, the results were inconclusive to the predictive value of the GRE scores, but it was stated that the GRE scores did influence the access into the graduate programs (Perez, 2011). The study suggested that the quantitative and verbal GRE scores were predictors for success in the master's program, but the quantitative GRE scores did not predict the doctoral degree success (Perez, 2011).

One study found that economic Ph.D. students had a 23% higher probability of completion with a 10-point higher GRE quantitative score and determined quantitative GRE scores to be an indicator in the student's completion of the doctoral degree in economics (Stock et al., 2011). A study of 1,083 engineering doctoral students showed a predictive value of quantitative and verbal GRE scores to the GGPA (Wang, 2013). The validity of GRE scores was tested in each area, and the predictive value on both master's and doctoral GPAs was investigated (Wang, 2013). In fact, GRE scores were found to have validity over UGGPA in predicting the GGPA (Wang, 2013). The GRE scores in verbal and quantitative could predict first-year and second-year GPA (Wang, 2013). These findings will have a significant impact on graduate program admissions and the use of GRE scores as predictors of success in engineering graduate education (Wang, 2013). Positive results of research studies on the GRE scores as a predictor of successful completion of a doctoral degree are not always the case.

A research study represented 256 graduate nursing students at the beginning of the program (Brown, 2011). The study found that only 159 of those graduate nursing students completed the program (Brown, 2011). GRE scores were not found to be a predictor in the completion of the program, but UGGPAs were higher for those students completing the program

(Brown, 2011). This study concluded that UGGPAs were better than GRE scores for predicting academic success in the graduate nursing program at that university (Brown, 2011). The factors of GRE scores and GPAs validate the requirements in many doctoral program admissions to point in the direction of the successful completion of the terminal degree.

Conducting a meta-analysis study, Kuncel et al. (2001) with 82,659 students in 1,753 independent sample data sets, with many variables, focused on the predictive abilities of the GRE scores. The study examined the GRE scores and UGGPAs for their abilities to predict TTD (Kuncel et al., 2001). The study also categorized the characteristic of traditional students and nontraditional (age 30 and older) students; the GRE scores and UGGPAs were found to be predictors of the first-year GGPA (Kuncel et al., 2001). The researchers found the GRE scores of the verbal, quantitative, and analytical writing tests as strong predictors of the first- and second-year GPAs for masters and doctoral degree participants (Kuncel et al., 2001). This study put to rest some of the previous controversial concepts that small, inconsequential, unexamined variables could influence the study by the very small corrected standard deviation (Kuncel et al., 2001). This study did not find GRE scores or UGGPAs a predictor of TTD in a doctoral degree (Kuncel et al., 2001). The researchers concurred that the GRE subject test may not be a valid predictor because of a lack of education in those subjects (Kuncel et al., 2001). The researchers emphasized that the GRE quantitative and verbal scores predicted the students' ability to acquire and process learned knowledge (Kuncel et al., 2001).

Another meta-analysis study of 100 previously conducted studies and 10,000 students synthesized the results to produce a larger perspective of the originally studied archival data (Kuncel et al., 2010). The predictive abilities of the GRE require a large data sampling to minimize the variables in predictive validity (Kuncel et al., 2010). Meta-analytical studies use

the previously published academic literature to derive the data sets by aggregating or disaggregating them for their study (Kuncel et al., 2010). The study found information to examine three different variables of the performance of the students in the graduate programs (Kuncel et al., 2010). The three examined variables were first-year GPA, overall GPA, and faculty ratings (Kuncel et al., 2010). The databases were found to be very reliable with a 99% agreement, indicating that the majority of the desired data were present in the study (Kuncel et al., 2001). This empirical study used data for both masters and doctoral degree programs to investigate the ability of GRE scores to predict performance of graduate students (Kuncel et al., 2010). The data was sorted by degree levels, and the doctoral degree students represented in this study were already in the programs so their previous UGGPAs were not evaluated in this study (Kuncel et al., 2001). This study desired to investigate the validity of GRE scores with the level of degree in its predictive abilities on academic performance (Kuncel et al., 2010). The research study validated the use of GRE scores in predicting student performance in first-year GPA and GGPA for masters and doctoral degree students (Kuncel et al., 2010). The ability of the GRE scores to predict the academic success of the graduate student is very important in the overall evaluation of the completion of the terminal degree and the components resulting in the success of the doctoral degree student.

**GRE gap.** Some research studies explore the gender, ethnicity, and income gap as a possibility for admissions committees needing to supplement or completely change admissions requirements to exclude the GRE scores. One research study investigated the nonresidential population of universities that were admitting more local students than residential diverse gender and ethnic low-income students (Jaquette, Curs, & Posselt, 2016). The GRE scores are considered to have a gap of the level of scores that can be obtained by the students that were the

focus of this study. The research showed a strong negative relationship in the study (Jaquette et al., 2016). This study evaluated the faculty of admissions committees in 10 selective schools and concluded that the GRE scores were used as a gatekeeper to limit diversity in the graduate admissions (Posselt, 2014). A comparative ethnographic case study of 10 graduate program admissions procedures analyzed faculty evaluation procedures during the admissions process to determine the actual merit of admissions criteria for diversity enrollment (Posselt, 2015). In a longitudinal study for the years 1972-2004, equity for race and ethnicity was modeled in the admissions procedures. The admissions standards reveal the gap of selective college acceptance in diversity (Posselt, Jaquette, Bielby, & Bastedo, 2012). Another study explored the underrepresented gender diverse students with GRE scores that may keep them from being considered into some graduate programs. This study highlights an enrollment gap created by the difference in gender GRE scores (Bielby, Posselt, Jaquette, & Bastedo, 2014).

## **GPA**

**Admissions requirement.** The GGPA of the doctoral student's master's degree is a focal point of obtaining entrance into many doctoral programs. The UGGPA and GGPA are considered important predictors in predicting the abilities and discipline of a doctoral student (Allum & Okahana, 2015; Brown, 2011; Burns, 2011; CGS, 2014; Kuncel & Hezlett, 2007; Kuncel, Crede', & Thomas, 2007; Kuncel et al., 2001; Kuncel et al., 2010; Okahana et al., 2016; Perez, 2011; Wang, 2013). The GPA is an indicator in the persistence and discipline of the doctoral candidate. The GPA and the GRE have been reported as an important combination in the success of graduate students (Brown, 2011). GGPA's were found significantly higher in the graduate nursing program of this research study for the students who completed the degree program in relationship to the students' UGGPA as a predictor (Brown, 2011). A study of GRE

scores as a predictor used the GPA as one of the variables in a Hispanic-serving University (Perez, 2011). The GRE score did have a positive relationship to the GPA and graduation rate (Perez, 2011). UGGPAs were found to be a strong predictor in a research study of engineering doctoral students (Wang, 2013). In another quantitative study, 12 Registered Nurse Anesthetics programs were the focus (Burns, 2011). The study analyzed the records for 914 students admitted into the Registered Nurse Anesthetics programs (Burns, 2011). The study investigated the predictive admissions requirement to improve student retention and found the GPA and total GRE to be predictors of success and significant admissions variables (Burns, 2011).

Kuncel et al. (2007) studied UGGPA predictive validity with the GMAT for graduate student performance. In the study of 402 independent samples of 64,583 students, the research found significant predictive validity from the variables of the UGGPA and the Graduate Management Admission Test scores (Kuncel et al., 2007). In the meta-analysis, Kuncel et al. (2001) investigated the predictive abilities of the UGGPA to the GGPA and found it was a successful predictor of GGPA. Although, the UGGPA or the GRE were not predictors of TTD (Kuncel et al., 2001). In a study that also was a meta-analytic investigation, Kuncel et al. (2010) found that GRE scores can be predictors of the GGPA and further validated the importance of the GRE and the UGGPA in the admission process for doctoral degree programs. The students' previous productive academic abilities are predictors of their tenacity in obtaining further educational endeavors.

### **Resiliency**

One positive aspect is a better preparation for the entrance into a doctoral degree program could lead to more successful completion of the program. In a research study of a biomedical program, a one-year post baccalaureate training program for underrepresented students provided

an intensive doctoral training program to prepare students for success in the doctoral degree (Hall et al., 2016). Out of the 18 students trained, 17 students successfully entered doctoral programs that had previously been declined admissions (Hall et al., 2016). GRE scores improved after the intense training program (Hall et al., 2016).

A second positive aspect is an aspect of higher resilience in the completion of the doctoral degree in education leadership (Blue, 2008). In a research study, Tinto's structure of student integration, the second rite of passage for this research study, was used as the conceptual framework to test the students in a doctoral degree of education leadership (Blue, 2008; Lovitts, 2005, Sader, 2013; Tinto, 1988). The resiliency characteristic of initiative was the predictor of a completer and a non-completer in the doctoral degree program (Blue, 2008). The GPA and GRE were used for the admission criteria in this program, but a true indicator of success was the predictor of initiative (Blue, 2008). This study brings to the table the importance of the GRE scores to help the doctoral candidate obtain entrance into the program, but there are many other factors that contribute to the successful completion of the terminal degree (Blue, 2008).

### **Dissertation Candidate Identity**

A scholarly identity is a significant part of the dissertation journey (Leshem, 2007; Limberg et al., 2013; Noonan, 2015). McAlpine (2012) wrote about identity-trajectory of the doctoral candidate and the importance of incorporating the agency, resourcefulness, and independence of the doctoral degree student into the doctoral experience. In this study, narratives were collected from 60 students; at least 20 of those students continued completing the activity logs for three years, then evaluations were written about their perspectives and activities during their dissertation journeys (McAlpine, 2012). The key constructs of agency, personal, past, opportunity, and horizons were considered in the development of the doctoral candidate

(McAlpine, 2012). Three interwoven strands of networking, intellectual, and institutional were considered as the conceived academic experience in this research study (McAlpine, 2012). The recommendation of this qualitative research study was to include within the admissions process the student's personal goals and academic agencies of the student's experience to assist the student to achieve the completion the terminal degree (McAlpine, 2012). The study evaluated the use of the student's past and future goals as a predictor in the admissions process of the doctoral degree program (McAlpine, 2012).

### **Publisher**

The second rite of passage for the doctoral degree student is the integration stage. Research prolongs the TTD and a lack of research writing causes the doctoral candidate to lose focus and drop out of the doctoral degree program (Stock et al., 2011). There are arguments on both sides of this issue. In the meta-analytic study, GRE scores were found to be predictors of the number of citations and scholarly publications for graduate students (Kuncel et al., 2001).

Co-authorship plays an integral role in the doctoral candidate becoming published in referred publications (Kamler, 2008; Pritcher, 2011). The research projects are often published in joint effort with the candidate and the dissertation committee (Kamler, 2008; Pritcher, 2011; Onwuegbuzie & Wao, 2011). Also, a candidate can publish with other professors or researchers in which they have engaged in the scholarly network. Helping with writing is an integral part of the research support that a candidate needs (Onwuegbuzie & Wao, 2011).

Publishing is a fundamental part of the dissertation experience. Numerous doctoral students have expressed fearfulness and tremendous struggle about the publishing aspects of academia (Kamler, 2008). A key move would be to incorporate co-authorship into the requirements of the dissertation journey (Kamler, 2008). Several students simply produce what

is expected of them without much ambition to go beyond their personal limitations. Kamler (2008) elaborated that students aim for the advisor's requirements, also elaborating on a lack of support causing doctoral students' reluctance to write for journal submission. One of the negative arguments in the non-completion of the terminal degree is a lack of integration into the society of academia, but publishing is an important part of the integration into academia.

### **Future**

The future of doctoral education programs is being investigated and evaluated by programs, such as CPED and CID, that are researching better methods to train future education doctoral students (Kumar et al., 2011; Parks, 2016). The CPED desired to distinguish between the educational Ph.D. and the Ed.D. (Taylor & Storey, 2011; Weisbush & Cassuto, 2016). The future holds many possibilities for improvement in the retention of doctoral students.

A research study examined an undergraduate program to assist underrepresented students better prepare for graduate education. The program supplied university administrations with the information for targeted underrepresented students before they entered higher education. The researcher referred to the programs as the universities' opportunities to build a bridge and a pipeline to higher education achievement. The research study surveyed the participants for satisfaction levels of the program (Sader, 2013). These types of programs are a consideration for the future to allow doctoral degree programs to close the gap on GRE scores for the underrepresented target groups that may need some diverse types of requirements for admissions considerations into doctoral degree programs.

### **Summary**

This research study focused on the correlation of the admissions acceptance GRE scores on the university level and the conferred Doctor of Education degree from the universities in the

research study in education to fill a gap in research literature. Historically, there are high attrition rates in doctoral degree programs, and research literature has studied the importance and diverse ways universities have strived to increase doctoral degree program retention. Research literature has expounded on many positive and negative aspects of admissions requirements into doctoral degree programs. Attrition is the largest negative of the education process. There is a price tag to the loss of a student's success in academia. Society carries the price of a loss of invested funding to the universities' doctoral degree programs with attrition rates over 30%. These funds are a loss of invested tax dollars and the investments of the student in their non-completed doctoral degree program (Bowen, Chingos, & McPherson, 2009). There are multiple studies across many fields in recent literature as researchers endeavor to investigate a solution to high attrition rates: biomedical (Hall et al., 2016; Moneta-Koehler et al., 2017; Pacheco et al., 2015); economics (Stock et al., 2009; Stock et al., 2011); engineering (Wang, 2013); construction management (Wao et al., 2016); business (Young et al., 2014); speech-language pathology (Moore, 2013); registered nursing (Burns, 2011); graduate nursing (Brown, 2011); Hispanic ethnicity (Perez, 2011; Vaquera, 2008); and Austrian science doctoral degree program (Vladmir, 2010), to list only a few. There is a little research in the field of education and no research in the relationship of the aggregated average GRE scores at the university level to completion of the doctoral degree. The scholarship of the non-completer is also a loss to society.

The UGGPA, GGPA, and the GRE scores are just a few of the myriad of admissions requirements a prospective doctoral degree student can face to be accepted into a doctoral degree program. There has been an abundant amount of research into the predictive abilities of GRE scores and multiple aspects of the admissions process. The literature research substantiated the

need for this study to investigate a correlation between the admissions acceptance GRE scores at the university level and the conferred Doctor of Education degrees at those universities.

This study looked at the importance of the GRE test scores in the perspective of the admissions process on a university level with the aggregated GRE scores being accepted into the Doctor of Education programs in comparison to the numbers of conferred doctoral degrees from each university program of the 51 universities examined. This study did not investigate the predictability of the GRE to a successful completion of the doctoral degrees of education. This study did not fill the research gap and more in-depth studies need to attempt to answer the questions of the predictabilities of the GRE and the completion of the Doctor of Education degree, along with other doctor degree programs to minimize the attrition of potential scholarship.

## **CHAPTER THREE: METHODS**

### **Overview**

The correlational analysis was used to analyze the strength of the relationship between the university admissions aggregated GRE scores and the conferred degrees in Doctor of Education at 51 universities in the years of 2015 and 2016 in this quantitative research study. Chapter Three examines the design of this study, the research questions and hypotheses, the participants and setting, procedures, and the data analysis of the research.

### **Design**

A correlation design was employed in this study. A correlation design is acceptable for research that is not an experimental study, has large numbers of participants, is seeking a correlational relationship, and is seeking to know if direction of the relationship is positive, negative, or if there is no relationship (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017). This study examined the degree of casual relationship between the variables but does not establish a causation of the variable relationship, (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017). The correlational study investigated the relationship between the predictor variables of the aggregated average GRE scores, disaggregated into the following categories of GREV, GREQ, GREVQ, GREA, GREVQA, and the criterion variable of the conferred doctoral degrees in education at the university level of 51 universities in the years of 2015 and 2016.

The current study used aggregated archival data for the data sets at the university level for the years of 2015 and 2016 to investigate the relationship between aggregated university average GRE scores and conferred Doctor of Education degrees. These aggregated archival databases were the NSF (2015) and the US News and World Report (2016/2017) Education

Graduate Schools. This study did not include the ranking systems in the research of 51 universities. The study used the aggregated average admissions GRE scores from the US News and World Report Education Graduate Schools Report for the years of 2015 and 2016. Along with the total conferred doctoral degrees in education for each of the 51 universities in the NSF Doctoral Degree Reports for 2015 and 2016. The rationale for using two different archival data sources was the individual archival data provided by each data source. The aggregated archival data was used in the research study for the purpose of investigating the significant relationships of the variables to establish the positive, negative, or neutral relationship of the variables and the effect size of those relationships in a Pearson's correlation using SPSS 23 (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017).

### **Research Questions**

**RQ1:** Is there a significant correlation between the average combined GRE Verbal and GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ2:** Is there a significant correlation between average GRE Verbal scores and the number of completed doctoral degrees in education at the university level?

**RQ3:** Is there a significant correlation between average GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ4:** Is there a significant correlation between average GRE Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

**RQ5:** Is there a significant correlation between the combined average GRE Verbal, Quantitative, and Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

### **Null Hypotheses**

**H<sub>0</sub>1:** There is a significant correlation between the combined average GRE Verbal and GRE Quantitative scores and the number of completed doctoral degrees in education at the university level.

**H<sub>0</sub>2:** There is a significant correlation between the GRE Verbal score and the number of completed doctoral degrees in education at the university level.

**H<sub>0</sub>3:** There is a significant correlation between the average GRE Quantitative score and the number of completed doctoral degrees in education at the university level.

**H<sub>0</sub>4:** There is a significant correlation between the average GRE Analytical Writing score and the number of completed doctoral degrees in education at the university level.

**H<sub>0</sub>5:** There is a significant correlation between the average combined GRE Verbal, Quantitative, and Analytical Writing scores and the number of completed doctoral degrees in education at the university level.

### **Participants and Settings**

The participants in the research study are homogeneous. The study used aggregated archival data from 51 U.S. doctoral degree granting universities in education that conferred the Doctor of Education degrees for the years of 2015 and 2016 (NSF, 2015; US News and World Report, 2016, 2017). The sample of 51 universities in this study that conferred Doctor of Education degrees in the years of 2015 and 2016 were all located in the United States of America. The effect size of the 51 universities sampled exceeded the required minimum of 48 subjects for a medium effect size with the statistical power of .7 at the .05 alpha level (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017). The 51 universities were located both in rural and metropolitan areas in following states: Arizona,

California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin (NSF, 2015; US News and World Report, 2016, 2017). For this study, the number of participants were the 51 universities in the study with conferred 2,815 Doctor of Education degrees and in 2015 and 2,037 Doctor of Education degrees in 2016, bringing the total of Doctor of Education Degrees during the 2015-2016 academic years to 4,852 (NSF, 2015; US News and World Report, 2016, 2017). There were both private and public universities included in the sample.

All the database information was homogeneous, and the specifics of each of the 51 universities' Doctor of Education programs were anonymous. The only information obtained by the researcher was the aggregated admissions GRE scores and the number of conferred Doctor of Education degrees for the years of 2015 and 2016. The universities chosen for this study had to meet the criteria of requiring admissions GRE scores for the Doctor of Education programs and be listed in both the US News and World Report Ranking of Doctor of Education degree programs and NSF SED Rankings (NSF, 2015; US News and World Report, 2016, 2017). The top 51 universities in the two database rankings that met the aggregated admissions GRE data base requirements were sample participants in the archival data research study.

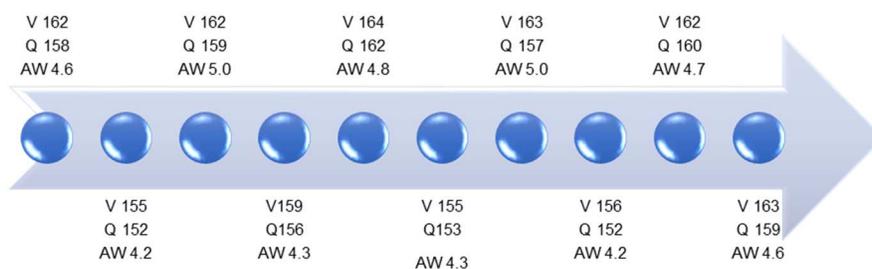
### **Instrumentation**

The archival data consisted of the anonymous participants, in the form of numerical aggregated archival data as the number of recipients of doctoral degrees in education at the university level in the years of 2015 and 2016 (NSF, 2015; US News and World Report, 2016, 2017). The participants were only identified as a number in the 51 universities number of

degrees granted by the Doctor of Education degree program (see Table 2). Each university had average aggregated GRE scores that were disaggregated into the categories of quantitative, verbal, and analytical writing scores given in the archival data (see Figure 3). Each university with GRE scores that conferred doctoral degrees in education granted for the years of 2015 and 2016 were included in the aggregated archival data (see Table 1). All the archival data was entered in two data sets in SSPS. The research excluded universities that did not require admissions GRE scores.

### Graduate School Rankings

**NSF.** The NSF Ranking of Earned Doctorate Degree Survey is a publicly published survey that nationally ranks doctoral degree programs by the number of conferred doctoral degrees each year (Kena et al., 2015; NSF, 2014, 2015). The ranking of the top 20 doctorate degree granting universities is solely based on the number of doctoral degrees conferred by those universities each year of the survey. Therefore, the NSF ranking basically includes only those doctoral degrees granting universities with the largest amounts of conferred doctoral degrees (Kena et al., 2015; NSF, 2014, 2015). This researcher has culled the information of the top 10 universities of the NSF ranking in the Table 1.



*Figure 3.* Doctor of Education program admissions averaged GRE score from the Top 10 Universities: US News and World Report 2017 Ranking.

*Note.* The Figure was developed in Word by the researcher. The GRE sub scores were adapted from US News and World Report, 2017, Compass Pass purchased by the researcher from: <https://www.usnews.com/best-graduate-schools/search?program=top-education-schools&name=>

Table 1

*51 Universities' Doctor of Education Degrees in the years of 2015 and 2016*

University #	2015	2016	University #	2015	2016
1	36	40	27	23	18
2	40	32	28	17	40
3	49	60	29	19	19
4	16	19	30	50	85
5	67	70	31	23	34
6	0	11	32	53	80
7	136	184	33	8	16
8	17	52	34	54	67
9	52	48	35	95	121
10	10	10	36	48	18
11	50	54	37	52	80
12	83	72	38	76	115
13	20	48	39	80	104
14	14	40	40	29	20
15	31	34	41	10	34
16	10	177	42	41	56
17	45	55	43	46	72
18	71	63	44	57	80
19	25	27	45	50	26
20	29	45	46	24	57
21	87	117	47	13	40
22	82	155	48	37	63
23	25	51	49	13	24
24	63	75	50	12	32
25	9	16	51	6	23
26	16	38			

*Note.* University # is the number assigned to the university by the researcher in place of the name of the university.

**US News and World Report Graduate School Ranking.** The US News and World Report Graduate School Ratings are a publicly published rating with the option to pay for more detailed information on each graduate school evaluated. The rankings take into consideration UGGPA, employment outcomes, faculty ratings, program average GRE scores, and some degree specific areas. There are six distinct categories that are rated and evaluated on individual methodologies according to the needs of the graduate programs (Smith-Barrow, 2016). The

researcher has given numerical value in place of university names, culled the GRE percentiles, and averaged the aggregated GRE scores in each category to arrive at the information provided on Table 2 (see also Figure 3).

Table 2

*Top 10 Education 2017 US News and World Report Ranking: Conferred Education Degrees and GRE Verbal, Quantitative, and Analytical Writing Average Score Percentile Report*

University # - DDEDU #	Verbal Percentile	Quantitative Percentile	Analytical Writing Percentile
1 – 40	92	73	84
2 – 32	90	76	86
3 - 60	72	47	68
4 – 19	92	67	93
5 – 70	68	51	73
6 – 11	94	82	91
7 – 184	82	72	73
8 – 52	90	73	93
9 – 48	68	47	68
10 – 10	90	7	84

*Note.* Doctor Degree of Education University (DDEDU). University # is the number assigned to the university by the researcher in place of the name of the university.

### **Educational Testing System**

ETS is the company that generates and conducts the GRE. The GRE is a standardized test that is accepted for admissions into many graduate programs. The GRE is administered and scored by ETS (ETS, 2017). It was developed in 1949 for the United States testing of admission of students into graduate schools for the purpose of testing and screening applicants for

admissions into graduate programs (ETS, 2017; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013).

The GRE has three separate tests that measure the intellectual skill and ability of the student. Each field has established a range of GRE scores for their admission requirements based on the skills needed to complete the graduate and doctoral program degrees (ETS, 2017; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Wang, 2013). The GRE score range in the verbal test is 130-170, the score range for the quantitative test is 130-170, the combined score range for both the verbal and the quantitative tests is 260-340, and the analytical writing score range is 0-6 (ETS, 2017).

The average education major GRE scores for 2015 were 151 for the verbal test average, 148 for the quantitative test, and 3.9 for the analytical writing test (Kapelke-Dale, 2017; Swimmer, 2015, 2017). In 2015, the top 10 university education graduate programs average admissions GRE verbal score was 160.3 compared to the average of 151 for an education major, and the average GRE quantitative score was 156.6 compared to the average of 148 for an education major (Kapelke-Dale, 2017; Swimmer, 2015, 2017). Comparable with the 2017 top 10 university education graduate programs, average admissions GRE verbal scores ranged between 155-164, the average admissions GRE quantitative scores ranged between 152-160, and the average admission GRE analytical writing scores ranged between 4.2 and 5.0 (see Figure 3; Kapelke-Dale, 2017; Swimmer, 2015, 2017). The 2017 average aggregated GRE scores of the top 10 university graduate education programs in verbal was 160.1, quantitative was 156.8, and analytical writing was 4.57 (US News and World Report, 2017). These average admissions GRE scores are marginally higher for the 2017 top 10 university education graduate programs than the average education major test scores leading to a more competitive position for these programs.

Although GRE scores are required for admission to most graduate degree programs, there has been no substantial proof that GRE scores alone have the predictive value of the completion of a terminal degree (Pacheco et al., 2015). Historically, it has been a source of measurement of the perspective students' academic ability to perform in a graduate environment. In fact, the ability of the GRE scores to predict student performance has been a subject of much controversy and many years of scholarly research (Bleske-Rechek & Browne, 2014; Blue, 2008; Brown, 2011; Darolia et al., 2014; Grasso & Valentine, 2009; Kuncel et al., 2010; Lederman, 2016; Liu, Klieger, Bochenek, Holtzman, & Xu, 2016; Pacheco et al., 2015; Perez, 2011; Rockinson-Szapkiw et al., 2015; Vaquera, 2008; Vladimir, 2010; Wao, 2010; Wang, 2013). The validity and reliability of the GRE scores are defined as trustworthiness in a study that derived the values of trustworthiness on a 100-point scale as follows: reading skills - 84, reading application - 91, math skills - 83, math application - 88, writing skills - 81, and writing application - 81 (Monaghan, 2006). Many research studies have concluded that the GRE scores have been valid, reliable, and trustworthy over the decades of testing students for acceptance into admissions of graduate education.

The new revised GRE test has a Score Select option that allows the test taker to pick and choose which test scores are sent to each university and the student can choose to take the test on paper or the computer-delivered option. The cost of the GRE test is over \$200.00 for each attempt, and at an additional cost, the GRE Prep-test series can also be purchased. The test can be taken up to five times in a 12-month period with a six-week waiting period between each attempt (ETS, 2018). It is possible to study and retake the GRE test to improve the students' scores and then choose which of those scores are sent to each university admissions department.

**GRE analytical writing test.** The analytical writing test on the GRE is calculated as a separate score from the other tests on the examination. The analytical writing test measures the ability to articulate critical thinking skills (Barneron, Allalouf, & Yaniv, 2016; Breyer, Rupp, & Bridgeman, 2017; Bridgeman, & Ramineni, 2017; Briehl, & Wasieleski, 2007; Burmeister et al., 2014; Crossley, & McNamara, 2016; ETS, 2016, 2017; Hatchett, Lawrence, & Coaston, 2017; Pacheco et al., 2015). The analytical writing test has one section with two separate tasks, and the student is given 30 minutes to complete each task, allowing the student a total of 60 minutes to complete this section of the test (ETS, 2018).

Some university doctoral programs have a set of analytical writing GRE scores or analytical writing GRE percentiles that are part of the consideration for admissions acceptance and these are listed for the perspective student to understand what is required to be accepted into the graduate program (Wang, 2013). The analytical writing test is scored from an interpretative data scale of percentiles and given a point value; the final testing score is in half-point increments as follows: 6 for the 99 percentile, 5.5 for the 98 percentile, 5 for the 93 percentile, 4.5 for the 82 percentile, 4 for the 59 percentile, 3.5 for the 42 percentile, 3 for the 17 percentile, 2.5 for the 7 percentile, 2 for the 2 percentile, 1.5 for the 1 percentile and 0 for any percentile below the 1.5 level score (ETS, 2017).

**GRE quantitative reasoning test.** The quantitative reasoning test measures the computation skills in arithmetic, algebra, geometry, and data analysis (ETS, 2016, 2017; Pacheco et al., 2015). The quantitative reasoning test has two sections with 20 questions per section. The student is given 35 minutes per section to complete the test (ETS, 2018). The quantitative reasoning test scores range from 130-170 in one-point increments (ETS, 2018).

Some university doctoral programs have a set of quantitative reasoning GRE scores or quantitative reasoning GRE percentiles that are part of the consideration for admissions acceptance and these are listed for the perspective student to understand what is required to be accepted into the graduate program (Wang, 2013). The quantitative test is scored from an interpretive data scale of percentiles and a given point value for each one-point increment scores as follows: 170 being the highest score at the 97 percentiles, 152 being the median score at the 47 percentiles, 130 being the lowest score at the 0 percentile (ETS, 2018).

**GRE verbal reasoning test.** The verbal reasoning test measures the ability to analyze, synthesize, and evaluate relationship and concepts in written material (ETS, 2016, 2017; Pacheco et al., 2015). The verbal reasoning test has two sections with 20 questions per section. The student is given 30 minutes per section to complete the test (ETS, 2018). The verbal reasoning test scores range from 130-170 in one-point increments (ETS, 2018).

Some university doctoral programs have a set of verbal reasoning GRE scores or verbal reasoning GRE percentiles that are part of the consideration for admissions acceptance and these are listed for the perspective student to understand what is required to be accepted into the graduate program (Wang, 2013). The verbal test is scored from an interpretive data scale of percentiles and there is a given point value for each score in one-point increment scores as follows: 170 being the highest score at 99 percentiles, 149 being the median score at 43 percentiles, and 130 being the lowest score at 0 percentile (ETS, 2018).

### **Procedures**

The approval of the Institutional Review Board (IRB) was obtained for the use of archival data that was publicly published before conducting the correlational study. The IRB required that a list of all web addresses be supplied for verification of authenticity, and approval

was granted for the archival databases to be used to complete the correlation research study (see Appendix A). After permission was given for the research, the research began to proceed to process the archival data from each of the necessary databases (Allum & Okahana, 2015; CGS, 2014; NSF, 2015 US News and World Report, 2016, 2017). The participants were anonymous because databases used in this study provided numerical statistics and the identity of all the participants were not known to the researcher. The researcher entered the archival data information into two datasets in SPSS 23 for the years of 2015 and 2016. Although the names of the students were not known to the researcher, the names of the universities were listed in the databases. The researcher then assigned a numerical value to each university based on the ranking that universities' Doctor of Education programs had received in each database. The methodology of the NSF database was solely based on the numbers of conferred Doctor of Education degrees the universities had graduated during the academic year (NSF, 2015). The methodology of the US News and World Report Graduate Education Ranking was based on a mixed method of methodology that is not publicly disclosed (US News and World Report, 2016, 2017). The research used the top 51 universities on the combined listing from both databases that required admission GRE scores for their Doctor of Education programs.

The researcher entered the universities' code numbers and the average admissions GRE scores aggregated data into SPSS 23. The average admissions GRE aggregated scores were disaggregated into categories of the sub-scores on the GRE test. The categories the researcher listed in SPSS 23 were verbal reasoning, quantitative reasoning, and analytical writing for the universities in the study. The researcher combined sub-scores of GRE tests to answer the questions of score combinations were important in the admissions GRE testing. The sub-scores of verbal reasoning and quantitative reasoning and the sub-scores of the combined verbal

reasoning, quantitative reasoning, and analytical writing were each given a category in SPSS 23 for the universities in the study.

### **Data Analysis**

The data analyzed in this research study was the average GRE scores of the doctoral degree granting universities listed on the NSF Earned Doctorate Ranking and the US News and World Report Education Graduate School Ranking (NSF, 2015; US News and World Report Ranking, 2016, 2017). The variables of the GRE average scores of each university and the number of conferred doctoral degrees for the years of 2015 and 2016 were published in public archival databases (NSF, 2015; US News and World Report Ranking, 2016, 2017).

SPSS 23 was used to determine the descriptive statistics of the mean and standard deviation for the GREV, GREQ, GREA, GREVQA, and the GREVQ scores for each university for both the 2015 and 2016 years. A Pearson's correlation coefficient was used to investigate the correlation relationship of the variables and indicates the strength and direction of that relationship. It reveals if that relationship is positive, negative, or neutral (Laerd Statistics, 2017). A Pearson's correlation does not take a dependent variable or independent variable; all variables are equal with a Pearson's correlation, and a Pearson's correlation coefficient makes no predictions and does not develop any theory about the variables in the study (Laerd Statistics, 2017). The Pearson's  $r$  is the correlation coefficient that represents the direction of the casual correlation relationship and the strength of the correlation relationship; it does not give a causation or infer any prediction of the variables (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017).

The data was analyzed in SPSS 23 for descriptive statistics frequencies, scatter plots, and histograms to prove assumption to be met for a Pearson's correlation coefficient were conducted.

The datasets were analyzed in a bivariate correlation and a Pearson's Product Moment was performed on each variable set according to the null hypothesis being addressed. A significance level for the null hypotheses was  $p = .05$  with a 95% confidence level (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017). The Pearson's correlation has four assumptions that must be met. The first assumption is that the variables must not be ordinal or interval; the variables were aggregated admissions GRE scores (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship; scatter plots were performed to establish linear relationship with line of best fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The fourth assumption is that there is homoscedasticity of the data; linearity and homoscedasticity are determined by the shapes formed in the scatter plots. The data points were in a tube-like shape and evenly distributed from the scatter plot line of best fit (Statistical Solutions, 2018). The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data (Laerd Statistics, 2017). The four assumptions were met, and the Pearson's Product Moment was conducted on each data set for each of the five null hypotheses.

### **Summary**

Chapter Three discussed the design of the study, the questions the study addressed and the null hypotheses the study investigated, the instruments, the participants and settings, the procedures to obtain the variable data, and the data analysis. The results of this research study are detailed in Chapter Four, and the conclusions are detailed in Chapter Five.

## CHAPTER FOUR: FINDINGS

### Overview

Chapter Four will discuss the research questions, the null hypotheses, the descriptive statistics, and the results from the Pearson's correlation study. A breakdown of each GRE test, verbal reasoning, quantitative reasoning, and analytical writing was tested and combined tests of verbal-quantitative and verbal-quantitative-analytical writing, were also investigated. The results of the correlation study were presented and explained in this chapter

### Research Questions

**RQ1:** Is there a significant correlation between the average combined GRE Verbal and GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ2:** Is there a significant correlation between average GRE Verbal scores and the number of completed doctoral degrees in education at the university level?

**RQ3:** Is there a significant correlation between average GRE Quantitative scores and the number of completed doctoral degrees in education at the university level?

**RQ4:** Is there a significant correlation between average GRE Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

**RQ5:** Is there a significant correlation between the combined average GRE Verbal, Quantitative, and Analytical Writing scores and the number of completed doctoral degrees in education at the university level?

### **Null Hypotheses**

**H<sub>01</sub>:** There is a significant correlation between the combined average GRE Verbal and GRE Quantitative scores and the number of completed doctoral degrees in education at the university level.

**H<sub>02</sub>:** There is a significant correlation between the GRE Verbal score and the number of completed doctoral degrees in education at the university level.

**H<sub>03</sub>:** There is a significant correlation between the average GRE Quantitative score and the number of completed doctoral degrees in education at the university level.

**H<sub>04</sub>:** There is a significant correlation between the average GRE Analytical Writing score and the number of completed doctoral degrees in education at the university level.

**H<sub>05</sub>:** There is a significant correlation between the average combined GRE Verbal, Quantitative, and Analytical Writing scores and the number of completed doctoral degrees in education at the university level.

### **Descriptive Statistics**

The data set for 2015 was from 51 universities conferring 2,037 Education Doctoral Degrees, the average verbal and quantitative GRE scores combined and the average verbal GRE score, and the average quantitative GRE score (NSF 2015; US News and World Report, 2016). The data set for 2016 was from 48 universities conferring 2,815 Education Doctoral Degrees, the average verbal and quantitative GRE scores combined, the average verbal GRE score, the average analytical writing GRE score, and the average quantitative GRE score (US News and World Report, 2017). These data sets included the same universities with statistical GRE and Education Conferred Doctoral Degrees statistical information collected for consecutive years of 2015 and 2016 (see Tables 3 & 4).

Table 3

*Descriptive Statistics 2015*

	N	Minimum	Maximum	Mean	Std. Deviation
GREV-2015	51	152	165	157.59	3.407
GREQ-2015	51	149	162	154.47	3.239
GREVQA-2015	51	302	326	312.06	6.313
DDEDU-2015	51	0	136	39.94	27.936
Valid N (listwise)	51				

Table 4

*Descriptive Statistics 2016*

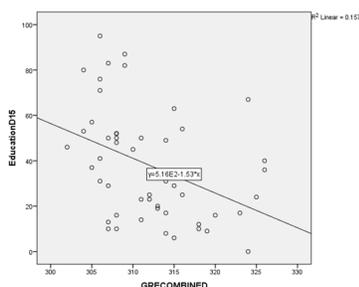
	N	Minimum	Maximum	Mean	Std. Deviation
AUGGPA16	46	2.8	3.9	3.498	.1832
GREV-2016	45	3.9	5.0	4.282	.2972
GREVQ-2016	48	150	166	157.02	3.884
GREVQ-2016	48	299	333	311.15	7.273
GREQ-2016	48	147	167	154.13	3.785
Valid N (listwise)	44				

## Results

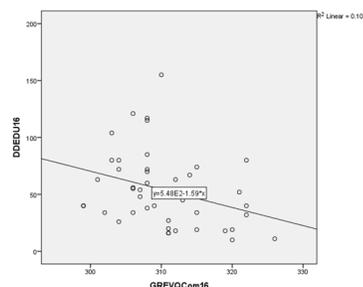
### Null Hypothesis One

Null hypothesis one stated that there was no significant correlation between the combined GREVQ scores and the completion of the education doctoral degree. A Pearson's correlation coefficient was conducted to investigate the null hypothesis one. The Pearson's correlation has four assumptions that must be met. The first assumption was that the variables must not be

ordinal or interval; the variables were aggregated admissions GREVQ scores (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship; scatter plots were performed to establish linear relationship with line of best fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. Scatter plots and Whisker box plots were performed (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The outliers were identified by observation of the scatter plots. The definition of an outlier is the points that are lying away from the body of points (Laerd Statistics, 2017). The fourth assumption is that there is homoscedasticity of the data. The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data and a line of fit was applied to the scatter plots to prove linearity and normal distribution (see Figures 4 and 5; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 4.* Scatter plot of GREVQ 2015.



*Figure 5.* Scatter plot of GREVQ 2016.

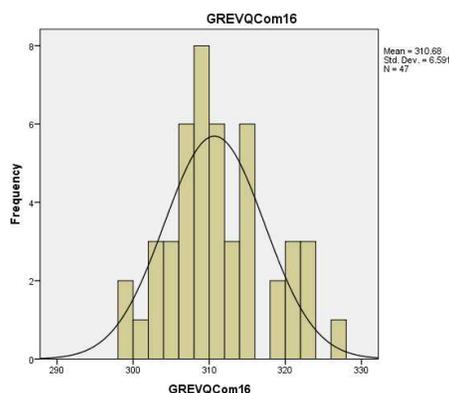
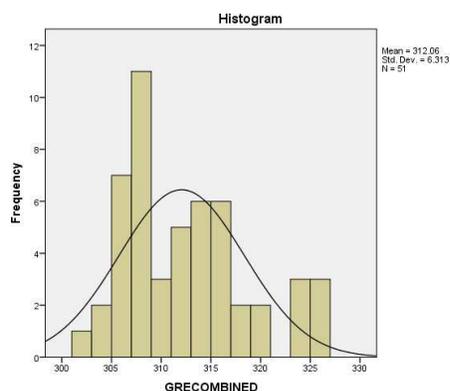
*Note.* GREVQ = GRE Verbal and Quantitative scores for 2015 and 2016 (see Figure 4).

*Note.* GREVQ = GRE Verbal and Quantitative scores for 2015 and 2016 (see Figure 5).

A Pearson's correlation can measure both types of continuous data, interval and ratio.

The variable of admissions aggregated GRE scores are interval measurements and the variable of conferred Doctor of Education degrees are ratio measurements, both are measurements are continuous data (Laerd Statistics, 2017, Statistics Solutions, 2018). A histogram was performed

in SPSS 23 for an independent observation of normality and the data was evenly distributed in a bell shape to prove normal distribution (see Figures 6 and 7; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 6.* Histogram of GREVQ 2105. *Figure 7.* Histogram of GREVQ 2016.  
*Note.* GREVQ = GRE Verbal and Quantitative scores for 2015 and 2016 (see Figure 6).  
*Note.* GREVQ = GRE Verbal and Quantitative scores for 2015 and 2016 (see Figure 7).

The histogram in Figure 6 shows normal distribution for the admissions aggregated GREVQ scores for 2015 and the Doctor of Education conferred degrees for 2015. The histogram in Figure 7 shows normal distribution for the admissions aggregated GREVQ scores for 2016 and the Doctor of Education conferred degrees in 2016.

The results of the Pearson's correlation test for 2015 were  $R(43) = -.396$ ,  $p = .05$  with a significance value  $p = .004$  (see Table 5). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium  $r = .40$ . The results of the Pearson's correlation test for 2016, were  $R(48) = -.323$ ,  $p = .001$  with a significance value  $p = .031$  (see Table 6). According to Cohen's guidelines of association, there was a medium effect size  $r = .32$  (Cohen, 1988). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50

(Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium.

A correlational relationship was found, and the researcher rejected null hypothesis one. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased the combined quantitative reasoning and verbal reasoning admissions aggregated GRE scores decreased.

Table 5

*Pearson's Product Moment of GREVQ 2015*

		DDEDU-2015	GREVQ-2015
DDEDU-2015	Pearson Correlation	1	-.396**
	Sig. (2-tailed)		.004
	N	50	50
GREVQ-2015	Pearson Correlation	-.396**	1
	Sig. (2-tailed)	.004	
	N	50	51

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

*Note.* GREVQ-2015= GRE Verbal and Quantitative 2015, DDEDU-2015= Doctor Degree Education 2015.

Table 6

*Pearson's Product Moment of GREVQ 2016*

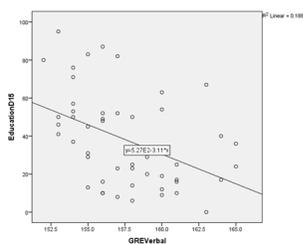
		DDEDU-2016	GREVQ-2016
DDEDU-2016	Pearson Correlation	1	-.323*
	Sig. (2-tailed)		.031
	N	46	45
GREVQ-2016	Pearson Correlation	-.323*	1
	Sig. (2-tailed)	.031	
	N	45	47

\*. Correlation is significant at the 0.05 level (2-tailed).

*Note.* GREVQ-2016 = GRE Verbal and Quantitative 2016, DDEDU-2016 = Doctor Degree Education 2016.

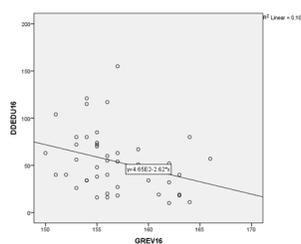
## Null Hypothesis Two

Null hypothesis two stated that there is no significant correlation between the GREV score and the completion of the education doctoral degree. A Pearson's correlation coefficient was conducted to investigate null hypothesis two. The Pearson's correlation has four assumptions that must be met. The first assumption is that the variables must not be ordinal or interval; the variables were aggregated admissions GREV (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship. Scatter plots were performed to establish linear relationship with line of best fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. Scatter plots and Whisker box plots were performed (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The outliers were identified by observation of the scatter plots. The definition of an outlier is the points that are lying away from the body of points (Laerd Statistics, 2017). The fourth assumption is that there is homoscedasticity of the data. The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data and a line of fit was applied to the scatter plots to prove linearity and normal distribution (see Figures 8 and 9; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 8.* Scatter plot of GREV 2015.

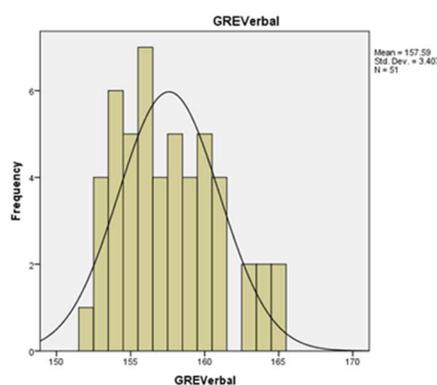
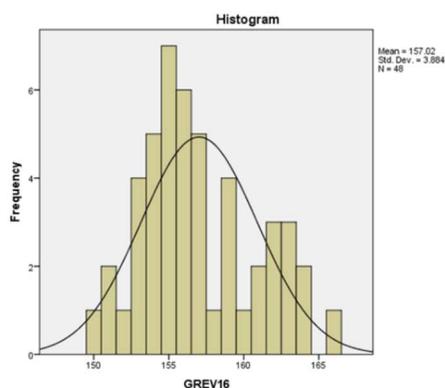
*Note.* GREV 2015= GRE Verbal scores 2015 (see Figure 8).



*Figure 9.* Scatter plot of GREV 2016.

*Note.* GREV 2016= GRE Verbal scores 2016 (see Figure 9).

A Pearson's correlation can measure both types of continuous data, interval and ratio. The variable of admissions aggregated GRE scores are interval measurements and the variable of conferred Doctor of Education degrees are ratio measurements, both are measurements are continuous data (Laerd Statistics, 2017, Statistics Solutions, 2018). Histograms were performed in SPSS 23 for an independent observation of normality and the data was evenly distributed in a bell shape to prove normal distribution (see Figures 10 and 11; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 10.* Histogram for GREV 2015.      *Figure 11.* Histogram for GREV 2016.  
*Note.* GREV 2015= GRE Verbal scores 2015 (see Figure 10).  
*Note.* GREV 2016= GRE Verbal scores 2016 (see Figure 11).

The histogram in Figure 10 shows normal distribution for the admissions aggregated GREV scores for 2015 and the Doctor of Education conferred degrees for 2015. The histogram in Figure 11 shows normal distribution for the admissions aggregated GREV scores for 2016 and the Doctor of Education conferred degrees in 2016.

The results of the Pearson's correlation test for 2015, are  $R(48) = -.434, p = .001$  with a significance value  $p = .002$  (see Table 7). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's

correlation was medium  $r = .4$ . The results of the Pearson's correlation test for 2016, are  $R(44) = -.318, p = .05$  with a significance value  $p = .031$  (see Table 8). According to Cohen's guidelines of association, there is a medium effect size  $r = .32$ . Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium.

A correlation relationship was found and there was significant evidence for the researcher to reject the null hypothesis for both the years of 2015 and 2016. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased the verbal reasoning, admissions aggregated GRE scores decreased.

Table 7

*Pearson's Product Moment of GREV 2015*

		DDEDU-2015	GREV-2015
DDEDU-2015	Pearson Correlation	1	-.434**
	Sig. (2-tailed)		.002
	N	50	50
GREV-2015	Pearson Correlation	-.434**	1
	Sig. (2-tailed)	.002	
	N	50	51

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

*Note.* GREV-2015= GRE Verbal scores 2015, DDEDU-2015= Doctor Education 2015.

Table 8

*Pearson's Product Moment of GREV 2016*

		DDEDU-2016	GREV-2016
DDEDU-2016	Pearson Correlation	1	-.318*
	Sig. (2-tailed)		.031
	N	46	46
GREV-2016	Pearson Correlation	-.318*	1
	Sig. (2-tailed)	.031	
	N	46	48

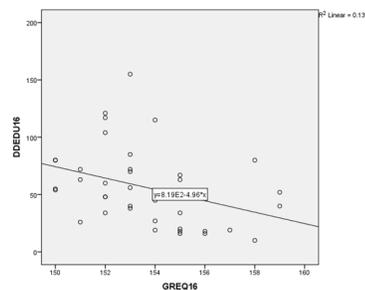
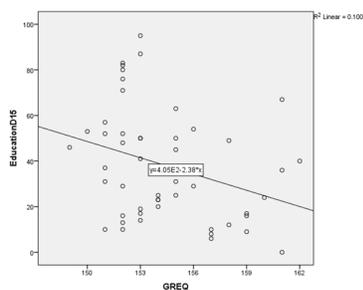
\*. Correlation is significant at the 0.05 level (2-tailed).

*Note.* GREV-2016= GRE Verbal scores 2016, DDEDU-2016 = Doctor Degree Education 2016.

### Null Hypothesis Three

Null hypothesis three stated that there is no significant correlation between the GREQ score and the completion of the education doctoral degree. A Pearson's correlation coefficient was conducted to investigate null hypothesis three. The Pearson's correlation has four assumptions that must be met. The first assumption is that the variables must not be ordinal or interval; the variables were aggregated admissions GREQ reasoning scores (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship; scatter plots were performed to establish linear relationship with line of best fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. Scatter plots and Whisker box plots were performed (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The outliers were identified by observation of the scatter plots. The definition of an outlier is the points that are lying away from the body of points (Laerd Statistics, 2017). The fourth assumption is that there is homoscedasticity of the data,

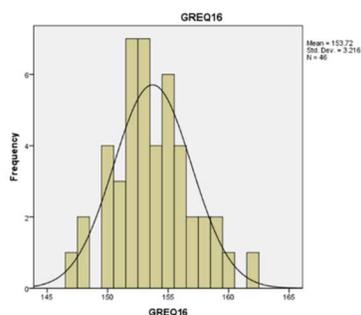
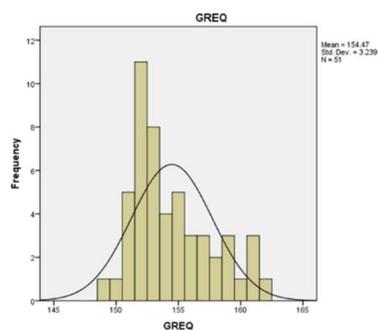
linearity and homoscedasticity (Statistical Solutions, 2018). The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data and a line of fit was applied to the scatter plots to prove linearity and normal distribution (see Figures 12 and 13; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 12.* Scatter plot for GREQ 2015.      *Figure 13.* Scatter plot for GREQ 2016.  
*Note.* GREQ =GRE Quantitative scores for 2015 (see Figure 12).  
*Note.* GREQ =GRE Quantitative scores for 2016 (see Figure 13).

A Pearson's correlation can measure both types of continuous data, interval and ratio.

The variable of admissions aggregated GRE scores are interval measurements and the variable of conferred Doctor of Education degrees are ratio measurements, both are measurements are continuous data (Laerd Statistics, 2017, Statistics Solutions, 2018). Histograms were performed in SPSS 23 for an independent observation of normality and the data was evenly distributed in a bell shape to prove normal distribution (see Figures 14 and 15; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 14.* Histogram of GREQ 2015.

*Figure 15.* Histogram of GREQ 2016.

*Note.* GREQ =GRE Quantitative scores for 2015 (see Figure 14).

*Note.* GREQ =GRE Quantitative scores for 2016 (see Figure 15).

The histogram in Figure 14 shows normal distribution for the admissions aggregated GREQ scores for 2015 and the Doctor of Education conferred degrees for 2015. The histogram in Figure 15 shows normal distribution for the admissions aggregated GREQ scores for 2016 and the Doctor of Education conferred degrees in 2016.

The results of the Pearson's correlation test for 2015, are  $R(48) = -.316$ ,  $p = .05$  with a significance value  $p = .026$  (see Table 9). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium  $r = .31$ . The results of the Pearson's correlation test for 2016, are  $R(37) = -.363$ ,  $p = .05$  with a significance value  $p = .023$  (see Table 10). According to Cohen's guidelines of association, there is a medium effect size  $r = .36$ . Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium.

Table 9

*Pearson's Product Moment of GREQ 2015*

		DDEDU-2015	GREQ-2015
DDEDU-2015	Pearson Correlation	1	-.316*
	Sig. (2-tailed)		.026
	N	50	50
GREQ-2015	Pearson Correlation	-.316*	1
	Sig. (2-tailed)	.026	
	N	50	51

\*. Correlation is significant at the 0.05 level (2-tailed).

*Note.* GREQ-2015 = GRE Quantitative scores for 2015, DDEDU-2015 = Doctor Degree Education for 2015.

Table 10

*Pearson's Product Moment of GREQ 2016*

		GREQ-2016	DDEDU-2016
GREQ-2016	Pearson Correlation	1	-.363*
	Sig. (2-tailed)		.023
	N	41	39
DDEDU-2016	Pearson Correlation	-.363*	1
	Sig. (2-tailed)	.023	
	N	39	46

\*. Correlation is significant at the 0.05 level (2-tailed).

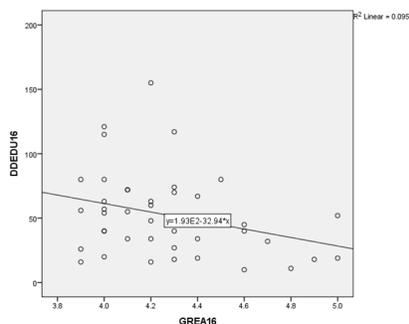
*Note.* GREQ-2016= GRE Quantitative scores for 2016, DDEDU-2016 = Doctor Degree Education for 2016.

A correlational relationship was found and there was significant evidence for the researcher to reject the null hypothesis for both the years of 2015 and 2016. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased the quantitative reasoning, admissions aggregated GRE scores decreased.

#### **Null Hypothesis Four**

Null hypothesis four stated that there is no significant correlation between the GRE score and the completion of the education doctoral degree in 2016. The databases used in this study did not provide average aggregated GRE scores for 2015; therefore, the null hypothesis is only for the year of 2016. A Pearson's correlation coefficient was conducted to investigate null hypothesis four. The Pearson's correlation has four assumptions that must be met. The first assumption is that the variables must not be ordinal or interval; the variables were aggregated admissions GRE scores (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship; scatter plots were performed to establish linear relationship with line of best

fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. Scatter plots and Whisker box plots were performed (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The outliers were identified by observation of the scatter plots. The definition of an outlier is the points that are lying away from the body of points (Laerd Statistics, 2017). The fourth assumption is that there is homoscedasticity of the data, linearity and homoscedasticity (Statistical Solutions, 2018). The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data and a line of fit was applied to the scatter plots to prove linearity and normal distribution (see Figure 16; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 16.* Scatter plot of GREA 2016.

*Note.* GREA 2016 = GRE Analytical scores for 2016.

A Pearson's correlation can measure both types of continuous data, interval and ratio.

The variable of admissions aggregated GRE scores are interval measurements and the variable of conferred Doctor of Education degrees are ratio measurements, both measurements are continuous data (Laerd Statistics, 2017, Statistics Solutions, 2018). A histogram was performed in SPSS 23 for an independent observation of normality and the data was evenly distributed in a bell shape to prove normal distribution (see Figure 17; Laerd Statistics, 2017; Statistical Solutions, 2018).

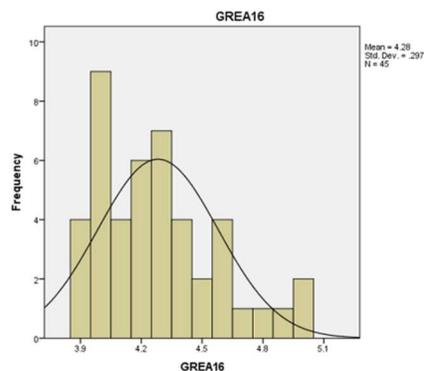


Figure 17. Histogram GREA 2016.

Note. GREA 2016 = GRE Analytical scores for 2016.

The histogram in Figure 17 shows normal distribution for the admissions aggregated GREA scores for 2016 and the Doctor of Education conferred degrees for 2016.

The results of the Pearson's correlation test for 2016, are  $R(41) = -.309$ ,  $p = .05$  with a significance value  $p = .044$  (see Table 11). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium  $r = .31$  (Cohen, 1988).

A correlation relationship was found and there was significant evidence for the researcher to reject the null hypothesis for the year 2016. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased the analytical writing, admissions aggregated GRE scores decreased.

Table 11

*Pearson's Product Moment of GREA 2016*

		DDEDU-16	GRE A-16
DDEDU-16	Pearson Correlation	1	-.309*
	Sig. (2-tailed)		.044
	N	46	43
GRE A-16	Pearson Correlation	-.309*	1
	Sig. (2-tailed)	.044	
	N	43	45

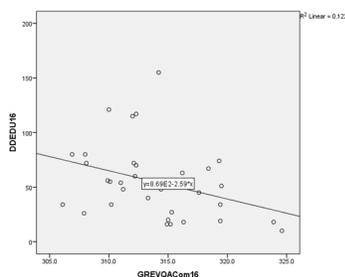
\*. Correlation is significant at the 0.05 level (2-tailed).

Note. GRE A-16 = GRE Analytical score for 2016, DDEDU-16= Doctor Degree Education 2016.

**Null Hypothesis Five**

Null hypothesis five stated that there is no significant correlation between the combined GREVQA scores and the completion of the education doctoral degree 2016. The databases used in this study only provided admissions aggregated GRE scores for analytical writing 2016; therefore, null hypothesis five was only for the year 2016. A Pearson's correlation coefficient was conducted to investigate null hypothesis five. The Pearson's correlation has four assumptions that must be met. The first assumption is that the variables must not be ordinal or interval; the variables were aggregated admissions GREVQA scores (exam performance) and conferred Doctor of Education degrees (numerical measurement) (Laerd Statistics, 2017). The second assumption is that there is a linear relationship; scatter plots were performed to establish linear relationship with line of best fit (Laerd Statistics, 2017). The third assumption is that there are no significant outliers, or they must be removed. Scatter plots and Whisker box plots were performed (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The extreme outliers were minimal and removed for the purpose of the study (Laerd Statistics, 2017). The outliers were identified by observation of the scatter plots. The definition of an outlier is the points that are lying away from the body of points (Laerd Statistics, 2017).

The fourth assumption is that there is homoscedasticity of the data, linearity and homoscedasticity (Statistical Solutions, 2018). The scatter plots were performed in SPSS 23 to prove homoscedasticity of the data and a line of fit was applied to the scatter plots to prove linearity and normal distribution (see Figure 18; Laerd Statistics, 2017; Statistical Solutions, 2018).



*Figure 18.* Scatter plot of GREVQVA 2016.

*Note.* GREVQVA 2016= GRE Quantitative, Verbal, Analytical scores for 2016.

A Pearson's correlation can measure both types of continuous data, interval and ratio. The variable of admissions aggregated GRE scores are interval measurements and the variable of conferred Doctor of Education degrees are ratio measurements, both measurements are continuous data (Laerd Statistics, 2017, Statistics Solutions, 2018). A histogram was performed in SPSS 23 for an independent observation of normality and the data was evenly distributed in a bell shape to prove normal distribution (see Figure 19; Laerd Statistics, 2017; Statistical Solutions, 2018).

The histogram in Figure 19 shows normal distribution for the admissions aggregated GREVQ scores for 2016 and the Doctor of Education conferred degrees for 2016.

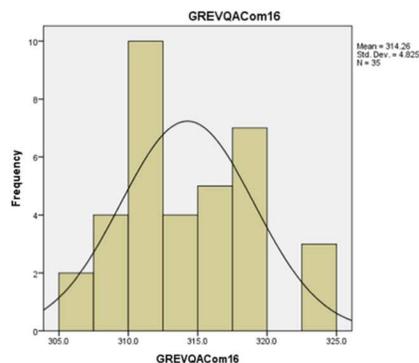


Figure 19. Histogram of GREVQA 2016.

Note. GREVQA 2016= GRE Quantitative, Verbal, Analytical scores for 2016.

The results of the Pearson's correlation test for 2016, are  $R(31) = -.349$ ,  $p = .05$  with a significance value  $p = .047$  (see Table 12). Cohen's guideline of association lists effect size as small = 0.10, medium = 0.30, and large = 0.50 (Cohen, 1988; Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2016). The effect size for this Pearson's correlation was medium  $r = .35$ . A correlation relationship was found and there was significant evidence for the researcher to reject the null hypothesis for the year 2016. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased the GREVQA admissions aggregated GRE scores decreased.

Table 12

*Pearson's Product Moment of GREVQA 2016*

		DDEDU-2016	GREVQA-2016
DDEDU-2016	Pearson Correlation	1	-.349*
	Sig. (2-tailed)		.047
	N	46	33
GREVQA-2016	Pearson Correlation	-.349*	1
	Sig. (2-tailed)	.047	
	N	33	35

\*. Correlation is significant at the 0.05 level (2-tailed).

Note. GREVQA= GRE Verbal, Quantitative, and Analytical scores for 2016, DDEDU-2016= Doctor Degree Education 2016

## CHAPTER FIVE: CONCLUSIONS

### Overview

Chapter Five examines the results of the correlational study. The implications, limitations, and suggested future research are also deliberated in this chapter.

### Discussion

The purpose of this research study was to investigate the correlation relationship between the variables of the verbal, quantitative, and analytical writing GRE scores and the Education Conferred Doctoral Degrees in the years of 2015 and 2016. This research study did not investigate the casual relationship of the variables, the effect of the casual relationship upon each variable, or the importance of the casual relationship between the variables. The study investigated the significance of the casual correlation relationship between the variables to find out whether they are positive, negative, or neutral (Gall et al., 2007; Green & Salkind, 2011; Laerd Statistics, 2017; Statistical Solutions, 2017).

The research study rejected all five null hypotheses and accepted the five hypotheses that there is a significant relationship between the GRE scores and the conferred education doctoral degrees of the years 2015 and 2016. All five hypotheses had a medium strength coefficient (Cohen, 1988). The medium strength may have been contributed by the use of average admissions GRE scores archival aggregated data for each of the 51 universities in the research study.

Each correlation had a negative correlation, which represents an opposite linear relationship (see Table 13). When the number of conferred Doctor of Education degrees increased, the verbal reasoning, quantitative reasoning, and analytical writing admissions aggregated GRE scores decreased. A larger number of doctoral candidates are admitted into the

program and the GRE scores are decreasing by having a larger pool of accepted doctoral candidates. This also could reflect the larger number of students taking the GRE tests bringing a lower average in GRE scores in general. GRE scores are a requirement during the admissions consideration process in many doctoral degree programs across all fields of the terminal degree. GRE scores have proven to be a predictor of many facets of the doctoral degree (Kuncel & Hezlett, 2007; Kuncel et al., 2001; Kuncel et al., 2010).

Table 13

*Pearson's correlations table*

GRE Sub-scores	DDEDU 2015	DDEDU 2016
Verbal Reasoning	-.434	-.318
Quantitative Reasoning	-.316	-.363
VQ Combined	-.369	-.323
Analytical Writing	NA	-.309
VQA Combined	NA	-.349

*Note.* DDEDU = Doctor Degree Education for 2015 and 2016. VQ = Verbal and Quantitative and VQA = Verbal, Quantitative, and Analytical.

The conceptual framework of this study included three stages in the rites of passage. The third stage, the incorporation stage, was considered the dissertation defense being passed and graduation scheduled for the doctoral candidate enters the doctoral community when conferred with a doctoral degree in education (see Figure 1). The study focused on the completion of the doctoral degree in education and passing through the third stage of the rites of passage. The GRE scores were often seen as a gatekeeper to the admissions into doctoral degree programs (Cassuto, 2016; Jaschik, 2016; Lovitts, 2008; Posselt, 2016; Weisbuch & Cassuto, 2016). This study investigated the significance of the relationship between the aggregated admissions GRE

scores and the conferred doctoral degrees of 51 universities. The findings of this study reverberated the importance of GRE scores in the admissions process (Allum & Okahana, 2015; CGS, 2014; Gardner, 2008; Grasso et al., 2009; Kuncel et al., 2010; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Rockinson-Szapkiw et al., 2015; Wang, 2013). The results of this study indicated the decrease in the GRE scores as the number of candidates for the terminal degrees increased.

### **GRE Quantitative Reasoning and Verbal Reasoning**

The quantitative reasoning test measures the computation skills in arithmetic, algebra, geometry, and data analysis (ETS, 2016, 2017; Pacheco et al., 2015); whereas, the verbal reasoning test measures the ability to analyze, synthesize, and evaluate relationship and concepts in written material (ETS, 2016, 2017; Pacheco et al., 2015). Kuncel et al. (2010), in a meta-analysis, found that GRE scores can be a strong predictor of GGPA and further validating the use of GRE and UGGPA in the admission of students to doctoral degree programs. In this research study, null hypothesis one stated that there is no significant correlation between the combined GREV and the GREQ scores and the completion of the education doctoral degree. In concordance with the previously mentioned study, the research found a significant casual correlation relationship between the combined GREV and the GREQ scores and the completion of the Doctor of Education degrees in the years of 2015 and 2016. In this study, null hypothesis two stated that there is no significant correlation between the GREV score and the completion of the education doctoral degree. The research found a correlation relationship and there was significant evidence to reject the null hypothesis for both the years of 2015 and 2016. This study found value in the admissions GRE scores and is in agreement with the following studies. A study found that verbal and quantitative GRE scores were the focus of predicting success in an

engineering graduate program (Wang, 2013). Along with another study, the GRE revised verbal test did show predictive values in this study with the GRE revised quantitative test the single best predictor of success in MBA GPA (Young et al., 2014).

In this study, null hypothesis three stated that there is no significant correlation between the GREQ score and the completion of the education doctoral degree. A statistically significant correlational relationship was found and there was significant evidence to reject null hypothesis three for both the years of 2015 and 2016. A study used GRE scores as predictors of GPA and completion of the program. The GRE scores did have a significant relationship to GPA and graduation rates (Perez, 2011). Another study found that a 10-point higher GREQ score indicated success for the completion of an economics Ph.D. (Stock et al., 2011). This research study found a casual correlation and agrees with the encouragement of using admissions GRE scores. Along with a study that did not find GRE scores as a predictor of completion of a program, they did have a positive relationship to the GPA for those who completed the program and the academic success of those students (Brown, 2011). This study did find a casual correlation and concurs that the admissions GRE is important in projecting the applicant's academic capabilities.

### **GRE Analytical Writing**

The GREA test measures the ability to articulate critical thinking skills (ETS, 2016, 2017; Pacheco et al., 2015). A study investigated the predictive admissions requirement to improve student retention and found the GPA and total GRE to be predictors of success and significant admissions variables (Burns, 2011). In this research study, null hypothesis four stated that there is no significant correlation between the GREA score and the completion of the education doctoral degree. This research study found a casual correlation relationship and there

was significant evidence to reject the null hypothesis and therefore agrees with the previously mentioned study.

In this study, null hypothesis five stated that there is no significant correlation between the combined GREVQA scores and the completion of the education doctoral degree. A casual correlation relationship was found and there was significant evidence to reject the null hypothesis. In another study, where resilience was tested for the ability to complete the doctoral degree, the GRE and GPA were required for admission into the doctoral program, but the study indicated that the factor of resilience was important to the completion of the terminal degree (Blue, 2008). In concurrence, the research study does encourage admissions GRE scores. The GRE scores may prove beneficial for the admissions departments to recognize the writing talents of a doctoral degree applicant.

### **Implications**

The research found a significant correlation relationship, and the use of GRE scores as an admission tool in education doctoral degree programs does influence the completion of the Doctor of Education degree (Kuncel & Hezlett, 2007; Kuncel et al., 2001). The study used aggregated archival data of 51 universities, and the strength of using archival data is the ability to transpose research data into real world solutions (Barnes, Dang, Leavitt, Guarana, & Uhlmann, 2015). These findings encourage a continued focus on the trend of admissions GRE scores being one of the important factors in the admissions process to achieve positive results of the completion of the terminal degree in education doctoral programs (Allum & Okahana, 2015; CGS, 2014; Gardner, 2008; Grasso et al., 2009; Kuncel et al., 2010; Moneta-Koehler et al., 2017; Pacheco et al., 2015; Rockinson-Szapkiw et al., 2015; Wang, 2013). The GRE scores do not eliminate the personal factors of daily life that can distract a doctoral student from completing

the terminal degree, but it can give the doctoral admission departments insight into the abilities of the student applying to the program.

These findings encourage a continued focus on the trend of using admissions GRE scores as predictors of student performance in the first year of a program (Kuncel et al., 2010; Perez, 2011). Strong academic abilities can be presented in the admissions GRE scores that give indication to the student's overall academic abilities to perform under the rigors of doctoral education.

A correlation relationship was found and there was significant evidence to reject each null hypothesis for both years 2015 and 2016. A negative correlation represents an opposite linear relationship. When the number of conferred Doctor of Education degrees increased, the admissions aggregated GRE scores decreased. The results of this study brought to light the increased number of conferred Doctor of Education degrees is also increasing the threshold for more students to be admitted, giving a larger pool of admissions aggregated GRE scores. These findings also encourage the trend of programs instituted within the universities to assist in the persistence of the doctoral student (Rockinson-Szapkiw et al., 2015). The aggregated archival database used in this study was large to represent 51 universities, but it was also focused on the specific population of Doctor of Education conferred degrees in the years of 2015 and 2016 to narrow down the casual correlational relationship of the admissions GRE scores to the completion of the terminal degree.

### **Limitations**

There are limitations of internal and external validity in this research study (Gall et al. 2007; Green & Salkind, 2011). The purpose of a dissertation research study is to make generalized statements about a large population that has not been included in the research study,

and this leads to limitations in the external validity of the research study (Laerd Statistics, 2017). The first limitation of the study is that it only investigates the correlational relationship between the average admissions GRE scores and the conferred Doctor of Education degrees from the 51 universities; and, it cannot be used to generalize the findings of the study to other fields of study, but these findings are limited to the field of Doctor of Education degree programs. The second limitation to external validity found in this research study was the data sets were only for the years of 2015 and 2016. A wider span of years may have shown a stronger correlation relationship. The research focused on 51 universities' Doctor of Education degree programs listed by US News and World Report as the best education doctoral degree programs and there are many more universities with education doctoral degree programs (US News and World Report Education Graduate Schools, 2016, 2017). The first internal limitation to validity in this study was a lack of demographical information of the individual students receiving education doctoral degrees at the 51 universities. A second internal limitation to validity in this research study was the use of archival data in the data sets. The data sets of archival data were generalized average admissions GRE scores for each of the 51 universities conferring Doctor of Education degrees and did not investigate individualized data such as age, gender, or ethnicity (Gall et al., 2007; Green & Salkind, 2011).

### **Recommendations for Future Research**

The recommendation for future research into the multiple facets of improving retention rates of doctoral degree students is imperative. A measure of success has been achieved over the past decade in developing instruments for investigation of sense of community and mentoring scales to improve the retention of doctoral degree students (Bell-Ellison & Dedrick, 2008; Chavis et al., 2008; Mansson & Myers, 2012; Rovai, 2002b; Rovai & Baker, 2004; Terrell et al.,

2009; Tinto, 1988). Admissions is an important aspect of the attrition and retention of doctoral students because it is the gate of entrance into the program (Cassuto, 2016; Clayton, 2016; Jaschik, 2016; Posselt, 2016; Weisbuch & Cassuto, 2016). Future research on the intricate roles of the GPA, GRE scores, and other admissions requirements will assist in validating the procedures for selecting education doctoral degree students. Further research of the GRE scores in relationship to the Doctor of Education while controlling for the differentiation in the Ed.D. and Ph.D. of Doctor of Education degrees is also imperative. Further research needs to be done on the GRE scores and GPA on a larger scale to determine the impact these variables are having on the retention of doctoral degree students. Research on the benefits of completing an education doctoral degree would also be important to assess the value of time and finances the student will be investing in obtaining the terminal degree.

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**APPENDIX A: IRB Approval****LIBERTY UNIVERSITY**  
INSTITUTIONAL REVIEW BOARD

January 25, 2016

Terri Wallace

IRB Application 1884: Online Education Doctorate: A Correlation of the Combination of the Relationship of Completion of the Doctorate Degree and the Perception Of Community

Dear Terri,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at [irb@liberty.edu](mailto:irb@liberty.edu).

Sincerely,

**G. Michele Baker, MA, CIP**

*Administrative Chair of Institutional Research*

**The Graduate School**

**LIBERTY**  
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