THE RELATIONSHIP BETWEEN TEACHER ATTRITION AND STUDENT ACHIEVEMENT IN READING AMONG MIDDLE SCHOOL STUDENTS

Gwendolyn Moseley Perkins, M.Ed.

Dissertation Prepared for the Degree of

DOCTOR OF EDUCATION

UNIVERSITY OF NORTH TEXAS

August 2017

APPROVED:

David A. Brackett, Committee Chair
Jane B. Huffman, Committee Co-Chair
Cathy Bryce, Committee Member
David Hicks, Committee Member
James D. Laney, Chair of the Department of Teacher Education and Administration
Randy Bomer, Dean of the College of Education
Victor Prybutok, Dean of the Toulouse Graduate School

Perkins, Gwendolyn Moseley. *The Relationship between Teacher Attrition and Student Achievement in Reading among Middle School Students*. Doctor of Education (Educational Leadership), August 2017, 91 pp., 23 tables, 16 figures, references, 75 titles.

The purpose of this study was to determine whether a significant relationship existed between teacher attrition and student success in middle school reading by conducting a quantitative analysis. Additionally, the inclusion of school demographic characteristics were included in the model to consider previous findings referencing the challenges schools face in attracting and retaining teachers in low performing urban schools with high populations of economically disadvantaged and minority students. In this analysis, the relationship between teacher attrition and student achievement in middle school as measured by the State of Texas Assessments of Academic Readiness (STAAR) for reading among middle school students in Grades 6, 7, and 8, as reported on the Texas Academic Performance Reports (TAPR), were examined. The regression models used to analyze the three research questions addressed in the study include an examination of teacher attrition on campus pass rates, and grade level pass rates for sixth, seventh, and eighth grades as measured by the STAAR Reading assessment. The data utilized in this study were collected from seven North Texas middle schools in a fast growth school district together with their comparable campuses as identified by the Texas Education Agency for the school years 2013-2014 through 2015-2016. The results of the analysis indicate teacher attrition accounts for a significant variance in STAAR Reading pass rates among middle school students. Additionally, the school demographic characteristics defined as percentage economically disadvantaged, percentage English language learners, mobility rates, and percentage white students account for 83.4% of the variance in the average campus pass rates for STAAR Reading when combined.

ACKNOWLEDGEMENTS

This dissertation is dedicated to my husband, Mark Perkins, and my two daughters, Savannah Hollis-Fife and Samantha Schandorff. Never in life has there been anything I have pursued that the three of you were not standing beside me and behind me full of love, encouragement, and support. Your unwavering belief in me (and your demand that I believe in myself) spurred me to the finish line of this journey! You are my life and my inspiration!

My dissertation committee contributed to my sense of accomplishment and success. Dr. Huffman, thank you for your continuous encouragement and guidance throughout this journey. Dr. Brackett, I am so grateful for the statistical understanding I developed with your coaching; your expertise and brainstorming were always “germane” to my study! Dr. Bryce and Dr. Hicks, you both represent what one can accomplish with the right mindset.

To those who believed in me before I believed in myself, thank you! You are my colleagues, my work family, my mentors, and my friends who helped carry the load when the days were long and arduous. When the balancing act was unsteady, you were always there with a steady hand. Teresa Becker, I will be forever grateful for your friendship and constant encouragement! You are a blessing!

Without my family and friends, this aspiration would have never come to fruition. You have listened patiently to my challenges, while always guiding me back to my strengths and talents. I am the product of two strong-willed and determined parents, who taught me that grit and determination always pay off and to NEVER give up on your dreams! Growing up in a family of five children, my sister and brothers continue to be an inspiration. Lorne and Kay, as my best friends, you each have a very special place in my heart and in my life. You have been a part of the good, the bad, and the ugly . . . and you are still here!

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CHAPTER 1

INTRODUCTION

As the nation's public education system continues to come under fire by elected officials and the public for perceived inadequacies, it becomes more and more critical to consider all variables that may jeopardize student achievement. This study examines the relationship between teacher attrition and student achievement in reading among middle school students. As students shift from developing their skills in learning how to read in elementary school, to reading for the purpose of learning in middle school, the possible connections that might exist between teacher attrition and mastering the critical skill of reading in middle school become more critical. The problem of teacher attrition involves more than supply and demand, and as such, there was a need to explore the trends in teaching alongside the organizational characteristics affecting a school's capacity to recruit and retain high quality teachers. Furthermore, research suggests because of the unstable school environment created by teacher attrition, schools that struggle to staff classrooms with qualified teachers also experience lower student achievement (Darling-Hammond, 2002; Guarino, Santibanez, & Daley, 2006; Ingersoll, 2001b). Bryk and Schneider (2002) observed schools that have successfully addressed the needs of disadvantaged students experience a strong sense of community. The sense of community can be compromised when schools experience a high level of attrition; ultimately relating to reduced student achievement.

For over 50 years, researchers have considered the impact of school level factors, specifically the teacher, on improving student achievement (Coleman, 1966; Marzano & Kendall, 1996; Ingersoll, 1999; Weglinsky, 2000). Coleman (1966) posited student achievement is dependent only on a child's background and general social context and that most school factors bear little or no relevance. More recent research supports a contrasting perspective. In the

late 1990s, several researchers found significant correlations between teacher characteristics and student achievement (Jordan, Mendro, & Weerasinghe, 1997; Sanders & Rivers, 1996; Scheerens & Bosker, 1997). In a similar value-added study conducted in the Dallas Independent School District, Jordan et al. (1997) concluded a teacher not only affects student achievement over time, but the effects of the teacher have a "strong additive component, they have a strong cumulative component, and they show little evidence of compensatory effects" (p. 7).

Throughout the years, studies have focused on attrition among teachers new to the profession, teacher retention in schools of poverty or high need, and other basal factors affecting student achievement over time. According to Keigher (2010), in a report for the National Center for Education Statistics (NCES), approximately 20% of teachers leave the profession within the first five years of their teaching career. This attrition rate negatively affects the academic success of those students. In addition, school district leaders are faced with an inexperienced and less stable teaching force, which presents schools with challenges in attracting and retaining teachers particularly for low performing urban schools with high populations of socio-economically disadvantaged and minority students (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2007; Boyd, Lankford, Loeb, & Wyckoff, 2005; Brown, Anfara, & Roney, 2004; Guarino et al., 2006; Hanushek, Kain, & Rivkin, 2004; Ingersoll, Merrill, & Stuckey, 2014). A principal's ability to recruit and retain qualified teachers in the classroom has a significant impact on student performance (Ingersoll, 2001a).

Statement of the Problem

The instability created in schools by teacher attrition leads to challenges for schools in identifying highly qualified classroom teachers to serve students (Darling-Hammond, 2002; Guarino et al., 2006; Ingersoll 2001b). This challenge suggests teacher turnover (attrition) affects

student success (Ingersoll, 2001a). Ronfeldt, Loeb, and Wyckoff (2013) found students experiencing teacher turnover "had lower test scores by 5.0 to 8.5 percent of a standard deviation in English Language Arts as compared to grade levels with no turnover at all" (p. 15).

Purpose of the Study

The purpose of this study was to examine the relationship between teacher attrition, student success in middle school reading, and school demographic characteristics. Aligned with Ingersoll's (2001a, 2001b, 2003) research identifying a relationship between student performance and the challenges schools face in addressing attrition, this study replicated and extended the research of Ronfeldt et al. (2013), contributing to the empirical evidence on the subject. Ronfeldt et al. (2013) utilized fixed-effects models to examine the relationship between teacher turnover and student achievement for New York City students in Grades 4-5 over a period of eight years. For this study, data was collected in a North Texas school district described as a fast-growth school district. Data collection was related to teacher attrition, student performance in reading for Grades 6-8, and school demographic characteristics. Student demographic data included grade level, ethnicity, socio-economic status, and special program status. Teacher attrition was identified by calculating the difference in total staff between each year included in this study, as reported by the Texas Education Agency and reflected in the campus and district Texas Academic Performance Reports (TAPR).

Research Questions

The following research questions guided this study:

1. What is the relationship between teacher attrition rates on student achievement in reading at the middle school level?
2. What is the specific relationship between attrition of teachers and student achievement in reading observed in each middle school grade level (i.e., 6th, 7th, and 8th)?

3. What is the relationship among teacher attrition, student success, and the demographic characteristics of the schools?

Assumptions

Data collected in this study was limited to students enrolled in the district during their sixth, seventh, and eighth grade years. Teacher attrition data was collected for teachers who were employed with the district and served as a sixth, seventh, and/or eighth grade teacher during the span of years in which data was collected. Attrition data, student achievement data, and demographic characteristic data were collected through collaboration with the district and as reported by the Texas Education Agency and the TAPR for the academic years 2013-2014, 2014-2015, and 2015-2016. The assumption was data reported to the Texas Education Agency by the district was accurate as reported.

Theoretical Framework

The theoretical framework for this study was based on Ingersoll's (2001a, 2001b) application of supply and demand in relation to teacher turnover. The basic concept of supply and demand requires analysis of the factors driving both supply and demand and the relationship between the two. The historical application of supply and demand in economics focuses on price as the dependent variable where supply and demand would be the independent variables. In other words, what is the outcome of price when there is a shift in the predictor variables of supply and demand. In the application of the concept of supply and demand to this study, supply would be the number of teachers available to fill any given vacancy, while demand would be the number of vacancies needing to be filled within the education organization.

Ingersoll (2001a) proposed a study of teacher supply and demand from an alternate perspective. Drawing from theory grounded in sociology, Ingersoll analyzed teacher attrition from an organizational level. Ingersoll's contention was understanding teacher turnover is rooted

in the organizational structures of the schools, which employ teachers. While he acknowledged the individual characteristics of the teacher have a significant relationship to teacher turnover, "school characteristics and organizational conditions" play a more dominant role in teacher turnover than other factors combined (p. 501). The conditions or characteristics of the school organization were identified as the level of support teachers perceived from school leadership, problems associated with student discipline issues, distributive leadership and faculty input processes. Ingersoll suggested the problem with recruiting and retaining qualified teachers could be identified in a study of school characteristics in relation to the demand for teachers. Furthermore, Ingersoll connected the demand for teachers to the increase in opportunities afforded teachers in other careers as opposed to the demand being related to retirement. He referred to this as the *revolving door* of education, wherein the demand for teachers was linked to factors other than retirement.

Simply stated, where organizations are supportive of the individual needs of teachers (e.g., salary, benefits, resources, etc.) and organizational structures allow for and honor teacher input (e.g., support for student behavior issues, leadership opportunities, decision-making authority, etc.), teacher turnover declines; the demand for teachers is lower and teacher attrition is reduced. In organizations where these factors are not addressed, teacher attrition occurs at higher rates and demand is increased, which has a direct relationship to the supply of teachers required to be considered for any given vacancy. Thus, this type of organization experiences the *revolving door* of education.

Figure 1 represents a visual of the sociological theory of supply and demand as it relates to teacher characteristics, and organization structures and school characteristics. Supply (S1) represents the supply of teachers driven by initiatives impacting teacher characteristics. Supply

(S2) represents the supply of teachers driven by initiatives addressing organizational structures and school characteristics. If Ingersoll's theory is valid, student achievement increases when attrition is examined from organizational theory.

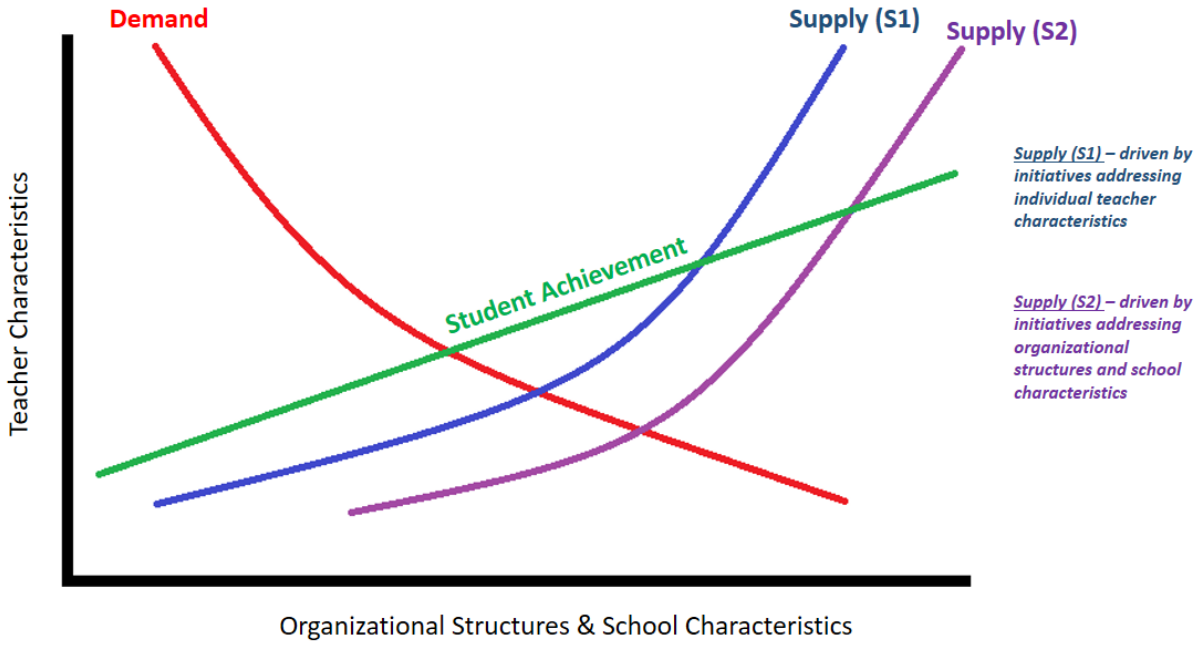

Figure 1. Sociological theory of supply and demand (adapted from Ingersoll, 2001a, p. 500).

Historical Perspective of Supply and Demand in Teaching

Beginning in the early 1980s, several high-profile studies predicted the demand for teachers would be significantly greater than the supply of teachers in the near future. One such report was prepared by Darling-Hammond (1984) in response to the country's renewed commitment to ensure quality teachers were prepared to educate increasing student enrollments. The primary concern centered around data reflecting a large portion of the teaching force of experienced and quality teachers near retirement coupled with younger educators leaving the profession for other more financially rewarding occupations offering better pay, benefits, and working conditions. Additionally, Darling-Hammond's (1984) data indicated the supply of

teachers was not as qualified as the masses leaving the profession at the time. Darling-Hammond's report compiled data from major institutions such as the National Commission on Excellence in Education, the Education Commission of the States, and the National Science Board, to name a few, exacerbated the fear of moving into the next two decades with underqualified, inexperienced teachers serving in education. The supply and demand of quality teachers and school leaders' ability to recruit and retain quality teachers was considered a crisis in education and became a focus of study for many researchers.

In response to the fears ignited by studies such as Darling-Hammond's (1984) and reports published by the National Commission on Excellence in Education in the 1980s, the national response was the implementation of broad based recruiting initiatives. *Teach for America* and alternative certification programs garnered media attention and gained ground in the years to follow. Many of these programs and similar initiatives sought to recruit teachers from other professional careers into the teaching field. Coupled with state and national financial incentives for teachers, the hope was to spur the supply of teachers to address the anticipated demand for teachers.

However, the empirical research of supply and demand during this time was focused on individual teacher characteristics. The reason teachers left the profession was linked to other opportunities such as higher pay and benefits. Ingersoll's research does not negate these factors, but does extend the body of research related to supply and demand in teaching to include organization structures and school characteristics (Ingersoll, 2001a, 2001b, 2003; Ingersoll & May, 2011; Ingersoll & Merrill, 2010; Ingersoll et al., 2014).

Organization Structures and School Characteristics

Ingersoll, together with his colleagues, studied the connection between teacher turnover (i.e. teacher attrition), student achievement, and school characteristics (Ingersoll, 2001a, 2001b, 2003; Ingersoll & May, 2011; Ingersoll & Merrill, 2010; Ingersoll et al., 2014). Ingersoll et al. (2014) often challenged the notion of a teacher shortage offering U.S. Census data reflecting teachers as one of the largest occupational groups in the country with a correspondingly high turnover rate as compared to other occupations such as nurses, attorneys, and professors. While the reports from Schools and Staffing Survey (SASS) and the National Center for Education Statistics (NCES) data reflected an increase in the demand for teachers, the data also indicated the teacher workforce grew. Again, supporting Ingersoll's (2001a, 2001b) theory that the demand for teachers is not related to high numbers of retirements in the profession, but rather it is the organizational structures of schools. This in turn creates problems for a school's capacity to hire and retain quality teachers in the classroom. Studies conducted by Ingersoll and colleagues continue to reveal a high rate of teacher attrition within the first five years of teachers' educational careers, the factors connected to these trends, and the impact to student achievement (Ingersoll, 2001a, 2001b, 2003; Ingersoll & May, 2011; Ingersoll & Merrill; 2010; Ingersoll et al., 2014).

Student Achievement

Hanushek et al. (2004) explored the difficulties Texas schools experience in hiring and retaining quality teachers. They sought to address the assertion presented by the Coleman Report (1966) that teachers and schools did not factor into student achievement. Using value-added models to control for variances and focus on student achievement over time, Hanushek et al.'s (2004) longitudinal studies based on Texas data revealed several valuable conclusions. Research results showed students served in low income, high minority schools experienced higher teacher

attrition rates and were more often taught by beginning teachers. In relation to a previous study conducted by Hanushek et al. (2004), their results revealed new and inexperienced teachers performed lower on average as compared to their more experienced colleagues. Therefore, schools with higher attrition rates often exhibit higher numbers of beginning teachers, resulting in lower student achievement scores.

Significance of the Study

This study contributes to the body of research related to teacher attrition and student achievement. As the nation faces projected student enrollment to exceed 52.9 million students by 2024-2025, according to *The Condition of Education 2015* (Kena et al., 2015) with significant changes in student demographics, the findings of the current study may assist district and state policymakers in decisions related to these expectations for the district and Texas. At the local level, the results of this study may inform the actions and decisions of school and district leaders in addressing teacher attrition and student performance concerns. At a state level, this study may assist legislative officials in an understanding of the impact changing demographics play in teacher attrition and student achievement in consideration of educational policy decisions.

Delimitations

The parameters of this study included data collection for seven middle schools of a North Texas school district serving approximately 28,000 students and the middle schools identified within the comparison group of each campus as determined by the Texas Education Agency (TEA). The study included student achievement data from student performance on the State of Texas Assessments of Academic Readiness (STAAR) in Reading (TEA Division of Performance Reporting) for Grades 6, 7, and 8 for the middle schools of the district and the middle schools identified as comparison campuses for each of the district middle schools. Campus comparison

groups are identified by TEA based on the similarities between campuses. These similarities include number of students enrolled, grade levels served, percentage of economically disadvantaged students, mobility rates, and the number of students identified as English Language Learners. Each comparison group includes 40 campuses from across the state with similar demographics as described above.

The STAAR assessment for Reading is given annually in Grades 3-8. Assessment data for reading was used exclusively for the data collection in this study. Although mathematics and writing assessment scores are also reported on the TAPR, reading achievement scores were selected for this study because the Texas Essential Knowledge and Skills (TEKS) for reading have remained constant since 2009-2010. Reading data was collected for the years 2014, 2015, and 2016 for each middle school of the district and the campuses identified in the comparison group for each campus.

Attrition rates were calculated by determining the difference in total staff as reflected on the TAPR between each year of the study. The assumption is the difference between total staff reported each year for each campus was an indication of teacher attrition for each of the campuses included in this study. This study did not compare such data with neighboring districts, but compared related data with state and federal data similar in nature.

Demographic characteristics of the schools included in this study were collected for campuses serving middle Grades 6-8 within the district and the comparison group campuses identified by TEA for each middle school in the district. Demographic characteristics of the schools included student, teacher, and school-by-grade characteristics as reported by TEA and as reflected on the TAPR for the campuses included in the study. Additionally, demographic

characteristics included in the methods of this study were limited to those characteristics utilized by TEA to determine comparable groups for individual campuses.

Definitions of Terms

This study refers to specific terms the reader may or may not recognize in this context. For clarity to the reader, the following definitions apply to this study:

Attrition – A reduction in the number of employees or participants that occurs when people leave because they resign, retire, etc., and are not replaced (Attrition, n.d.).

Curvilinear relationship – Describes the positive and negative relationship that may exist between two variables. The relationship may form an upward arch on a graph when the relationship is positive and a downward arch when the relationship between the variables is negative (Vieira, 2017).

Demographic characteristics – Relating to student, teacher, and school-by-grade characteristics in proportion to total population. Student demographic characteristics may include gender, race, ethnicity, free/reduced lunch, etc. Teacher demographic characteristics may include experience, proportion of stayers, movers, first years, etc. School demographic characteristics may include number of students, teachers, turnover rates, etc. (Ronfeldt et al., 2013).

Institute of Education Sciences (IES) – An independent, non-partisan statistics, research, and evaluation division of the U.S. Department of Education (2016).

Leavers – In relation to teacher attrition, leavers are defined as those teachers who leave the teaching profession altogether (Kena et al., 2016).

Linearity – Describes the assumption that the relationship between two variables can be represented by a straight-line relationship (Mertler & Vannatta Reinhart, 2017).

Movers – In relation to teacher attrition, movers are defined as those teachers who do not remain at the same campus, but move to another campus to teach (Kena et al., 2016).

National Assessment of Educational Progress (NAEP) – The largest continuing and nationally representative assessment of what America's students know and can do in various subjects (ED.gov, 2016).

National Center for Education Statistics (NCES) – A division of the U.S. Department of Education's Institute of Education Sciences (IES) responsible for collecting, analyzing, and publishing statistics on education and public school finance (U.S. Department of Education, 2016).

Orthagonality – Describes the relationship two independent variables might have on one dependent variable. When each independent variable has a separate contribution, in an *additive* manner, on the dependent variable, the relationship is said to be orthagonal (Mertler & Vannatta Reinhart, 2017).

Schools and Staffing Survey (SASS) – A survey conducted by the National Center for Education Statistics (NCES), under the governance of the U.S. Department of Education (2016).

State of Texas Assessments of Academic Readiness (STAAR) – The state assessment replacing the Texas Assessment of Knowledge and Skills (TAKS), which was phased in from 2012 to 2014 in accordance with Texas Senate Bill 1031 (TEA.Texas.gov, 2016).

Stayers – In relation to teacher attrition, stayers are defined as those teachers who remain at the same school (Kena et al., 2016).

Texas Assessment of Academic Skills (TAAS) – The third standardized test used in Texas between 1991 and 2002; this state assessment was replaced by Texas Assessment of Knowledge and Skills (TAKS) from 2003 to 2013 (Texas Education Agency, 2010).

Texas Education Agency (TEA) – A branch of the state government of Texas responsible for the oversight of public education and related reporting for the state (Texas Education Agency, 2016).

Value-added – Measurement of a given teacher's contribution to a student's achievement level over time (Texas Center for Educator Effectiveness, 2016).

Organization of Study

This study is organized into five chapters: 1) Introduction; 2) Review of the Literature; 3) Methodology; 4) Results; and 5) Discussions, Implications, and Recommendations. Chapter 1 identifies the purpose and significance of the study, followed by three research questions. The theoretical/conceptual framework of this study was also outlined in Chapter 1 and included supply and demand, organizational structures, student achievement, retention issues, and the middle school experience as each relates to the study of the problem.

The review of the literature contained in Chapter 2 explores historical research supporting the theoretical/conceptual areas identified in Chapter 1. This exploration provides the reader with a historical perspective and the relationship between teacher attrition and student success in reading in the middle school grades. Review of the research related to student and school characteristics provides support for the trends identified in the teaching workforce. Chapter 2 also provides insight into research and findings relative to middle school and the importance of literacy development for this age group.

Chapter 3 is an outline of the research design for this study. This is a partial replication of the methods used by Ronfeldt, Loeb, and Wyckoff (2013) in their study conducted in New York City schools; this study is an extension and revision to Ronfeldt et al.'s (2013) study to accommodate new thinking. The regression models with fixed effects used by Ronfeldt et al. are

described in this chapter. The methodology for this study provides the reader with the population and setting, and identifies the resources and method for data collection and analysis for this study.

Chapter 4 provides the results of the data analysis and a summary of findings as they relate to the research questions of this study. Chapter 5 allows the reader to review the discussion, implications, and recommendations based on the results, the relationship to the research, and consider suggestions for further study.

CHAPTER 2

REVIEW OF THE LITERATURE

Within the next decade, student enrollment in the United States is expected to reach 53 million students, according to *The Condition of Education 2015* (Kena et al., 2015). Couch and Zakariya (2012) report the population of the country is growing quickly, growing older, and growing diverse, which means significant changes in student demographics as well. How the country, Texas, and local education agencies respond to these changes in student demographics will impact teacher attrition and student achievement. Steve Murdock, former director of the U.S. Census Bureau, reported Texas transitioned to a majority-minority state between 2000 and 2010. Murdock also reports the student population in Texas is not only more diverse, but more than 60% of these children are identified as socio-economically disadvantaged (Collier & Ura, 2015). The review of the literature is important in developing an understanding of the impact changing demographics play in teacher attrition and student achievement in consideration of education for future policy decisions.

This literature review includes survey data collected by state and federal agencies together with a collection of research studies as they relate to teacher attrition and student achievement in middle school. The review of literature guides the reader through historical data targeting the trends in teacher attrition and student achievement. In providing the foundation for the conceptual framework of the study, the literature is an examination of supply and demand in teaching, organizational structures, and characteristics impacting teacher attrition and student achievement, specifically in middle school. While there is significant research on the topic of teacher attrition and student achievement, the focus of the literature review includes only those topics germane to the current study.

Historical Basis for Analyzing Educational Data

Fulfilling Congressional requirements to gather data related to the state of education in the United States, the U.S. Department of Education was created in 1980; however, the history of the department dates back to 1867. As the department has evolved, the U.S. Department of Education is charged with collecting and disseminating data related to the nation's schools. Under the auspices of the U.S. Department of Education, the National Center for Education Statistics (NCES) was formed to conduct a series of surveys to collect and analyze specific data related to education not only in the United States, but also other countries. Researchers have used this survey data for more than two decades to study trends in education and student achievement (Bobbitt, Leich, Whitener, & Lynch, 1994; Boe, Bobbitt, Cook, Whitener, & Weber, 1997; Darling-Hammond, 1984; Ingersoll, 2003; Ingersoll & May, 2012; Ingersoll & Merrill, 2010; Ingersoll et al., 2014; Perda, 2013).

One such survey used to gather comprehensive data on both public and private elementary and secondary American schools is the Schools and Staffing Survey (SASS). The constructs of SASS allow the U.S. Department of Education to analyze data nationally, statewide, and at the local level. A product of the SASS is the Teacher Follow-up Survey (TFS), which contains findings from the Current Teacher and Former Teacher Data Files. The SASS has been conducted seven times, with the most recent survey being completed in the 2012-2013 school years. Data are collected from survey responses provided by school districts, schools, campus leadership, educators, and library media centers. Approximately 4,400 questionnaires were completed by current and former public educators for the 2012-2013 TFS.

According to the NCES (2014), *Teacher Attrition and Mobility: Results from the 2012-13 Teacher Follow Up Survey* report, 84% of the 3,377,900 public school teachers employed to

teach during 2011-12 remained at the same school; these public school teachers are defined as *stayers*. Of the 16% of public school teachers who did not remain at the same school, 8% had moved (*movers*) to another campus, and the remaining 8% had left (*leavers*) the profession altogether. Since the initial inception of the SASS in the 1988-89 school year, the percentage of stayers has decreased from 86.5% to 84.3% in 2012-13. In similar fashion, movers have increased from 7.9% to 8.1% and leavers have also increased from 5.6% to 7.7% in 2012-13.

Careful consideration of attrition and mobility rates among teachers is an important factor in developing local, state, and federal policies and procedures as such entities are responsible for setting educational priorities and opportunities for students. Analytical data such as that provided by the NCES and others allows for underlying factors to be analyzed and addressed through policy and programs. This becomes critically important as public education and the students served are constantly changing, which according to research impacts both the supply and demand of teachers and student achievement (Bobbitt, Cook, Whitener, & Weber, 1997; Darling-Hammond, 1984; Grissmer & Kirby, 1987, 1997; Guarino et al., 2006; Ingersoll, 2003; Ingersoll & May, 2012; Ingersoll & Merrill, 2010; Ingersoll et al., 2014; Perda, 2013).

Supply and Demand

The issue of supply and demand in teaching is not a new discussion. In 1999, *Education Week* devoted a five-part series to address the anticipated need for over 2 million teachers to serve in the nation's schools as estimated by the U.S. Department of Education over the next decade (Bradley, 1999). Darling-Hammond (2002) provided significant recommendations to state and local governing boards in response to the anticipated teacher shortage in the U.S., while also addressing the need to ensure the demand was met with a supply of high-quality teachers. Although student enrollment, class-size requirements, teaching assignments, and financial

restraints have a direct impact on the demand for teachers, Guarino et al. (2006) added high opportunity costs perceived by aspiring teachers may also impact teacher supply. The "ease of entry and overall compensation" as compared to other occupations could be viewed as a determining factor in choosing to teach over another profession (Guarino et al., 2006, p. 175).

In 2013, there were an estimated 3.5 million full-time-equivalent (FTE) teachers serving in U.S. K-12 schools; 3.1 million of which were serving in the public school system (NCES, 2013). According to the *Digest of Education Statistics, 2013*, this number is up approximately 2% from that reported in 2003 (NCES, 2013). It also appears student to teacher ratios have slightly increased over the 10-year period from 15.9 students per teacher in 2003 to 16 students per teacher in 2013. However, the Research Division of the National Education Association (2015) reported Texas student to teacher ratio to be 15.3 students per teacher based on 2014 data contained in *Rankings of the States 2014 and Estimates of School Statistics 2015* (National Education Association, 2015). The demand for competent, high quality, teachers remains a challenge for districts and states as evidenced by unfilled vacancies, legislative priorities, and loan forgiveness programs.

Reports suggest approximately half a million teachers move or leave the profession annually (NCES, 2015). Roughly 13% of all public school teachers in the U.S. "either move or leave the profession each year" (Witt, 2014, para. 1). The costs to states in addressing this attrition and mobility is estimated to range from $1 billion to $2.2 billion annually, as reported by Witt (2014) in a policy brief published by the Alliance for Excellent Education. While Public Education Information Management System (PEIMS) data compiled for the *Employed Teacher Attrition and New Hires 2007-2014* report prepared by TEA's research specialist, Dr. Michael Ramsay (2015), suggests Texas public schools hired more teachers than they lost for the

academic years reported, recent data analysis suggests the teaching profession has become increasingly unstable.

In a critical review of the empirical literature available on recruiting and retaining teachers within the U.S., Guarino et al. (2006) used supply and demand as the conceptual framework for their study. Although the authors defined supply as the number of teachers available for any given number of positions and demand as the number of positions available for teachers, they intentionally examined the concept of supply and demand as related to recruitment and retention in education (Guarino et al., 2006). Teacher supply is driven by the ease in which teachers can enter the profession and the *overall compensation*, which not only includes salary and benefits, but may also encompass *working conditions* or *personal satisfaction* related to the position. Guarino et al. effectively described the demand for teachers to be driven by "student enrollments, class-size targets, teaching-load norms, and budgetary constraints" (p. 175). While Guarino et al. (2006) did not delve deeply into the issue of supply and demand as it relates to student achievement, they noted policy improvements in addressing teacher retention and recruitment may be achieved at "the expense of quality, [thus] students may experience more harm than benefit from such a policy" (p. 177). Such policy improvements would only be beneficial if "student learning improves or remains constant as a result" (Guarino et al., 2006, p. 177).

As the nation's education leaders have sought to meet the demand for teachers by targeting the supply through recruitment initiatives such as "Teach for America," alternative licensing programs, and a variety of financial incentives, the concern shared by Guarino et al. (2006) may be justified. In fact, this concern has been the impetus of study for Ingersoll (1995a, 1995b, 1999, 2000, 2001b) for years as he focused on the organizational structures and school

characteristics attributing to teacher attrition as they relate to supply and demand. Ingersoll (1996, 2001a, 2001b, 2003) believed there to be a subset of factors within these structures and characteristics that extended beyond the individual teacher characteristics to which most recruitment initiatives sought to target. These factors included a teacher's feelings of job satisfaction as it related to the level of support they believed they received from school leaders, the development of processes allowing teacher input in campus decision making, and support for addressing various student behaviors and characteristics (Hanushek et al., 2004; Ingersoll 2001a, 2001b).

School Characteristics Related to Teacher Attrition

Teacher attrition, or teacher turnover, has been a focus of study for the past several decades. With the release of *A Nation at Risk* in 1983, the fear of significant teacher shortages has garnered national attention and research (Darling-Hammond, 1984; Ingersoll, 2001a, 2001b, 2003; Ingersoll & May, 2011; Ingersoll & Merrill, 2010; Ingersoll et al., 2014; National Academy of Sciences, 1987; National Commission on Excellence in Education, 1983). Darling-Hammond (1984) predicted teacher attrition rates would reach all-time highs, leading to a crisis in supply and demand for teachers. In relation to supply and demand in teaching, the concern was the number of teachers leaving the profession (leavers) would far outweigh the number of teachers who stayed in the profession (stayers) even when combined with the number of new teachers entering the profession. Where leavers are defined as those teachers who leave the profession and stayers are defined as those who stay, the prediction of the research at the time held the supply of quality teachers would not be sufficient to cover the shortfall. While national leaders reacted with several policy reforms and initiatives in an effort to increase the supply of adequate teachers for the future, most recent studies focused on the individual characteristics of

the teachers, and few considered the school characteristics related to teacher attrition (Ingersoll, 2001a, 2001b).

Very similar to choosing a particular neighborhood in which to buy a home, teachers often consider school characteristics as reasons to stay or leave a school or school district. Hanushek et al. (2004) used a regression model to analyze teacher turnover in Texas. The results of their study revealed ethnic composition of a school or district to be an important factor in whether teachers left a position within a district or left the profession altogether. According to the study, White teachers leave public schools where enrollment numbers for African-American and Hispanic students are predominant. This trend in attrition among White teachers occurs regardless of experience. The authors' research identified four primary reasons teachers decide to leave a school: 1) salary and working conditions; 2) other opportunities in the field; 3) personal and family situations; and 4) personnel policies and procedures within their current district (Hanushek et al., 2004). While Hanushek et al. identify four categories impacting teacher retention/attrition, they contend "teachers transfer from one school to another more as a reaction to the characteristics of their students than in response to better salaries in other schools" (p. 78).

The results of Hanushek et al.'s (2004) study reflected a loss of almost 20% of the teaching force in schools where student achievement scores were within the lowest quartile as measured by the Texas Assessment of Academic Skills (TAAS) assessment. In comparison, schools whose students scored within the top quartile of TAAS, experienced an exit rate of only 15% among teachers. Hanushek et al. found the results of the study confirmed their belief that "new teachers are often placed in the most difficult teaching situations" (p. 80) during their first years of teaching. In reflection, the authors stated, "teachers with fewer than two years of experience tend to be less effective than more experienced teachers, existing mobility patterns in

Texas are likely to adversely affect the achievement of disadvantaged students" (Hanushek et al., 2004, p. 80).

Changing Student Characteristics

In May 2015, NCES produced its annual report on the condition of education. *The Condition of Education 2015* provided policymakers with valuable data and trends in education within and outside of the United States (Kena et al., 2015). According to the report, public schools served almost 50 million students in the fall of 2012. It is anticipated student enrollment in public schools will increase to 52.9 million students by the school year 2024-25. In Texas, where the current study takes place, public school enrollment reached 5,151,925 students in the 2013-2014 school year; an increase of 19% over a 10-year period as reported by the Texas Education Agency. Public school enrollment in Texas increased more than five times the overall enrollment increase for the United States between 2001 and 2011. According to NCES, the state of Texas ranked seventh behind Nevada, Arizona, Alaska, Utah, Florida, and Maryland in expected increases in student enrollment (NCES, 2013).

With increased enrollment in the nation's schools, the country must also address significant demographic changes reflected in the profile of today's student. The nation's Hispanic population is expected to grow to 102.6 million by 2050; an increase of 188% as reported in 2000 (Couch & Zakariya, 2012). Additionally, the country's Asian/Pacific Islander population is projected to increase by 213% from 2000 to 2050, growing from 10.7 million to 33.4 million. In the 2001-02 school year, Texas saw the number of Hispanic students enrolled in school exceed the number of White students enrolled (Texas Education Agency, 2014). According to the *Enrollment in Texas Public Schools 2013-14* report, the number of Asian, Hispanic, and multiracial students has continued to rise, while the percentage of Black students

has remained the same and the percentage of White students has declined (Texas Education Agency, 2014). Policies and programs must be considerate of this change in student demographics. Changing student characteristics requires intentional changes in teacher preparation and political support to ensure teachers are confident and prepared to adjust to the needs of their students rather than the requirement of students adjusting to education.

Demographic studies not only revealed significant changes in race and ethnicity of today's student, but greater numbers of students living in poverty. In comparison to the demographic trends reported by *The Condition of Education 2015*, which indicated 21% of U.S. children age 5 to 17 years of age were living in poverty, Texas reported 60.1% of all students enrolled in public education have been identified as economically disadvantaged (Kena et al., 2015). Furthermore, national reports indicated 51.1% of Texas students were eligible to receive free or reduced meals during the 2011-12 school year. These statistics are further examined in the literature review when discussing reasons teacher *movers* and *leavers* change assignments and professions. As enrollment climbs and demographics change in the nation's public schools and within the state of Texas, the demand to recruit and retain competent, highly qualified teachers to serve this generation of students will continue to present challenges.

Trends and Characteristics in Teaching Force

As student characteristics have changed, so too have the characteristics of teachers serving in the classroom. Setting out to explore the field of teaching and those pursuing a career in the teaching field, Ingersoll et al. (2014) sought to answer several questions related to the profession: "Has the elementary and secondary teaching force changed in recent years? And, if so, how? Have the types and kinds of individuals going into teaching changed? Have the demographic characteristics of those working in classrooms altered?" (p. 1). These are among

the questions Ingersoll et al. (2014) sought to address in what they described as an exploratory research project. What they discovered is the teaching force in the U.S. has dramatically changed; however, more compelling are the seven trends they identified through their research. The teaching force is: "1) larger; 2) grayer; 3) greener; 4) more female; 5) more diverse, by race-ethnicity; 6) consistent in academic ability; and, 7) less stable" (Ingersoll et al., 2014, p. 1). These characteristics of the teaching force become important considerations when examining the supply and demand of teachers. Referencing the theory of supply and demand in this study, supply is driven by both organizational structures/characteristics and teacher characteristics.

Interestingly, as district leaders, states, and the country continue to convey and react to fears related to significant teacher shortages, Ingersoll et al. (2014) found data to the contrary. Among the seven trends Ingersoll et al. reported for education, it appears the teaching workforce in the United States is the largest occupational group according to the Bureau of Labor Statistics for 2011. While this may be true, the teaching profession also has one of the highest attrition rates in the country. According to Ingersoll et al., teacher attrition rates reached 9% in 2008-09, which is a 41% increase from the rate of 6.4% reported in 1988-89. Data evaluated by Ingersoll et al. revealed the highest rate of teacher turnover often occurs among campuses serving student populations identified as high-poverty, high-minority in communities described as urban and rural areas. Additionally, the findings identified a pattern of significant numbers of teachers *move* from poor to more affluent campuses, from high-minority schools to low-minority schools, and from schools defined as urban to those defined as suburban (Ingersoll, 2011; Ingersoll & May, 2012; Ingersoll et al., 2014). Hanushek et al. (2004) suggested the trend in this attrition cycle is difficult to address because it is hard to pinpoint whether the exit is a result of financial

need or working conditions. Regardless, it is evident both teacher and school characteristics play a factor in teacher turnover for high-need, high-diversity campuses.

Nationally, the highest attrition rates occurred for those teachers with less than five years of experience. In 2003, Ingersoll estimated "40 to 50 percent of those who enter teaching leave teaching within 5 years" (p. 17). In one of the largest longitudinal studies to date, Perda (2013) more accurately estimated 41.3% of beginning teachers leave the profession within their first five years of teaching. From 1988 to 2008, first-year teacher attrition rates rose from 9.8% to 13.1% (Ingersoll et al., 2014). Ingersoll et al. pointed out that "numerically there are far more beginners than before" equating to four times the number of teachers leaving the profession in 2007-08 as reported in 1987-88 (p. 25). If those teachers identified as contributing the most value-added in relation to student learning are, on average, the more experienced teachers in the profession (Hanushek et al., 2004), then rising attrition rates will directly influence student achievement.

In consideration of working conditions, Ingersoll et al. (2014) reported elementary class sizes reduced on average from 26:1 to 21:1 students to teacher from the late 1980s to 2008. Conversely, they reported there was little if any change in student to teacher ratios for middle and high school classrooms during this same period. They also reported both the number of courses taught per day and the number of hours taught per day increased at the middle and high school levels (Ingersoll et al., 2014). All of which continued to align with previous studies related to job dissatisfaction and feelings regarding the lack of administrative support at the secondary level (Allensworth, Ponisciak, & Mazzeo, 2009; Boyd et al., 2007; Goldring, Taie, & Riddles, 2014; Guarino et al., 2006). It is important to consider the reason(s) most often noted by teachers who move and/or leave the profession are related to workload and working conditions. Guarino et al. (2006) found job dissatisfaction to be the most often given reason by teachers for

leaving their positions. Although salaries were sometimes attributed to job dissatisfaction, the lack of perceived and/or real support from administration and student discipline problems were most influential in a teacher's reason for leaving the field of education (Hanushek et al., 2004; Ingersoll, 2001b).

Using the Schools and Staffing Survey and the linked Teacher Follow-up Survey data from 1990-2000, Smith and Ingersoll (2004) found the working conditions that attributed to a teacher's decision to remain were most often associated with mentor and induction programs, class sizes, teacher autonomy, and administrative support. Ingersoll et al. (2014) found these factors to remain true when analyzing first year teacher attrition rates from 1988-89 to 2008-09. The level of autonomy and control a teacher feels empowered to exercise with regard to issues that occur in the classroom or school-wide are considered working conditions that are critical factors in a teacher's decision to stay or leave. When these factors are absent, high levels of turnover occur (Ingersoll & May, 2011). When job satisfaction increases, or is perceived to be at high levels, attrition rates decrease resulting in lower demand and higher supply in teaching units.

Teacher Attrition and Student Achievement

Ronfeldt et al. (2013), in their study of teacher attrition, found small-scale organizational turnover provided opportunities to replace ineffective teachers with more effective teachers. They noted the compositional and disruptive factors inherent in teacher replacement are those most likely to relate to student achievement. To explain further, Ronfeldt et al. suggested the compositional factor is related to the number of effective teachers on a campus versus the number of ineffective teachers (i.e., the overall composition of the staff). When teachers come and go on a campus the compositional makeup of the entire staff is impacted. That is to say,

when turnover occurs on a campus and vacancies are filled the overall composition of the staff will equate to either a more effective or a less effective staff composition. This is an important consideration with the growing body of evidence that indicates more effective teachers tend to remain in schools while the less effective teachers tend to leave (Ronfeldt et al., 2013). Ferguson (1997) also observed students performed two standard deviations higher when assigned to teachers two years in a row who had been identified as highly qualified.

On the other hand, the disruptive effect of teacher attrition is related negatively to the cohesion of the school community, staff collaboration, and overall student achievement (Ingersoll, 2001b; Lortie, 1975). Ronfeldt et al. (2013) found the degree of disruption regarding patterns and structures has the potential to affect student achievement. To clarify, when turnover involves an effective teacher being replaced by an ineffective teacher, the disruptive factor comes into play. Most often the ineffective teacher requires significant coaching, instructional guidance, and other interventions, which has a direct impact to staff cohesion and student learning. While organizational theory contends some turnover to be healthy to an organization, the disruption caused by teacher turnover in a school community most often negatively affects student achievement. Bryk and Schneider (2002) observed schools that have successfully addressed the needs of disadvantaged students experience a strong sense of community. The sense of community can be compromised when schools experience a high level of attrition; ultimately relating to reduced student achievement.

Teacher Attrition and the Relationship to Middle School Student Achievement

The NCES (2014) reported approximately 20% of teachers leave the profession within the first five years of their teaching career. As U.S. leaders sought to address the anticipated teacher shortage over the past several decades, there has been significant research surrounding

teacher turnover rates in the nation's schools (Ingersoll, 2001a; Ingersoll & May, 2013; Ingersoll & Perda, 2013), but the research connecting the implications of teacher attrition and the relationship to student achievement is limited. Most studies focus on the financial implications of teacher turnover rather than the effect of teacher turnover on student achievement as measured by high stakes assessments (Barnes, Crowe, & Schaefer, 2007; Benner, 2000; Milanowski & Odden, 2007). Those investigating the educational ramifications of the *revolving door* of teaching in public schools, tend to analyze K-12 overall; however, few have explored the effects of teacher turnover on student performance in middle schools.

Research findings indicate the number of movers and leavers are also dependent upon the academic field of study of teachers and the type of school where a teacher is assigned. Carter and Carter (2000) found middle school to be the least desirable choice of teaching options among education majors in North Carolina and Virginia; noting discipline issues and behavioral dispositions associated with adolescents. However, in a review of literature conducted by the Education Commission of the States, this claim was found to be *inconclusive* (Allen, 2005). On the other hand, the commission's findings provided *strong evidence* that attrition is highest for secondary teachers, those serving in Grades 6-12, as compared to their elementary counterparts (Allen, 2005). An analysis of attrition patterns conducted among elementary and middle school teachers in New York City public schools found attrition rates to be highest among middle school math teachers versus elementary math teachers (Boyd et al., 2007). The authors noted the transfer rate after the first year of teaching in middle school to be 90% higher than that of first year fourth and fifth grade elementary teachers. This rate of transfer was three times larger after the second year of teaching middle school math in the New York Schools system, and the "pattern for middle-school ELA teachers" was found to be similar (Boyd et al., 2007, p. 16).

Commissioned as a task force in New York City, Boyd et al. (2007) examined teacher attrition rates in New York City middle schools. In comparison to New York City (NYC) elementary schools, the turnover rate in NYC middle schools was 11% higher than that of their elementary counterparts. The task force was assembled after data revealed 60% of the new mathematics teachers in New York City middle schools turned over during the first two years of teaching. Inexperienced novice teachers, lack of fidelity in instructional programs, and the high costs of recruitment and retention efforts were often referenced as contributors to the loss of teachers, which also aligns with Ronfeldt et al. (2013) findings. Boyd et al. (2007) found the relationship between teacher turnover and student achievement was reflected in a drop in math and reading scores for students in Grades 4-8.

The dip in student achievement scores for reading as measured by state assessments has been a trend at the state level for many years; however, it is also a concerning national trend among eighth grade students. The National Assessment of Educational Progress (NAEP, 2015), conducts the largest continuing assessment of trends in American student achievement in various subjects for students in Grades 4, 8, and 12 in the U.S. Approximately 100 schools within a state are selected to participate in each of the grade level assessments annually; however, the selection of campuses is unique to each grade level assessment. The three grade levels, and ages represented by the grades, are considered "critical junctures in academic achievement" (NCES, 2015, para. 1). According to the 2015 NAEP Reading Assessment, eighth grade reading scores were lower than those reported in 2013 (Nation's Report Card, 2015). Approximately 34% of eighth grade students are performing at or above the *proficient level* in reading. Although the report indicated there was no significant change in reading scores from 2013 to 2015 for eighth grade students in Texas (Nation's Report Card, 2015), the score change for eighth grade Texas

Texas students reflected a drop of 3 points on average in reading scores as compared to a drop of only 2 points for the nation's overall score change.

In an analysis of NAEP scores collected over 40 years, McKenna, Conradi, Lawrence, Jang, and Meyer (2012) found more than 25% of middle school and high school students continue to fall short in the area of reading achievement. McKenna et al. (2012) offer similar findings evident in the 2009 Program for International Student Assessment (PISA), which reveal significant numbers of students representing the 65 countries participating in the PISA fall below the baseline level of proficiency, associating the issue with the complexity of adolescence. Musen (2010) reported students who struggle in reading continue to fall behind their grade-level peers leading to a drop in college-career readiness and high school graduation rates, which supports the trends identified by the Alliance for Excellent Education (Witt, 2014). Musen's (2010) research also indicated the greatest gains in reading achievement to be obtained in the early grades with actual growth reducing each year through the middle years. These are disturbing findings considering the developmental needs of middle school aged students and the implications of teacher attrition and student achievement for middle school students.

Middle school, Grades 6-8, is a crucial time for the cognitive development of an adolescent child. Other than early childhood, there is no other time in a person's life when they undergo such significant development physically, cognitively, morally, psychologically, and social-emotionally than during the age of 10-15 years old; the time period defined as adolescence (Carnegie Council on Adolescent Development, 1989; Jackson & Davis, 2000). The need to respond developmentally to the middle level grades has been well documented by *Turning Points* (Carnegie Council on Adolescent Development, 1989), *Turning Points 2000* (Jackson & Davis, 2000), the Association for Middle Level Education's (formerly the National Middle

School Association, 2010) *This We Believe,* and the National Forum to Accelerate Middle Grades Reform (2014). Creating an environment appropriate to the cognitive, physical, and emotional needs of young adolescents is paramount in ensuring the future success of these children.

The Carnegie Corporation's Council on Adolescent Development's 1989 publication, *Turning Points: Preparing American Youth for the 21st Century,* was a grassroots effort to respond to the unique needs of adolescent youth. The report challenged the American education system to transform education in the middle level grades based on collected best practices and research at the time. Noting the stress associated with adolescence, Jackson and Davis (2000) recognized in the publication, *Turning Points 2000,* this stress combined with the transition from elementary school to middle school marked a decline in student achievement in English and mathematics. Without proper support and attention to the specific academic and emotional needs evident during this period of a child's life, the decline in student achievement continues. Depending on ethnicity, between 10% and 25% of adolescents in the United States, do not graduate from high school (National Center for Education Statistics, 2005). Although the U.S. Department of Education (2015) reports the nation's graduation rates have hit a record high at 82% for the 2013-2014 school year, these rates are still indicative of the high percentage of adolescents who do not earn a high school diploma. These statistics, combined with the trends in teacher attrition, warrant exploration in relation to student achievement in middle school.

Summary

The literature review supports the conceptual framework of supply and demand as analyzed through the work of Ingersoll (1995a, 1995b, 2001a, 2001b, 2003, 2014) and the relationship to teacher attrition through the empirical literature (Bradley, 1999; Darling-

Hammond, 2002; Grissmer & Kirby, 1987; Guarino et al., 2006; Hanushek et al., 2004; Milanowski & Odden, 2007). Teacher attrition rates continue to rise as schools identify and address those factors driving supply and demand in the field of teaching, while also attempting to increase student achievement. Noting the revolving door of education, Ingersoll et al. (2014) found the number of teachers entering the profession to be booming, yet turnover is at an all-time high. This is a concern as school community cohesion is a desirable working condition related to teacher attrition and a significant factor in student achievement. Although the literature related to teacher attrition is vast, the research extending the theory of supply and demand to organizational structures and school characteristics, is still developing. Likewise, the research on the implications of teacher attrition on student achievement in middle school is also limited.

CHAPTER 3

METHODOLOGY

This chapter explains the methodology used to examine the relationship between teacher attrition and student achievement in reading among middle school students. The methodology also focuses attention on the analysis of data collected for this study. In examining the relationship between teacher attrition, student success in middle school reading, and school demographic characteristics, the purpose of this study was to replicate and extend the research of Ronfeldt et al. (2013). This quantitative study used multiple linear regression models to analyze the variables to answer the following research questions:

1. What is the relationship between teacher attrition rates on student achievement in reading at the middle school level?
2. What is the specific relationship between attrition of teachers and student achievement in reading observed in each middle school grade level (i.e., 6th, 7th, and 8th grade)?
3. What is the relationship between teacher attrition, student achievement in reading in Grades 6, 7, and 8, and the demographic characteristics of the schools?

Research Design

This section introduces the framework of Ronfeldt et al.'s (2013) New York study of teacher attrition and student achievement. A review of the methods used by Ronfeldt et al. is provided along with an overview of the factors they attempted to control for and why. The description of Ronfeldt et al.'s study provides a foundation of the research conducted in the Texas study. While the connection between the New York and Texas studies are made, explanation for the differences between the two studies are also provided.

Through the literature review, Ronfeldt et al. (2013) determined that many factors attributed to the impact teacher turnover had on student achievement. However, Ronfeldt et al. (2013) believed previous research studies of teacher attrition and student achievement had failed

to establish a clear link between the two. Because of this lack of evidence, the New York study was designed in an attempt to establish such a "direct effect" clearly (Ronfeldt et al., 2013, p. 8) existed between teacher attrition and student achievement. Utilizing two fixed-effects regression models, Ronfeldt et al. designed methods to attempt to control for other influences, which may affect teacher turnover and student achievement.

The Ronfeldt et al. (2013) study conducted in New York City schools, analyzed data collected and reported by the New York City Department of Education and the New York State Education Department. Ronfeldt et al. (2013) was able to link student performance in mathematics and English language arts (ELA) to specific characteristics (i.e., student, grade, school, and teacher characteristics). They collected an estimated 85,000 observations of students in Grades 4 and 5 over a period of eight academic school years (2001-2002 and 2005-2010). Based on theoretical premises and studies previously proposed by researchers such as Guin (2004), Ingersoll (2001b), Boyd et al. (2005), Ronfeldt et al. (2013) sought to examine the relationship between teacher turnover and student achievement.

Ronfeldt et al. (2013) used regression models with fixed effects to control for variances that may present in teacher turnover when examining data across years in calculating data in the same grade and/or same school. Within these models, Ronfeldt et al. compared students in the same grade and same school over several years. Controlling for mitigating circumstances, which may have influenced student performance and attrition rates among teachers, the models developed by Ronfeldt et al. afforded extensive controls for these factors. The first regression model used by their team is reflected in Equation 1:

$$A_{itgsy} = \beta_0 + \beta_1 A_{itgs(y-1)} + \beta_2 OtherA_{itgs(y-1)} + \beta_3 X_{itgsy}$$
$$+ \beta_4 C_{tgsy} + \beta_5 S_{sy} + \phi_y + \nu_{sy} + \beta_6 T_{gsy} + \varepsilon_{itgsy}.$$

Ronfeldt et al. (2013) provide the following explanation of the first regression model reflected in Equation 1 as follows:

> The test performance of individual *i*, with teacher *t*, in grade *g*, in school *s*, in time *y* is a function of his or her test performance in that subject, *A*, and the other subject, *Other A*, in the prior year, student background characteristics, *X*, time-varying classroom characteristics, *C*, time-varying school characteristics, *S*, year fixed effects, ∅, grade-by-school fixed c effects, *v*, the grade-by-school-by-year turnover measure, *T*, and an error term, ∈. To account for the nonindependence of turnover rates within a grade-by-school-by-year level. (p. 14)

In the second regression model, Ronfeldt et al. (2013) sought to consider school-by-year, rather than school-by-grade. In this model, the fixed effects analysis was used to evaluate teacher turnover in the same year and school, across grades. The assumption was the second model would allow observation from year-to-year to determine whether the mitigating circumstances considered in Equation 1 might be observable in Equation 2 when evaluating student performance in different grades. The second regression model used by the team is reflected in Equation 2:

$$A_{itgsy} = \beta_0 + \beta_1 A_{itgs(y-1)} + \beta_2 OtherA_{itgs(y-1)} + \beta_3 X_{itgsy} + \beta_4 C_{tgsy} + \beta_5 S_{sy} + \phi_y + \nu_{sy} + \beta_6 T_{gsy} + \varepsilon_{itgsy}.$$

Ronfeldt et al. (2013) provide the following explanation of the second regression model reflected in Equation 2 below:

> The test performance of individual *i*, with teacher *t*, in grade *g*, in school *s*, in time *y* is a function of his or her test performance in that subject, *A*, and the other subject, *Other A*, in the prior year, student background characteristics, *X*, time-varying classroom characteristics, *C*, time-varying school characteristics, *S*, grade fixed effects, ∅, year-by-school fixed effects, *v*, the grade-by-school-by-year turnover measure, *T*, and an error term, ∈. To account for the nonindependence of turnover rates within a year-by-school unit across grade levels, we cluster the standard errors at the grade-by-school-by-year level. (p. 14)

Although Ronfeldt et al. (2013) were concerned the fixed-effects consideration may not reflect the variation anticipated within the groups identified, the methods used in evaluating the

relationship between teacher turnover and student performance did reveal a significant variance. Findings revealed the variation to be almost 75% of the shared variance using both methods measuring variance within both groups. The researchers acknowledged multiple fixed effects models may have yielded similar results. For instance, a multilevel analysis could prove advantageous because this approach would allow for direct adjustments within the grouping of students. The methods used by Ronfeldt et al. and the other possibilities were carefully considered in identifying the best model(s) to use in this study.

Population and Setting

Although this study was an attempt to replicate the research conducted by Ronfeldt et al. (2013), the collection of data was not limited to the district and did include similar data for the comparable groups identified by TEA for each middle school within the district. The district where the study takes place is located in North Texas and described as a fast-growth school district. Although this study focused primarily on seven middle schools within a North Texas school district, additional data was gathered for the campuses identified in the comparison groups for each middle school in the district. Prior to conducting the study, approval was secured from the study site and from the UNT Institutional Review Board. These approvals can be found in Appendices A and B.

Comparison groups are identified by the TEA based on similarities such as campus size, grade levels served, economically disadvantaged population, mobility rates, and the number of students identified as English language learners. Each comparison group contains 40 campuses from across the state of Texas. It was expected the data set in this study would yield approximately 240 campus observations as reported for 2014, 2015, and 2016 by the TEA. The yield of this study focused on campus observations rather than individual student observations as

reflected in Ronfeldt et al.'s (2013) study. The data sets of this study were more closely aligned due to the inclusion of data for the campuses identified in the comparison groups. Additionally, the North Texas school district study evaluated data over a three-year period as compared to the eight years of data collected by Ronfeldt et al. (2013). Lastly, this study encompassed all grade levels supported at the middle school level (i.e., sixth, seventh, and eighth) as compared to the two grade levels (fourth and fifth) used in the New York City models.

The study was conducted in a North Texas school district currently serving approximately 28,000 students. The district is described as a fast-growth school district covering approximately 180 square miles and serving all or parts of 17 cities, communities, or major developments. The district includes 34 comprehensive campuses serving Grades K-12 in addition to other specialized schools and centers. For the purpose of the study, data was collected from seven middle school campuses within the district and for campuses identified by the TEA in each middle school's comparison group.

In this study, the analysis encompassed data collected from the TEA and the North Texas school district. The analyses focused on students served in middle school Grades 6-8. The regression models for this study were designed to allow for analysis of the effects of teacher attrition based on approximately 240 data sets per year for 2014, 2015, and 2016. Data for the district's middle schools and the comparison groups included student assessment scores in reading over three academic years (2013-2014 through 2015-2016) as reported by the TEA. Demographic data, student-year, teacher-year, and school-by-grade-by-year, were provided for each year considered in this study as reported by the TEA.

Demographic characteristics for students and teachers are reflected as reported in the Texas Academic Performance Reports (TAPR) provided by the TEA, for the 2013-2014, 2014-

2015, and 2015-2016 school years. The information for the 2015-2016 school year is shown in Table 1. Data for the additional school years included in this study are shown in Appendix A and Appendix B. The information revealed Grades 6-8 to be consistent with state percentages over the years. Student demographics for the district are also comparable to state percentages for African American students; however, state percentages for Hispanic students are approximately 20% higher than the district average. Teacher characteristics for the district also lag behind state percentages for African American and Hispanic teachers. These similarities may be considered significant in this study in relevance to state implications. That is to say, the similarities and findings of this study could be considered statewide rather than relative only to the district and the comparison groups.

Data Collection

The timeline for data collection spanned three academic school years (2013-2014, 2014-2015, 2015-2016) for seven middle school campuses and the comparison group for each campus as identified by the TEA based on specific comparable factors such as campus size and demographics. The data collection period and campus selection were identified based on several factors. First, the first year of data collection was based on the seventh middle school opening in 2013-2014. This would be the first year state reporting data would be available for this campus from the TEA Division of Performance Reporting allowing the study to capture data for all middle schools within the district.

Although the New York City schools study included data for both mathematics and English language arts (ELA), the focus for this study was specifically state assessments for reading; excluding mathematics assessment data. This decision to collect data based on STAAR Reading assessments was based on recent changes to the Texas Essential Knowledge and Skills

(TEKS) standards in mathematics, which may present skewed results within the models because of discrepancies in results unrelated to teacher turnover.

Table 1

*Demographic Data by Student, Teacher, and School Characteristic – 2015-2016**

	Characteristics	District	%	State	%
Student	Total Students	27,296	100.0	5,284,252	100.0
	Grade 6	2,152	7.9	390,379	7.4
	Grade 7	2,125	7.8	389,411	7.4
	Grade 8	2,094	7.7	386,455	7.3
Ethnic Distribution	African American	3,683	13.5	666,933	12.6
	Hispanic	8,219	30.1	2,760,302	52.2
	White	13,841	50.7	1,507,225	28.5
	American Indian	197	0.7	20,855	0.4
	Asian	772	2.8	212,973	4.0
	Pacific Islander	41	0.2	7,392	0.1
	Two or More Races	543	2.0	108,572	2.1
Economically Disadvantaged		11,468	42.0	3,118,758	59.0
English Language Learners (ELL)		4,104	15.0	979,868	18.5
Teacher	Total Teachers	1,978.9	56.7	347,272.1	50.5
	African American	135.2	6.8	34,949.8	10.1
	Hispanic	242.8	12.3	90,214.9	26.0
	White	1,544.8	78.1	211,190.4	60.8
	American Indian	8.0	0.4	1,242.9	0.4
	Asian	7.5	0.4	5,134.3	1.5
	Pacific Islander	0.0	0.0	819.3	0.2
	Two or More Races	40.6	2.1	3,720.6	1.1
	Females	1,485.4	75.1	265,515.3	76.5
Teachers by Experience	Beginning Teachers	103.3	5.2	27,995.4	8.1
	1-5 Years	448.5	22.7	94,786.9	27.3
	6-10 Years	532.2	26.9	75,285.1	21.7
	11-20 Years	630.9	31.9	94,649.7	27.3
	Over 20 Years	264.0	13.3	54,555.0	15.7

Note. (Texas Education Agency, TEA Division of Performance Reporting, 2015, 2016)

Limitations

Data collected for the current study is limited to a North Texas school district of approximately 28,000 students and the comparison group identified for each middle school as identified by the TEA. Only student achievement data from the STAAR Reading assessment for Grades 6, 7, and 8 for the middle schools of the district and the comparison group campuses were analyzed in the study. The STAAR assessment for Reading is given annually in Grades 3-8. Assessment data for STAAR Reading assessments was used exclusively. The TEKS for reading have remained constant since 2009-2010.

This study was limited in scope as the sample only included attrition data related to teachers who were employed with the district and the comparison group campuses. Although TEA reports attrition rates by campus and district, the limitations of this data do not allow for evaluation of specific reasons for attrition within campus and/or district. The study included attrition rates only, but did not allow for consideration of movers and/or leavers within a campus or a district as this data is not provided by TEA. Teacher attrition data was collected only for professional teachers employed under contract and defined as a teacher in accordance with Chapter 21 of the Texas Education Code (2013). This study did not compare such data with neighboring districts, but did compare related data with state and federal data similar in nature.

Demographic characteristics of the schools included in this study were limited to schools serving middle Grades 6-8 within the district. Demographic characteristics of the school and district included student, teacher, and school-by-grade characteristics. School and district data were compared to state and federal data when comparable data exists. TEA defines comparison groups among campuses based on specific similarities of the campuses. Campus enrollment, grade levels supported, percentage of economically disadvantaged students, mobility rates, and

the number of students identified as English Language Learners are the similarities TEA utilizes in determining comparison groups. Each comparison group included 40 campuses from across the state with similar demographics as described above.

Assumptions

Data collected in this study was limited to students enrolled in the district during their sixth, seventh, and eighth grade years. Teacher attrition data was collected for teachers who were employed with the district and served as a sixth, seventh, and/or eighth grade teacher during the span of data collection years. Attrition data, student achievement data, and demographic characteristic data were collected through collaboration with the district and as reported by the TEA and the TAPR for the years included in this study. Teacher attrition was determined by the difference in total staff reported for each campus for each year data was collected as reported by the TAPR. It was assumed the difference between total staff between years was a close reflection of the attrition rate recognized by the campus for any given year. The assumption was data reported to the Texas Education Agency by the district was accurate as reported.

Data Analysis

An analysis of teacher and student data was conducted using teacher turnover/attrition rates and student achievement scores collected from seven middle schools in a fast-growth school district in Texas. In addition to the school-specific data collected within the district, similar data was collected for those schools identified as comparable campuses by the TEA. Teacher turnover/attrition rates and student achievement scores as measured by the STAAR in reading over three academic school years (2013-2014, 2014-2015, 2015-2016) was analyzed. To obtain the most accurate analysis, the data was examined at a *school-by-grade-by-year level*. This type of examination allowed adjustment for factors that may have “influence both student

achievement and turnover" (Ronfeldt et al., 2013, p. 9). The models for this study allowed for examination of the relationship between teacher turnover/attrition and student achievement in reading at the school-by-grade-by year level. It was anticipated the study would yield similar results to those found in New York City schools. That is, an observable relationship would be identified between teacher turnover rates and student achievement in reading, as observed in state mandated reading assessments in the middle schools of a North Texas school district and the campuses identified by the TEA in the comparison group for each middle school.

Although this was an attempt to replicate the study conducted by Ronfeldt et al. (2013), the data analysis was evaluated in similar, but different methods. Using multiple linear regression models, STAAR percentage passing rates for the sixth, seventh, and eighth grades represented three separate dependent variables. Attrition rates were calculated by identifying the difference in total professional staff as reported on the TAPR from the years 2014, 2015, and 2016. Additionally, it was necessary to include total professional staff reported on the TAPR for 2013. This difference in total profession staff from year to year represented one of independent variables within each research question of the study. The advantage of this analysis was it also allowed for the inclusion of data for schools that have increased their total number of teachers. This advantage is important in consideration of the identification of the district to be a fast-growth school district in Texas. The demographic variables were determined after running preliminary analyses to determine the relationship between the demographic variables and the dependent variables. The significant demographics were then added into the regression model as independent variables. The data was cleaned and screened for univariate and multivariate outliers, as well as multicollinearity and other mechanical factors that may skew the results. The

multiple regression method used followed the guidelines suggested by Mertler and Vannatta Reinhart (2017).

Table 2 reflects the variables, which were evaluated in analyzing each research question included in the North Texas study. The dependent variable for each question remained the same. Although each question included teacher attrition as an independent variable, Research Questions 2 and 3 included additional variables to determine the impact to achievement in reading by grade level and school demographic characteristics.

Summary

Although the current study was an attempt to replicate the study conducted by Ronfeldt et al. (2013), the models utilized to analyze the data were different. While Ronfeldt et al. applied regression models with fixed effects, this study utilized multiple linear regression models. Data collection spanned the 2013-2014, 2014-2015, and 2015-16 school years in Texas. The STAAR percentage passing data for reading assessments in Grades 6, 7, and 8 represented dependent variables. Attrition rates were calculated by comparing the difference in attrition rate percentages between the three academic school years included in the study. Preliminary analyses were conducted to determine the relationship between the demographic variables and the dependent variables. The significant demographics were added into the regression model as dependent variables. The results of the regression model are presented in Chapter 4.

Table 2

Independent Variables (Predictors) and Dependent Variable (Outcome)

Independent Variable(s) - Predictors	Dependent Variable - Outcome
Research Question 1: What is the relationship between teacher retention rates on student achievement in reading at the middle school level?	
Teacher Attrition	Reading Achievement
Research Question 2: What is the specific relationship between retention of teachers and student achievement in reading observed in each middle school grade level (i.e., 6th, 7th, and 8th grade)?	
Teacher Attrition	Reading Achievement
• % by 6th grade • % by 7th grade • % by 8th grade	• Reading Achievement in 6th grade • Reading Achievement in 7th grade • Reading Achievement in 8th grade
Research Question 3: What is the relationship among teacher retention, student success, and the demographic characteristics of the schools?	
Teacher Attrition	Reading Achievement
Demographic Characteristics • % African American Students • % Hispanic Students • % White Students • % American Indian Students • % Asian Students • % Pacific Islander Students • % Two or More Races Students • % Economically Disadvantaged • % English Limited Proficient • Mobility Rates	

CHAPTER 4

RESULTS

This study was conducted to determine if teacher attrition influences student achievement in a group of schools that are comparable. The parameters of this study included data collection for seven middle schools of a North Texas school district serving approximately 28,000 students and the middle schools identified within the comparison group of each campus as determined by the Texas Education Agency (TEA). The study included student achievement data from student performance on the State of Texas Assessments of Academic Readiness (STAAR) in Reading (TEA Division of Performance Reporting) for Grades 6, 7, and 8 for the middle schools of the district and the middle schools identified as comparison campuses for each of the district middle schools. Campus comparison groups are identified by TEA based on the similarities between campuses. These similarities include number of students enrolled, grade levels served, percentage of economically disadvantaged students, mobility rates, and the number of students identified as English Language Learners. Each comparison group included 40 campuses from across the state with similar demographics. This group included the seven district middle schools and their 40 comparison campuses with the elimination of duplicates and the removal of schools identified as anomalies, as defined by their inclusion in less than three years of the data in this study. The data sample for this study consisted of 280 schools. As part of a multiple regression analysis, the Pearson *r* correlation coefficient was used as it explains the amount of covariance represented by the line of best fit generated by the multiple regression model (Vieira, 2017). The Pearson *r* (reported as adjusted R^2) is considered to be the most stable measure of correlations and is the most accepted measure in correlating variable data that are either interval or ratio (Field, 2005). Statistical analyses were conducted using SPSS, Version 22. Chapter 4 includes

descriptive statistics, the results of the multiple regression analysis, and the answer to the research questions in this study. The chapter concludes with a summary of the results.

Descriptive Statistics

Table 3 shows each of the variables examined in the model. Initial analysis of the data indicated the data would not conform to the assumptions (e.g. linearity, normality, multicollinearity, etc.) required to conduct a multiple regression (Mertler & Vannatta Reinhart, 2017).

Table 3

Descriptive Statistics of Each Variable in the Model

		Statistic						Skewness		Kurtosis	
	N	Range	Min	Max	*M*	*SD*	Variance	Statistic	Std. Error	Statistic	Std. Error
Total Students	280	921.33	464.67	1386.00	890.58	178.60	31899.47	0.49	0.15	0.16	0.29
% Eco Dis	280	87.17	2.60	89.77	44.15	22.63	512.06	0.06	0.15	-1.13	0.29
% ELL	280	34.67	0.30	34.97	9.52	7.23	52.32	0.96	0.15	0.35	0.29
% Mobility	280	25.53	2.47	28.00	11.66	4.30	18.47	0.92	0.15	1.41	0.29
Total Staff	280	63.67	37.27	100.93	67.35	11.50	132.19	0.21	0.15	-0.06	0.29
% Af Am	280	55.73	0.00	55.73	10.46	10.12	102.47	1.80	0.15	3.93	0.29
% Hispanic	280	91.50	7.77	99.27	42.77	24.10	581.03	0.86	0.15	-0.09	0.29
% White	280	78.50	0.40	78.90	38.06	21.38	457.26	-0.14	0.15	-0.99	0.29
% Am Ind	280	1.30	0.00	1.30	0.34	0.23	0.05	0.89	0.15	1.15	0.29
% Asian	280	46.97	0.00	46.97	5.84	8.15	66.39	2.56	0.15	7.17	0.29
% Pac Isl	280	0.73	0.00	0.73	0.13	0.14	0.02	1.65	0.15	2.72	0.29
% 2 or more races	280	6.03	0.00	6.03	2.40	1.27	1.62	-0.01	0.15	-0.53	0.29
Staff Difference	280	47.43	18.37	65.80	41.41	8.21	67.33	-0.05	0.15	0.11	0.29
Pass Rate											
Campus	280	37.67	60.33	98.00	83.68	8.28	68.50	-0.47	0.15	-0.50	0.29
6th Grade	280	45.33	52.33	97.67	79.59	9.83	96.56	-0.41	0.15	-0.48	0.29
7th Grade	280	48.33	50.00	98.33	79.58	10.10	102.00	-0.42	0.15	-0.46	0.29
8th Grade	280	25.00	74.33	99.33	91.56	5.49	30.19	-0.78	0.15	-0.11	0.29

Thus, the independent and dependent variables from each year were combined to form averages and these variables are represented as averages over the three-year examination period. The dependent variable is the average passing rate on STAAR Reading assessments for the whole campus and by grade level, while the independent variables consist of school population size and characteristics, as well as, student demographics and teacher attrition. Table 3 displays the descriptive statistics for every variable used in the models to answer each research question.

When screening the data some of the variables had missing data points. For variables that were missing 5-15% of cases, the variable mean replaced the missing data point. For variables missing less than 5% of the cases, the listwise default value replaced the missing number. The original data set included 307 schools. After screening for univariate and multivariate outliers and eliminating them, the sample included in analyses was 280 (N = 280) campuses (Mertler & Vannatta Reinhart, 2017).

Research Question Results

The dependent variables (i.e., sixth, seventh, eighth, and campus STAAR Reading passing rates) were examined in relationship to school population size and characteristics, as well as, student demographics and teacher attrition. This section presents the results of each question. Chapter 5 discusses the implications of the findings.

Research Question 1

Research Question 1 examined the relationship between teacher attrition rates on student achievement in reading at the middle school level. To analyze this question, the average teacher attrition rate represented the independent variable, and the average campus passing rate for the STAAR Reading assessment represented the dependent variable. A simple regression (one independent, one dependent variable) analysis was used to determine if the average teacher

attrition rate could predict the average campus passing rate on the state assessment. Using this analysis for Research Question 1, it was determined attrition accounts for 16% of the variance in the average campus passing rate for STAAR Reading among middle school students.

Analysis of the scatterplot represented in Figure 2 reveals the dependent variable (Reading Achievement) and the independent variable (Teacher Attrition) are orthogonal and linearly related. The scatterplot for Research Question 1 also indicates there is no multicollinearity between the two variables examined in this question. Therefore, combining variables and/or recoding were not necessary in this analysis (Mertler & Vannatta Reinhart, 2017).

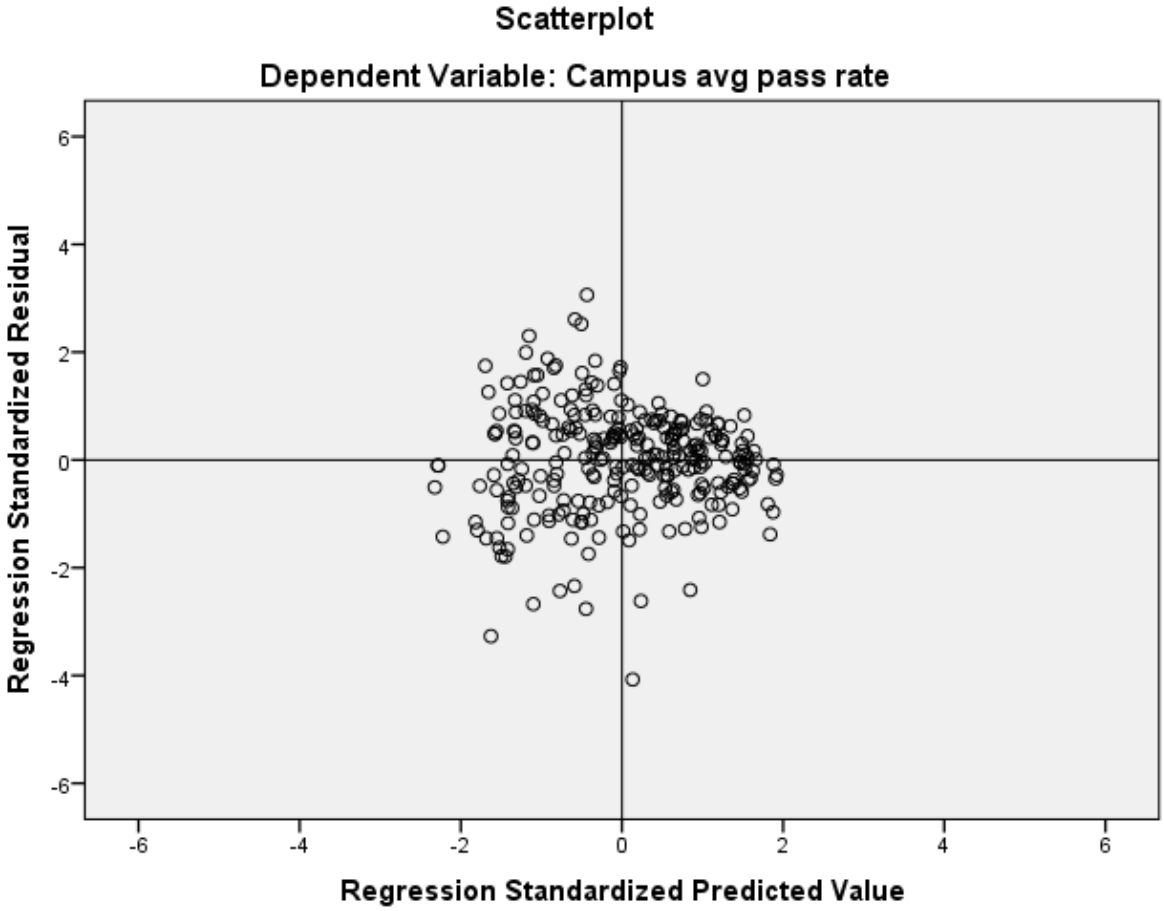

Figure 2. The relationship between the average campus STAAR Reading pass rates and the average teacher attrition rate from the 2013-2014 to 2015-2016 school years.

Figures 3 and 4 display the linear relationship and distribution of the data used in the regression. Although a slight curvilinear relationship is apparent in Figure 3 and a slightly negatively skewed distribution is observable in Figure 4, transforming the variables did not make sense because of the categorical nature of the variables. That is, mathematically manipulating STAAR Reading campus passing percentage rates and the average staff difference to better meet the assumptions necessary to conduct a regression would result in a constructed and convoluted variable that had minimal or any practical significance. Moreover, choosing not to transform the variables results in a model that is more conservative, which means that any effect would be artificially deflated. That is, any significant finding is less likely to result from Type I error, which means if it is observed, it is probably there (Mertler & Vannatta Reinhart, 2017).

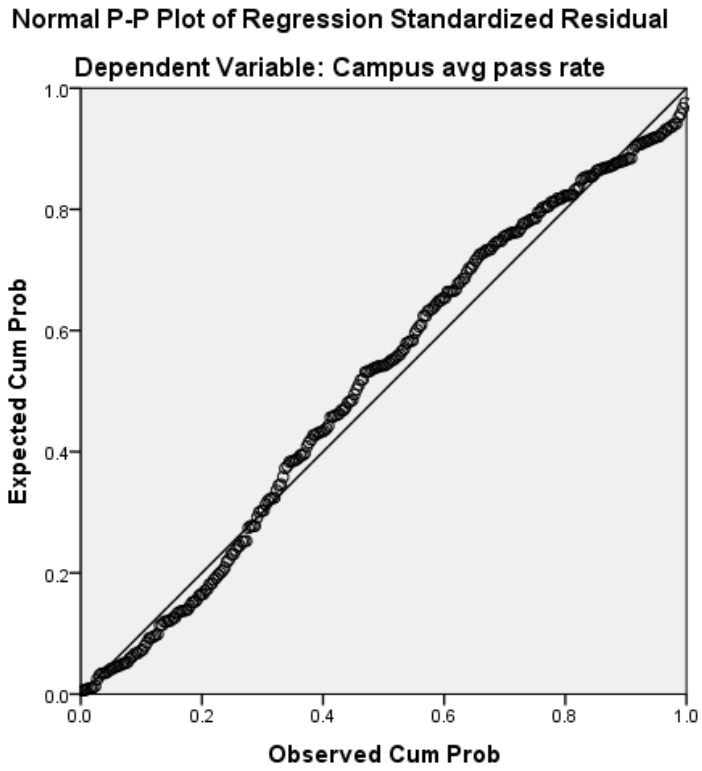

Figure 3. Observed residuals in relation to the expected residuals of the two variables in the model. Although a slight curvilinear pattern is visible, all the points are on or near the line throughout, and no severe outliers are present, which means that the variables are orthogonal and relatively normal.

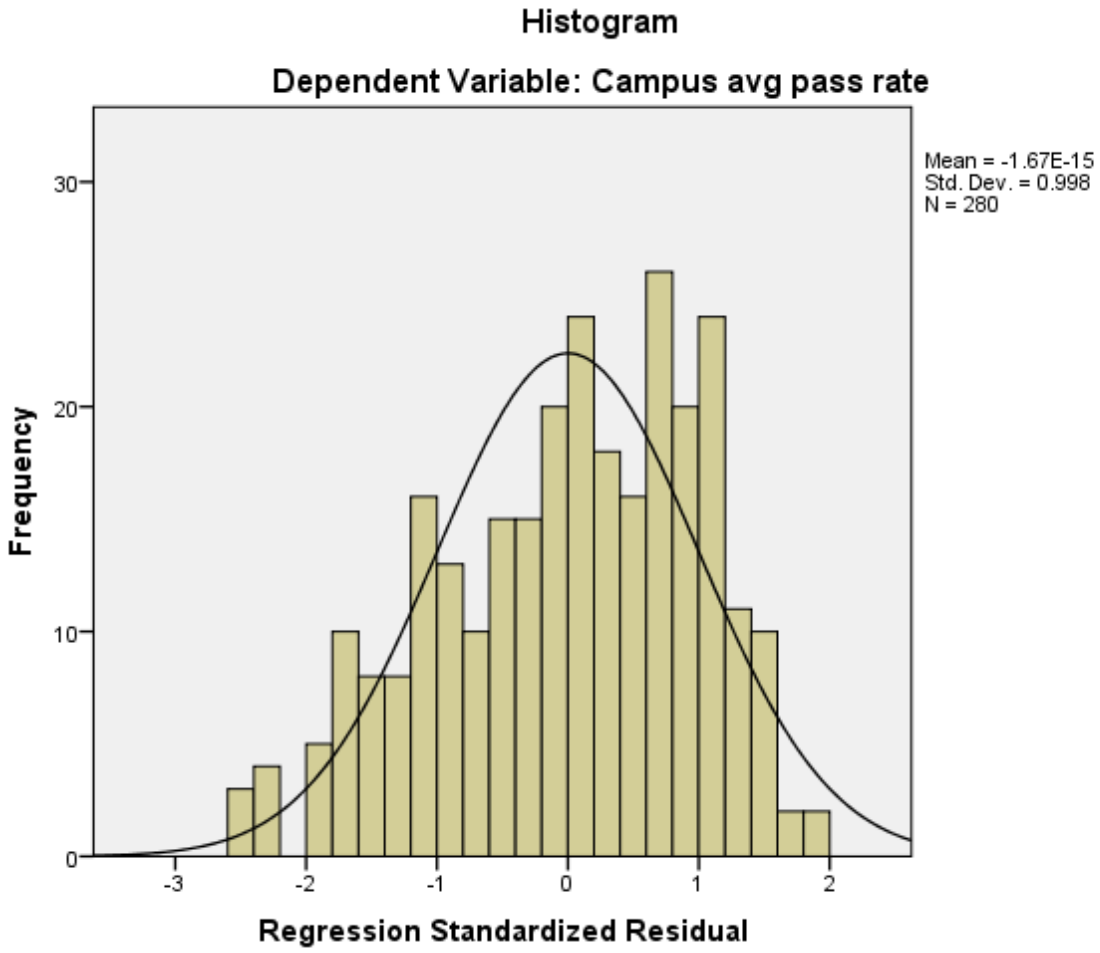

Figure 4. Distribution of standardized residuals expressed in the normality of the residuals of the two variables used in the model. Although a slight negative skew is apparent, it is not "non-normal" enough to matter, thus the assumption of a normal distribution (bell-shaped curve) is met and a regression is an appropriate method for analysis.

After following the data preparation techniques described by Mertler and Vannatta Reinhart (2017), a regression was conducted to determine the effect of the variable average teacher attrition on average campus STAAR Reading pass rates. Average teacher attrition had a significant impact on campus STAAR Reading pass rates and explained 15.8% of the variance ($F(1, 278) = 53.38$, $p < .001$, ($t(278) = 7.306$, $p < .001$, $R^2_{adj.} = .158$). Tables 4-7 display the results of the analysis.

Table 4

Correlations of Average Campus STAAR Reading Pass Rates and Average Teacher Attrition

Correlation		Campus Average Pass Rate	Average Staff Difference
Pearson	Campus avg pass rate	1.000	.401
	AVG Staff Difference	.401	1.000
Sig. (1-tailed)	Campus avg pass rate	.	.000
	AVG Staff Difference	.000	.
N	Campus avg pass rate	280	280
	AVG Staff Difference	280	280

Table 5

Regression Model Summary of Teacher Attrition on Average Campus STAAR Reading Pass Rates

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate
1	.401[a]	.161	.158	7.5940432

Note. [a] Predictors: (Constant), Average Teacher Attrition. In Table 5, *R* is the Pearson correlation, *R* square is the percentage shared variance, and the adjusted *R* square is the adjusted percentage shared variance (i.e., the effect size—in this model, Teacher Attrition accounts for 15.8% of the variance in average campus STAAR Reading pass rates.

Table 6

ANOVA for the Regression Model of Teacher Attrition on Average Campus STAAR Reading Pass Rates

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	3078.389	1	3078.389	53.380**	< .001[b]
	Residual	16032.119	278	57.669		
	Total	19110.508	279			

Note. [a] Dependent Variable: Campus avg pass rate. [b] Predictors: (Constant), AVG Staff Difference. **Indicates a significant regression model at the $p < .001$ level.

Table 7

Significant Coefficients in the Regression Model of Teacher Attrition on Average Campus STAAR Reading Pass Rates

		Coefficients					Correlations			Collinearity Statistics	
		Unstandardized		Standardized							
	Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	66.916	2.339		28.609	.000					
	AVG Staff Difference	.405	.055	.401	7.30**	< .001	.401	.401	.401	1.000	1.000

Note. ** Indicates significance at the $p < .001$ level

The resulting regression equation is for the model teacher attrition on average campus STAAR Reading pass rates is:

Average Campus STAAR Reading Pass Rates = .405 Average Teacher Attrition + 66.916

Research Question 2

In the second research question of the study, the analysis considered the specific relationship between retention of teachers and student achievement in reading observed in each middle school grade level (i.e., sixth, seventh, and eighth grade). As in the first research question, the average teacher attrition rate represented the independent variable; however, the dependent variables were represented by the STAAR Reading passing rate for each grade level assessed instead of the campus passing rate examined in Research Question 1. The second research question sought to determine if teacher attrition had a different impact on student achievement scores depending on the grade level of the students represented in this study.

As in Research Question 1, after eliminating univariate and multivariate outliers, the data was examined for linearity and normality in order to meet the assumptions necessary to conduct a regression analysis. Figures 5, 6, and 7 display the orthogonal relationship between teacher

attrition and the average sixth grade STAAR Reading pass rate, as well as the linear relationship and distribution of the residuals. As before, a slight curvilinear relationship is present as well as a slight negative skew; however, as before, no transformations were conducted, as they were not germane to the practical applications of this study.

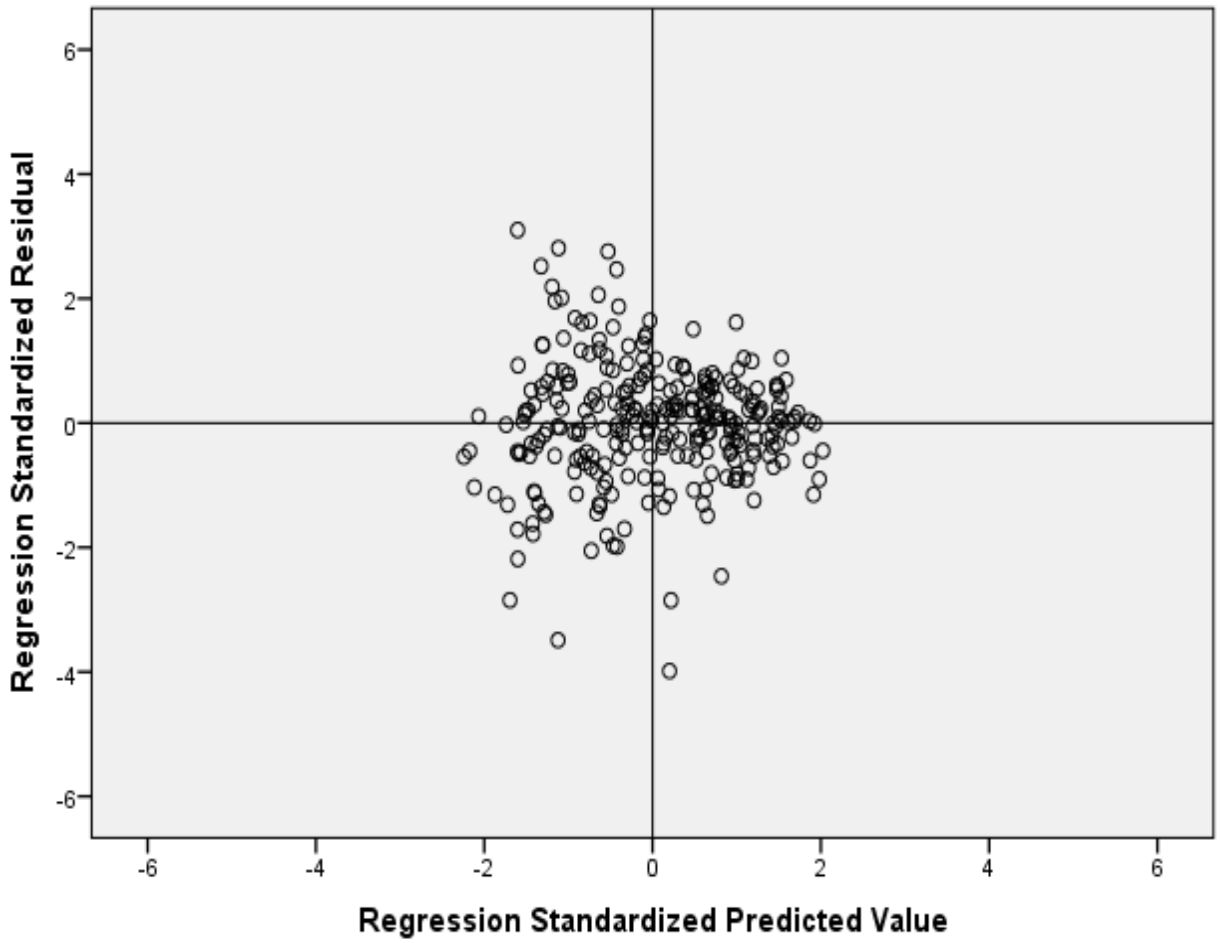

Figure 5. Relationship between the average 6th grade STAAR Reading pass rate and the average teacher attrition rate from the 2013-2014 to 2015-2016 school years.

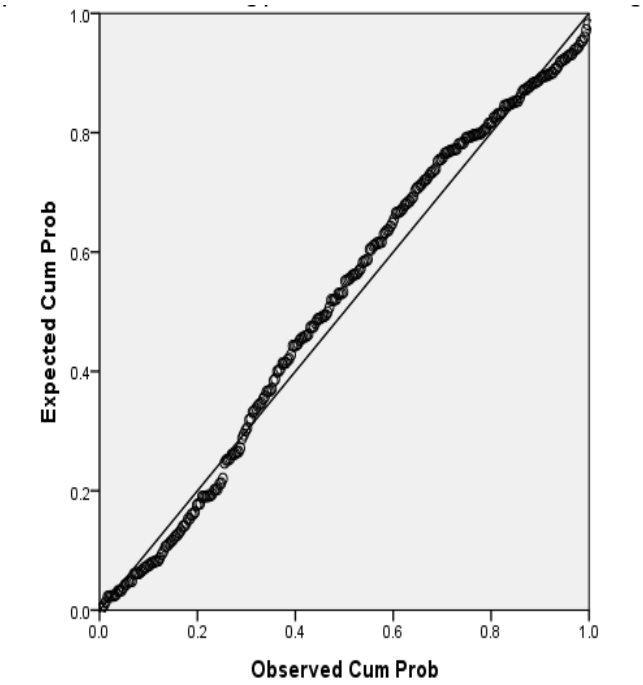

Figure 6. Observed residuals in relation to the expected residuals of average 6th grade STAAR Reading pass rate and average teacher attrition. Although a slight curvilinear pattern is visible, all the points are on or near the line throughout, and no severe outliers are present, which means that the variables are orthogonal and relatively normal.

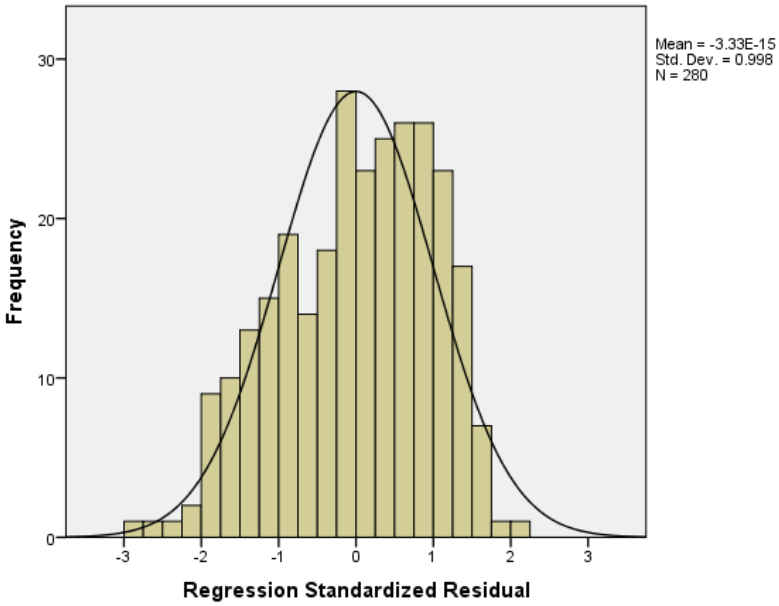

Figure 7. Distribution of standardized residuals expressed in the normality of the residuals of average 6th grade STAAR Reading pass rate and average teacher attrition. Although a slight negative skew is apparent, it is not "non-normal" enough to matter, thus the assumption of a normal distribution (bell-shaped curve) is met and a regression is an appropriate method for analysis.

After following the data preparation techniques described by Mertler and Vannatta Reinhart (2017), a regression was conducted to determine the effect of the variable average teacher attrition on average sixth grade STAAR Reading pass rate. Average teacher attrition had a significant impact on average sixth grade STAAR Reading pass rate and explained 15.8% of the variance ($F(1, 278) = 53.20$, $p < .001$, ($t(278) = 7.293$, $p < .001$, $R^2_{adj.} = .158$). Tables 8-11 display the results of the analysis.

Table 8

Correlations of Average 6th Grade STAAR Reading Pass Rates and Average Teacher Attrition

Correlation		6th Avg pass rate w/series mean for missing	AVG Staff Difference
Pearson	6th Avg pass rate w/series mean for missing	1.000	.401
	AVG Staff Difference	.401	1.000
Sig. (1-tailed)	6th Avg pass rate w/series mean for missing	.	.000
	AVG Staff Difference	.000	.
N	6th Avg pass rate w/series mean for missing	280	280
	AVG Staff Difference	280	280

Table 9

Regression Model Summary of Teacher Attrition on Average 6th Grade STAAR Reading Pass Rates

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate
1	.401[a]	.161	.158	9.0190582

Note. [a] Predictors: (Constant), AVG staff difference. R is the Pearson correlation, R square is the percentage shared variance, and the adjusted R square is the adjusted percentage shared variance (i.e., the effect size—in this model, teacher attrition accounts for 15.8% of the variance in average 6th grade STAAR Reading pass rates.

Table 10

ANOVA for the Regression Model of Teacher Attrition on Average 6th Grade STAAR Reading Pass Rates

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	4327.033	1	4327.033	53.195**	< .001[b]
	Residual	22613.468	278	81.343		
	Total	26940.502	279			

Note. [a] Dependent Variable: 6th Avg pass rate with series mean for missing. [b] Predictors: (Constant), AVG Staff Difference. **Indicates a significant regression model at the $p < .001$.

Table 11

Significant Coefficients in the Regression Model of Teacher Attrition on Average 6th Grade STAAR Reading Pass Rates

		Coefficients					Correlations			Collinearity Statistics	
		Unstandardized		Standardized							
	Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	59.711	2.778		21.495	.000					
	AVG Staff Difference	.480	.066	.401	7.293**	< .001	.401	.401	.401	1.000	1.000

Note. Dependent variable: 6th avg pass rate with series mean for missing. ** Indicates significance at the $p < .001$.

The resulting regression equation for the model teacher attrition on average sixth grade STAAR Reading pass rate is:

Average 6th Grade STAAR Reading Pass Rate = .480 Average Teacher Attrition + 59.711

Again, after eliminating univariate and multivariate outliers, the data for seventh grade was examined for linearity and normality in order to meet the assumptions necessary to conduct a regression analysis. Figures 8, 9, and 10 display the orthogonal relationship between teacher attrition and the average seventh grade STAAR Reading pass rate, as well as the linear

relationship and distribution of the residuals. A visual inspection reveals a slight curvilinear relationship is present as well as a slight negative skew; however, as before, no transformations were conducted, as they were not germane to the practical applications of this study.

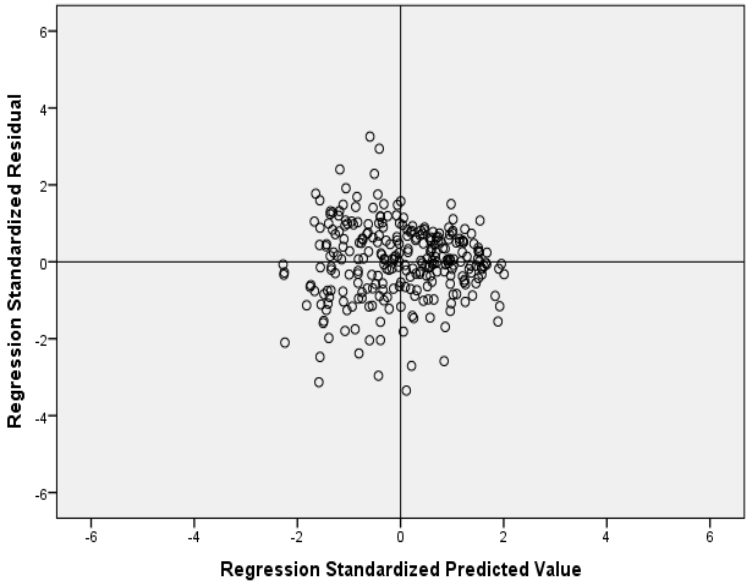

Figure 8. Relationship between the average 7th grade STAAR Reading pass rate and the average teacher attrition rate from the 2013-2014 to 2015-2016 school years.

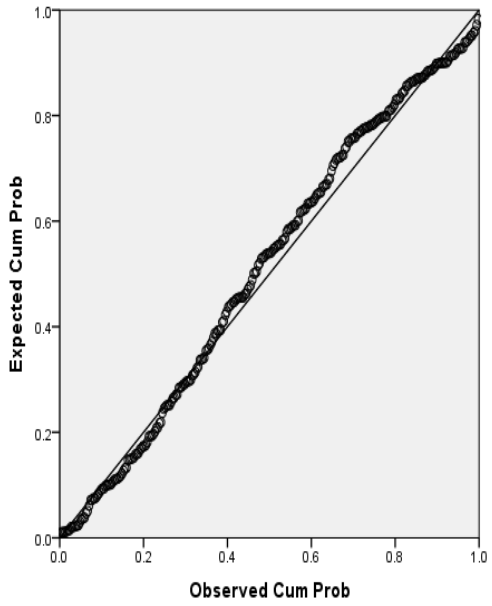

Figure 9. Observed residuals in relation to the expected residuals of average 7th grade STAAR Reading pass rate and average teacher attrition. Although a slight curvilinear pattern is visible, all the points are on or near the line throughout, and no severe outliers are present, which means that the variables are orthogonal and relatively normal.

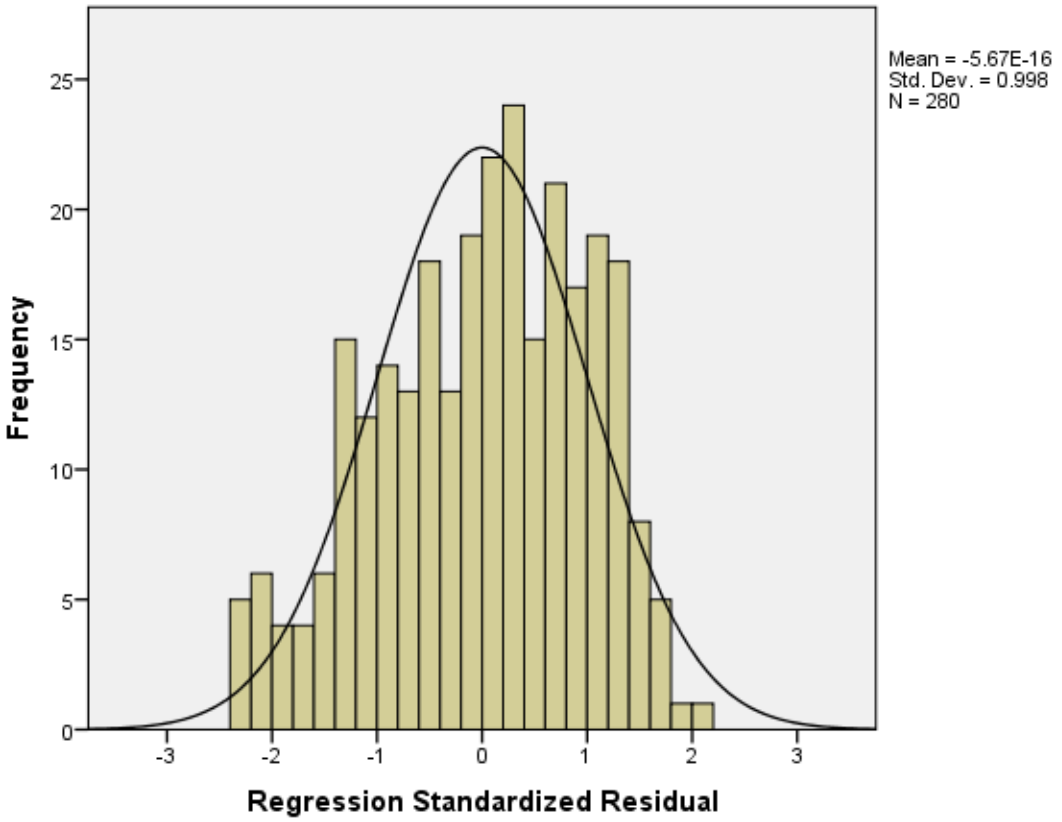

Figure 10. Distribution of standardized residuals expressed in the normality of the residuals of average 7th grade STAAR Reading pass rate and average teacher attrition. Although a slight negative skew is apparent, it is not *non-normal* enough to matter, thus the assumption of a normal distribution (bell-shaped curve) is met and a regression is an appropriate method for analysis.

After following the data preparation techniques described by Mertler and Vannatta Reinhart (2017), a regression was conducted to determine the effect of the variable average teacher attrition on average seventh grade STAAR Reading pass rate. Average teacher attrition had a significant impact on average seventh grade STAAR Reading pass rate and explained 15.8% of the variance ($F(1, 278) = 53.44$, $p < .001$, ($t(278) = 7.31$, $p < .001$, $R^2_{adj.} = .158$). Tables 12-15 display the results of the analysis.

Table 12

Correlations of Average 7th Grade STAAR Reading Pass Rates and Average Teacher Attrition

Correlation		7th Avg pass rate	AVG Staff Difference
Pearson	7th Avg Pass rate	1.000	.402
	AVG Staff Difference	.402	1.000
Sig. (1-tailed)	7th Avg Pass rate	.	.000
	AVG Staff Difference	.000	.
N	7th Avg Pass rate	280	280
	AVG Staff Difference	280	280

Table 13

Regression Model Summary of Teacher Attrition on Average 7th Grade STAAR Reading Pass Rates

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate
1	.402[a]	.161	.158	9.2662395

Note. [a] Predictors: (Constant), AVG Staff Difference. R is the Pearson Correlation, R Square is the percent shared variance, and the adjusted R Square is the adjusted percent shared variance (i.e. the effect size—in this model, Teacher Attrition accounts for 15.8% of the variance in average 7th grade STAAR Reading pass rates.

Table 14

ANOVA Table for the Regression Model of Teacher Attrition on Average 7th Grade STAAR Reading Pass Rates

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	4588.473	1	4588.473	53.439**	< .001[b]
	Residual	23869.968	278	85.863		
	Total	28458.441	279			

Note. [a] Dependent Variable: 7th Avg Pass Rate. [b] Predictors: (Constant), Avg. Staff Difference. **Indicates a significant regression model at the $p < .001$

Table 15

Significant Coefficients in the Regression Model of Teacher Attrition on Average 7th Grade STAAR Reading Pass Rates

		Coefficients					Correlations			Collinearity Statistics	
		Unstandardized		Standardized							
	Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	59.113	2.854		20.712	.000					
	AVG Staff Difference	.494	.068	.402	7.310**	< .001	.402	.402	.402	1.000	1.000

Note. [a] Dependent Variable: 7th Avg Pass Rate. **Indicates a significant regression model at the $p < .001$.

The resulting regression equation is for the model teacher attrition on average seventh grade STAAR Reading pass rate is:

Average 7th Grade STAAR Reading Pass Rate = .494 Average Teacher Attrition + 59.113

To examine eighth grade implications, after eliminating univariate and multivariate outliers, the data was examined for linearity and normality in order to meet the assumptions necessary to conduct a regression analysis. Figures 11, 12, and 13 display the orthogonal relationship between teacher attrition and the average eighth grade STAAR Reading pass rate, as well as the linear relationship and distribution of the residuals. Once again, a slight curvilinear relationship is present as well as a slight negative skew; however, as before, no transformations were conducted, as they were not germane to the practical applications of this study.

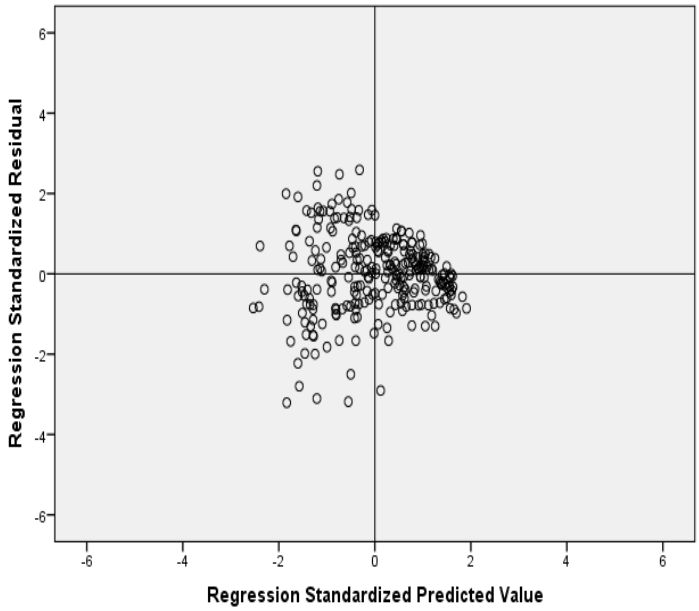

Figure 11. Relationship between the average 8th grade STAAR Reading pass rate and the average teacher attrition rate from the 2013-2014 to 2015-2016 school years.

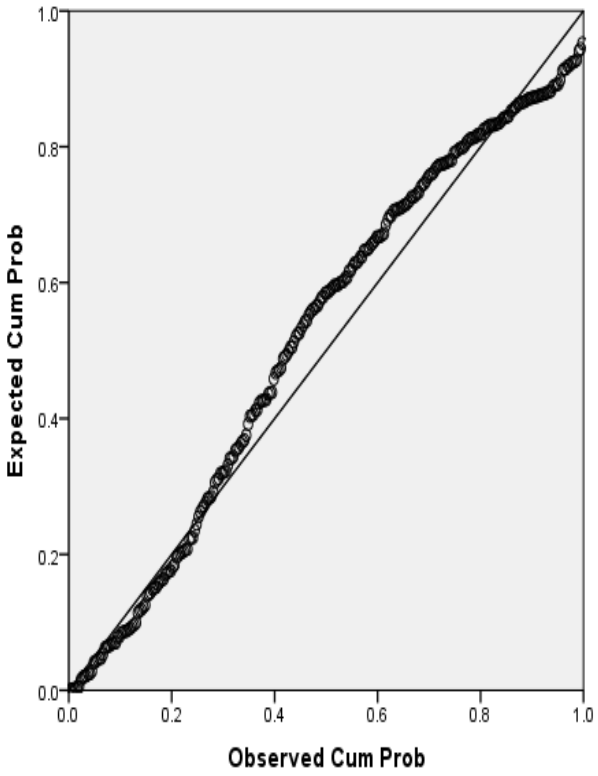

Figure 12. Observed residuals in relation to the expected residuals of average 8th grade STAAR Reading pass rate and average teacher attrition. Although a slight curvilinear pattern is visible, all the points are on or near the line throughout, and no severe outliers are present, which means that the variables are orthogonal and relatively normal.

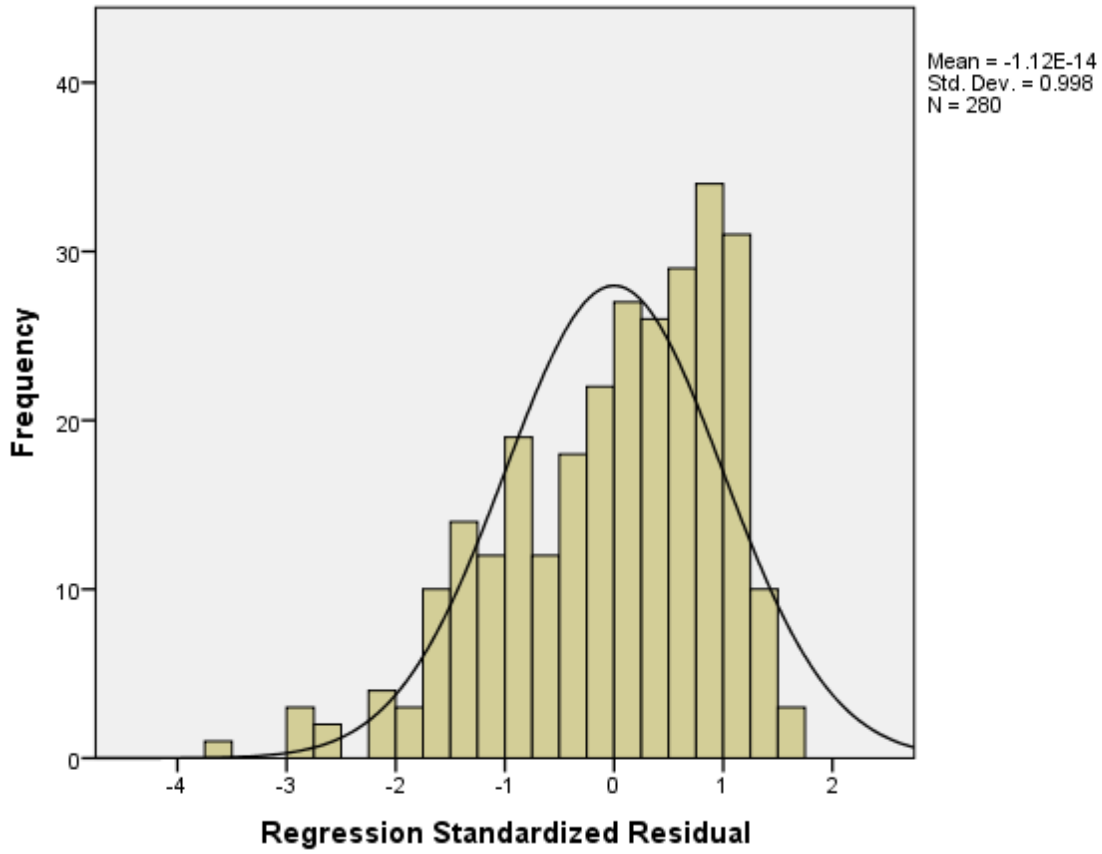

Figure 13. Distribution of standardized residuals expressed in the normality of the residuals of average 8th grade STAAR Reading pass rate and average teacher attrition. Although a slight negative skew is apparent, it is not "non-normal" enough to matter, thus the assumption of a normal distribution (bell-shaped curve) is met and a regression is an appropriate method for analysis.

After following the data preparation techniques described by Mertler and Vannatta Reinhart (2017), a regression was conducted to determine the effect of the variable average teacher attrition on average eighth grade STAAR Reading pass rate. Average teacher attrition had a significant impact on average eighth grade STAAR Reading pass rate and explained 13.2% of the variance ($F(1, 278) = 43.25$, $p < .001$, ($t(278) = 6.576$, $p < .001$, $R^2_{adj.} = .132$). Tables 16-19 display the results of the analysis.

Table 16

Correlations of Average 8th Grade STAAR Reading Pass Rates and Average Teacher Attrition

Correlation		8th avg pass rate	AVG Staff Difference
Pearson	8th avg pass rate	1.000	.367
	AVG Staff Difference	.367	1.000
Sig. (1-tailed)	8th avg pass rate	.	.000
	AVG Staff Difference	.000	.
N	8th avg pass rate	280	280
	AVG Staff Difference	280	280

Table 17

Regression Model Summary of Teacher Attrition on Average 8th grade STAAR Reading Pass Rates

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate
1	.367[a]	.135	.132	5.1200424

Note. [a] Predictors: (Constant), AVG Staff Difference. R is the Pearson Correlation, R Square is the percent shared variance, and the adjusted R Square is the adjusted percent shared variance (i.e. the effect size—in this model, Teacher Attrition accounts for 13.2% of the variance in average 8th grade STAAR Reading pass rates.

Table 18

ANOVA Table for the Regression Model of Teacher Attrition on Average 8th Grade STAAR Reading Pass Rates

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	1133.759	1	1133.759	43.249**	< .001[b]
	Residual	7287.724	278	26.215		
	Total	8421.483	279			

Note. [a] Dependent variable: 8th Avg Pass Rate. [b] Predictors: (Constant), AVG Staff Difference. **Indicates a significant regression model at the $p < .001$ level

Table 19

Significant Coefficients in the Regression Model of Teacher Attrition on Average 8th Grade STAAR Reading Pass Rates

		Coefficients					Correlations			Collinearity Statistics	
		Unstandardized		Standardized							
	Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	81.384	1.577		51.607	.000					
	AVG Staff Difference	.246	.037	.367	6.576**	< .001	.367	.367	.367	1.000	1.000

Note. [a] Dependent Variable: 8th Avg Pass Rate. **Indicates a significant regression model at the $p < .001$.

The resulting regression equation is for the model teacher attrition on average eighth grade STAAR Reading pass rate is:

Average 8th Grade STAAR Reading Pass Rate = .246 Average Teacher Attrition + 81.384

Research Question 3

To examine the relationship between teacher attrition, student achievement in reading, and the demographic characteristics of a school, a multiple regression was conducted after eliminating univariate and multivariate outliers. The data was examined for linearity and normality in order to meet the assumptions necessary to conduct a multiple regression analysis. Figures 14, 15, and 16 display the orthogonal relationship between teacher attrition, demographic characteristics of a school, and the average campus STAAR Reading pass rates as well as the linear relationship and distribution of the residuals. Once again, a slight curvilinear relationship is present as well as a slight negative skew; however, as before, no transformations were conducted, as they were not germane to the practical applications of this study.

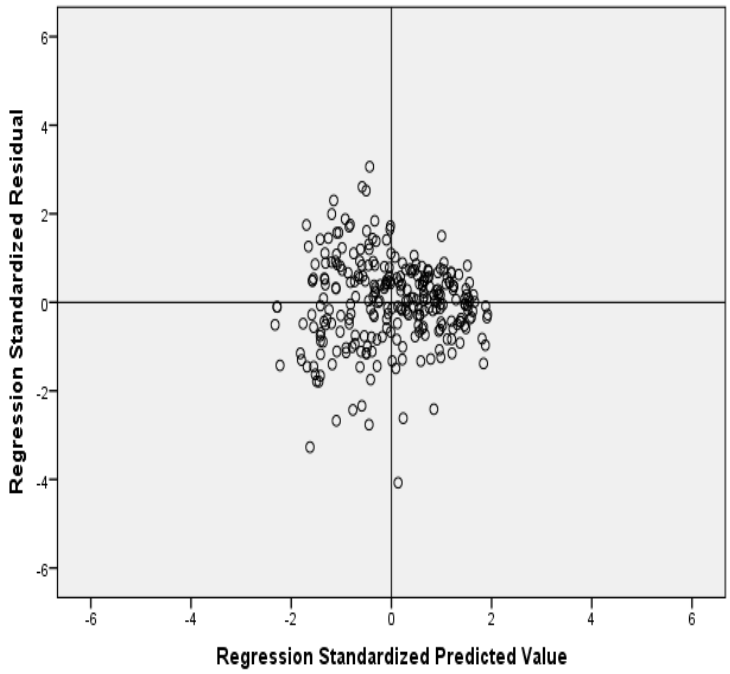

Figure 14. Relationship between the average campus STAAR Reading pass rate, the average teacher attrition rate, and demographic characteristics of the schools from the 2013-2014 to 2015-2016 school years.

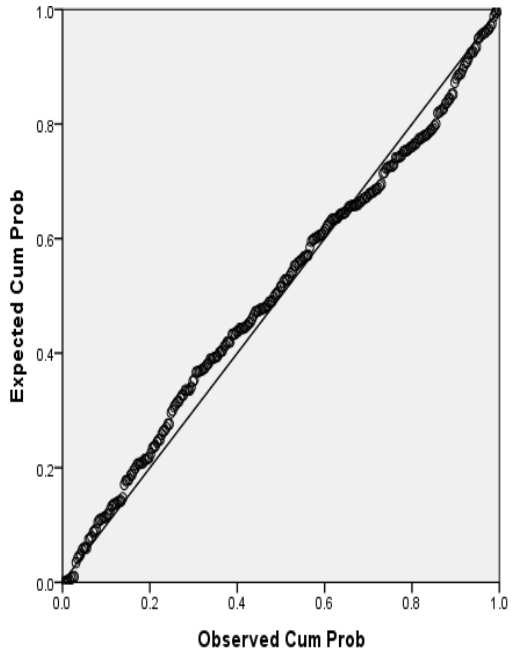

Figure 15. Observed residuals in relation to the expected residuals of average campus STAAR Reading pass rate, the average teacher attrition rate, and demographic characteristics of the schools. Although a slight curvilinear pattern is visible, all the points are on or near the line throughout, and no severe outliers are present, which means that the variables are orthogonal and relatively normal.

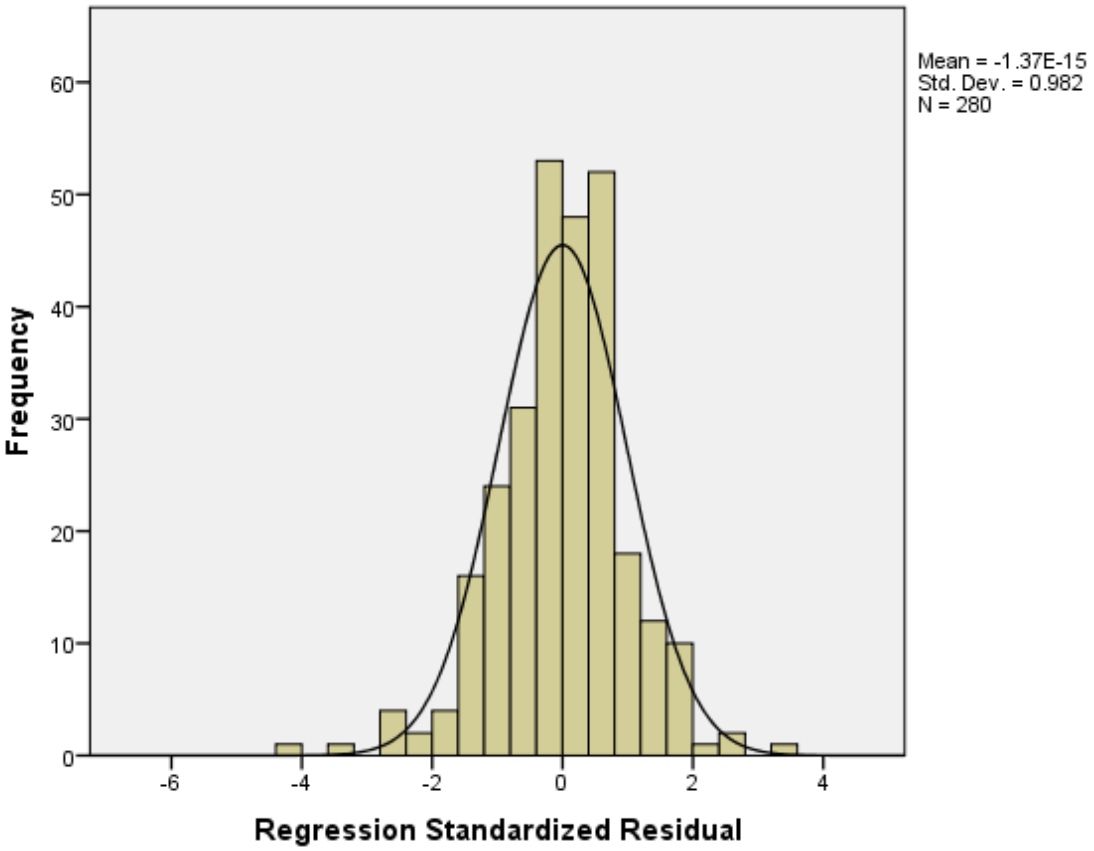

Figure 16. Distribution of standardized residuals expressed in the normality of the residuals of average campus STAAR Reading pass rate, the average teacher attrition rate, and demographic characteristics of the schools. Although a slight negative skew is apparent, it is not *non-normal* enough to matter, thus the assumption of a normal distribution (bell-shaped curve) is met and a regression is an appropriate method for analysis.

After following the data preparation techniques described by Mertler and Vannatta Reinhart (2017), a multiple regression was conducted to determine the effect of the variable average teacher attrition and demographic characteristics of the schools on average campus STAAR Reading pass rate. The model was significant and explained 83.4% of the variance in average campus STAAR Reading pass rate ($F(10, 269) = 141.303$, $p < .001$, $R^2_{adj.} = .834$). Tables 20-23 display the results of the analysis.

Table 20

Correlations of Average Campus STAAR Reading Pass Rates, School Demographic Characteristics, and Average Teacher Attrition

		AVG Campus Pass Rate	Eco Dis	ELL	Mobility	AVG Af Am	AVG Hispanic	AVG White	AVG Am In	AVG Asian	AVG Pac Isl	AVG 2 or more races	AVG Staff Diff
Pearson Correlation	AVG Campus Pass Rate	1.000	-.893	-.771	-.747	-.245	-.619	.598	.127	.482	.063	.516	.401
	Eco Dis	-.893	1.000	.852	.741	.225	.770	-.761	-.144	-.467	-.025	-.576	-.365
	ELL	-.771	.852	1.000	.592	.161	.681	-.709	-.119	-.271	-.015	-.520	-.230
	Mobility	-.747	.741	.592	1.000	.409	.454	-.540	-.084	-.384	.048	-.311	-.378
	AVG Af Am	-.245	.225	.161	.409	1.000	-.214	-.302	.111	.161	.070	.124	-.339
	AVG Hispanic	-.619	.770	.681	.454	-.214	1.000	-.805	-.343	-.467	-.044	-.655	-.128
	AVG White	.598	-.761	-.709	-.540	-.302	-.805	1.000	.282	.049	.031	.484	.234
	AVG Am In	.127	-.144	-.119	-.084	.111	-.343	.282	1.000	.076	.219	.188	.082
	AVG Asian	.482	-.467	-.271	-.384	.161	-.467	.049	.076	1.000	-.093	.349	.150
	AVG Pac Isl	.063	-.025	-.015	.048	.070	-.044	.031	.219	-.093	1.000	.196	.082
	AVG 2 or more	.516	-.576	-.520	-.311	.124	-.655	.484	.188	.349	.196	1.000	.202
	AVG Staff Diff	.401	-.365	-.230	-.378	-.339	-.128	.234	.082	.150	.082	.202	1.000
Sig. (1-tailed)	AVG Campus Pass Rate	.	.000	.000	.000	.000	.000	.000	.017	.000	.148	.000	.000
	Eco Dis	.000	.	.000	.000	.000	.000	.000	.008	.000	.339	.000	.000
	ELL	.000	.000	.	.000	.003	.000	.000	.023	.000	.403	.000	.000
	Mobility	.000	.000	.000	.	.000	.000	.000	.081	.000	.210	.000	.000
	AVG Af Am	.000	.000	.003	.000	.	.000	.000	.032	.004	.121	.019	.000
	AVG Hispanic	.000	.000	.000	.000	.000	.	.000	.000	.000	.233	.000	.016
	AVG White	.000	.000	.000	.000	.000	.000	.	.000	.209	.302	.000	.000
	AVG Am In	.017	.008	.023	.081	.032	.000	.000	.	.104	.000	.001	.086
	AVG Asian	.000	.000	.000	.000	.004	.000	.209	.104	.	.060	.000	.006
	AVG Pac Isl	.148	.339	.403	.210	.121	.233	.302	.000	.060	.	.000	.085
	AVG 2 or more races	.000	.000	.000	.000	.019	.000	.000	.001	.000	.000	.	.000
	AVG Staff Diff	.000	.000	.000	.000	.000	.016	.000	.086	.006	.085	.000	.

Note. $N = 280$.

Table 21

Multiple Regression Model Summary of Average Campus STAAR Reading Pass Rates, School Demographic Characteristics, and Average Teacher Attrition

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate
1	.917[a]	.840	.834	3.3706945

Note. [a] Predictors: (Constant), AVG Staff Difference, AVG American In, AVG Asian, AVG Pac Isl, ELL, AVG Afr America, AVG 2 or more races, Mobility, AVG White, Eco Dis. *R* is the Pearson Correlation, *R* Square is the percentage shared variance, and the adjusted *R* Square is the adjusted percentage shared variance (i.e., the effect size—in this model, teacher attrition accounts for 83.4% of the variance in average campus STAAR Reading pass rate.

Table 22

ANOVA for the Multiple Regression Model of Teacher Attrition and School Demographic Characteristics on Average Campus STAAR Reading Pass Rate

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	16054.242	10	1605.424	141.303**	< .001[b]
	Residual	3056.265	269	11.362		
	Total	19110.508	279			

Note. [a] Dependent Variable: Campus avg pass rate. [b] Predictors: (Constant), AVG Staff Difference, AVG American In, AVG Asian, AVG PI, ELL, AVG Afr America, AVG 2 or more, Mobility, AVG White, EconDis. **Indicates a significant regression model at the $p < .001$ level

The resulting multiple regression equation for the model of teacher attrition and school demographic characteristics on average campus STAAR Reading pass rate is:

Average Campus STAAR Reading Pass Rates = -.268 Economically Disadvantaged + -.161 English Language Learner + -.318 Mobility + -.080 Average White Percent + 100.599

In the multiple regression model, teacher attrition was not a significant contributor to the model ($t(269) = 1.768$, $p = .078$). The variables Eco Dis (Economically Disadvantaged) percentage, ELL (English Language Learners) percentage, Mobility percentage, and White percentage combine to form a significant model that explains 83.4% of the variance.

Table 23

Coefficients in the Multiple Regression Model of Teacher Attrition and School Demographic Characteristics on Average Campus STAAR Reading Pass Rate

Model		Coefficients					Correlations			Collinearity Statistics	
		Unstandardized		Standardized							
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tol.	VIF
1	(Constant)	100.599	2.278		44.166	.000					
	Eco Dis	-.268	.028	-.732	-9.424**	< .001	-.893	-.498	-.230	.099	10.142
	ELL	-.161	.057	-.141	-2.824*	.005	-.771	-.170	-.069	.239	4.188
	Mobility	-.318	.078	-.165	-4.099**	<.001	-.747	-.242	-.100	.366	2.735
	AVG Af Am	-.043	.026	-.053	-1.661^{NS}	.098	-.245	-.101	-.040	.587	1.703
	AVG White	-.080	.019	-.207	-4.175**	< .001	.598	-.247	-.102	.242	4.134
	AVG Am In	1.115	.992	.031	1.124^{NS}	.262	.127	.068	.027	.787	1.270
	AVG Asian	.039	.037	.038	1.042^{NS}	.299	.482	.063	.025	.444	2.254
	AVG Pac Isl	2.629	1.523	.045	1.727^{NS}	.085	.063	.105	.042	.858	1.165
	AVG 2 or more races	.255	.217	.039	1.171^{NS}	.243	.516	.071	.029	.532	1.878
	AVG Staff Diff	.051	.029	.050	1.768^{NS}	.078	.401	.107	.043	.739	1.354

Note. [a] Dependent Variable: Campus avg pass rate. ** Indicates significance at the $p < .001$. * Indicates significance at the $p < .05$. [NS] Indicates that the variable is not significant ($p > .05$) in the model. Tol. = Tolerance

Summary

To address the first two research questions of this study, a simple regression model was used to analyze the independent variable (average teacher attrition) and the dependent variable (average STAAR Reading pass rates) for the school years 2013-2014 through 2015-2016. The results of Research Question 1 reveal teacher attrition accounts for 15.8% of the variance on the average campus STAAR Reading pass rates among the middle schools included in this study.

Similar results were found in the analyses of sixth and seventh grade STAAR Reading pass rates, which reflected teacher attrition accounts for 15.8% of the variance on the STAAR Reading pass rates for these grade levels when analyzed separately. However, when analyzing eighth grade STAAR Reading pass rates, teacher attrition accounts for 13.2% of the variance for this grade level. This model provided evidence to support the notion that teacher attrition rates have significance in predicting student achievement as measured by the STAAR Reading assessment for sixth, seventh, and eighth grade students.

A multiple regression analysis was conducted to analyze the third research question of this study in which the independent variables were teacher attrition and the demographic characteristics of the schools, and the dependent variable was the average campus STAAR Reading pass rates. Four demographic variables within this model proved to have significance and explained 83.4% of the variance on the average campus STAAR Reading pass rates. Chapter 5 examines the results of the research questions in further detail.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to determine if a relationship existed between teacher attrition and student achievement in reading among middle school students. The intent was to replicate and extend the research of Ronfeldt et al. (2013), which aligned with Ingersoll's (2001a, 2001b, 2003) research identifying a relationship between teacher attrition and student achievement. Simple and multiple regression models were used to examine data collected in a North Texas school district and their comparable campuses as identified by TEA. In examining the relationship between teacher attrition and student achievement in reading among middle school students, a model was designed to determine if any statistically significant impact could be identified between teacher attrition (the difference in staff from one year to the next) and student achievement as measured by the STAAR Reading assessment. STAAR Reading achievement was examined by whole campus pass rates, collectively, and sixth, seventh, and eighth grade pass rates, individually.

Three research questions guided this study.

1. What is the relationship between teacher attrition rates on student achievement in reading at the middle school level?
2. What is the specific relationship between attrition of teachers and student achievement in reading observed in each middle school grade level (i.e., 6th, 7th, and 8th grade)?
3. What is the relationship among teacher attrition, student success, and the demographic characteristics of the schools?

In addressing the independent and dependent variables of each question, the data collection included information related to teacher attrition, student performance in reading for Grades 6, 7 and 8, and specific student demographic characteristics of each campus as reported on the TAPR from school years 2013-2014 through 2015-2016. After screening for univariate

and multivariate outliers and eliminating them, the sample included in analyses was 280 (n = 280) campuses (Mertler & Vannatta Reinhart, 2017). Chapter 5 discusses the findings, and addresses the implications, limitations, and recommendations that emerged from this study.

Discussion

Examining the quantitative data of Research Questions 1 and 2 reveals a strong correlation between teacher attrition and student achievement as measured by the STAAR Reading assessment. The simple regression model of Research Question 1 indicates teacher attrition accounts for 15.8% of the variance in campus pass rates on the STAAR Reading assessment for the three school years included in this study. Similar results were discovered when examining the data of Research Question 2, which revealed teacher attrition accounts for 15.8% of the variance in sixth and seventh grade pass rates on the STAAR Reading assessment. Furthermore, teacher attrition accounts for 13.2% of the variance in STAAR Reading pass rates when examining eighth grade student achievement. The regression models used to examine Research Questions 1 and 2 indicate a strong relationship exists between teacher attrition and student achievement among middle school students as measured by the STAAR Reading assessment for the data sets included in this North Texas study.

Using a multiple regression model, the quantitative data evaluated in Research Question 3 included school demographic characteristics. These school demographic characteristics included percentage of students identified as economically disadvantaged, English Language Learners, race, and mobility rates, as well as the total number of students enrolled for each campus included in the analysis. The model revealed the campus demographic characteristics that mattered were percentage economically disadvantaged, percentage ELL, mobility rates, and percentage White, as they were statistically significant when combined. This combination of

demographic characteristics accounted for 83.4% of the variance on campus pass rates as measured by the STAAR Reading assessment for the campuses included in this study. Further discussion of the school demographic characteristics is included in recommendations for future research.

Implications

As indicated, the results of this study reveal teacher attrition to have a significant relationship on student achievement among middle school students as measured by the STAAR Reading assessment for the grade levels examined. According to Research Questions 1 and 2 of this study, teacher attrition accounts for 13.2% to 15.8% of the variance in student achievement on STAAR Reading when analyzing campus pass rates and pass rates for sixth, seventh, and eighth grades. The regression models utilized for these two questions, support the findings of Ronfeldt et al. (2013), whose research indicated a significant variance existed in the relationship between teacher attrition and student achievement. Additionally, the North Texas study is aligned with prior research indicating the instability of the school environment created by teacher attrition has implications for student performance outcomes (Darling-Hammond, 2002; Guarino et al., 2006; Ingersoll 2001b). Such revelations would indicate monitoring and addressing teacher attrition rates from year to year might allow school, district, and state leaders to predict the impact of teacher attrition on student performance and develop programs or plans (i.e., incentive, training, mentoring programs, organizational structures, climate and culture, etc.) to mitigate teacher attrition rates.

Research Question 3 of this study lends support for previous findings indicating school demographic characteristics have implications for teacher attrition as it relates to student performance (Guarino et al., 2006; Hanushek et al., 2004; Ingersoll, 2003; Ingersoll & May,

2012, Ingersoll & Merrill, 2010; Ingersoll et al., 2014; Perda, 2013; Rivkin, Hanushek, & Kain, 2005). When combined, percentage economically disadvantaged, percentage ELL, mobility rates, and percentage White accounted for 83.4% of the variance in student performance. These are significant findings considering that more than 60% of the student population in Texas is identified at economically disadvantaged and that Texas has transitioned to a majority-minority state (Collier & Ura, 2015). The demographic landscape of Texas, especially among school-aged children, has changed remarkably over the past several decades. State and federal lawmakers must recognize the uniqueness of Texas and the implicit demands these special characteristics of the state present for recruiting and retaining competent, highly qualified teachers to serve this generation of students will require.

Consideration of Perda's (2013) findings suggesting 41.3% of beginning teachers leave the profession within the first five years of their career, combined with Carter and Carter's (2000) research indicating middle school to be the less desirable teaching option as compared to elementary and/or high school, student achievement in the middle school grades will continue to be a challenge. The implications of this study support careful consideration of attrition and mobility rates among teachers as a vital factor in developing local, state, and federal policies and programs when setting educational opportunities for students. This becomes critically important as public education and the students served are ever changing, which according to research influences both the supply and demand of teachers and student achievement (Boe et al. 1997; Darling-Hammond, 1984; Grissmer & Kirby, 1987, 1997; Guarino et al., 2006; Ingersoll, 2003; Ingersoll & May, 2011; Ingersoll & Merrill, 2010; Ingersoll et al., 2014; Perda, 2013).

Additional Considerations

The target population of this study was limited to seven middle school campuses of a North Texas school district serving Grades 6 through 8 and their comparable groups as identified by TEA for the school years 2013-2014, 2014-2015, and 2015-2016. The original data set included 307 schools. After screening for univariate and multivariate outliers and eliminating them, the sample included in analyses was 280 (N = 280) campuses (Mertler & Vannatta Reinhart, 2017). With more than 1,200 public school districts in Texas, the sample of campuses included in this study is a limitation and may not be applicable to all public middle schools within the state. Additionally, teacher attrition was calculated by identifying the difference in total staff from one year to the next as reported on the TAPR for each campus in the study for the three years of data collected. Teacher attrition data did not include specific reasons for attrition among movers and/or leavers.

The demographic characteristics of the schools included in this study were limited to schools serving middle Grades 6-8 within the district as well as their comparable schools. Demographic characteristics of the school and district were limited to student, teacher, and school-by-grade characteristics. School and district data were compared to state and federal data when comparable data existed.

Recommendations

Recommendations for further research would include analysis of specific reasons teacher attrition occurs within a campus and/or district. A qualitative component of this study may provide valuable insight related to the factors attributing to teacher attrition, which would allow targeted interventions in addressing teacher attrition rates; thereby, impacting and improving student achievement. It may also be beneficial to replicate this study at the elementary and high

school level to ascertain where teacher attrition rates may be the highest; again, allowing for targeted interventions.

In the multiple regression model conducted for Research Question 3, teacher attrition was not a significant contributor to the model ($t(269) = 1.768$, $p = .078$). However, the variables Eco Dis (Economically Disadvantaged) percentage, ELL (English Language Learners) percentage, Mobility percentage, and White percentage combine to form a significant model that explains 83.4% of the variance. A future study could hold constant the variables for economically disadvantaged, ELL, mobility rates, and White to determine what other variables within the model might emerge as significant. This study would be beneficial given the abundance of research that indicates economically disadvantaged, ELL, and mobility rates have a direct effect on student achievement. This adjustment to the model of this study would allow further analysis of school demographic characteristics beyond what is known to have a negative impact on student achievement. This slightly altered method, using similar data, could very well identify teacher attrition as a significantly contributing variable to the model. In this research, the variable teacher attrition was almost significant at the $p \leq .05$ level ($p = .078$) in the multiple regression model used to answer Research Question 3.

Additionally, the variable Hispanic was removed from the multiple regression model because it exceeded the limits of multicollinearity that Mertler and Vannatta Reinhart (2017) suggest. That is, Hispanic, Eco Dis (Economically Disadvantaged) percentage, ELL (English Language Learners) percentage, and Mobility percentage were too similar in nature to use as predictors of student achievement based on STAAR Reading pass rates. A future study may include analyses that either combine these variables into one larger, more encompassing variable

or disaggregates them to the individual student level, and then conducts the analyses on the nested variables.

Summary

The purpose of this study was to determine whether a significant relationship existed between teacher attrition and student success in middle school reading by conducting a quantitative analysis. Additionally, the inclusion of school demographic characteristics (e.g., percentage economically disadvantaged, percentage English Language Learners, race, mobility rates, and total number of students enrolled for each campus) were included in the model for Research Question 3 to consider previous research findings and the challenges schools face in attracting and retaining teachers in low performing urban schools with high populations of economically disadvantaged and minority students (Boyd et al., 2007; Boyd et al., 2005; Brown et al., 2004; Guarino et al., 2006; Hanushek et al., 2004; Ingersoll et al., 2014).

The findings of this study contribute to the body of research indicating teacher attrition is a predictive variable of student achievement, specifically in reading among middle school students. The analysis of similar data within a school district may allow for campus, district, state, and federal decision-makers to employ targeted interventions to address recruitment and retention of highly qualified teachers to directly impact student achievement. With an understanding of the significant development occurring during adolescence physically, cognitively, morally, psychologically, and social-emotionally (Carnegie Council on Adolescent Development, 1989; Jackson & Davis, 2000), the implications of this study may also speak to the specific cognitive development of an adolescent child within the efforts of addressing teacher attrition at the middle school level.

APPENDIX A

DENTON ISD LETTER OF APPROVAL

DENTON
INDEPENDENT SCHOOL DISTRICT

"Empowering lifelong learners to be engaged citizens who positively impact their local and global community"

James K. Wilson III, Ed.D.
SUPERINTENDENT of Schools

October 28, 2016

Gwendolyn M. Perkins
1547 Velda Kay Ln.
Haslet, TX 76052

Dear Gwendolyn

We are excited about the research study you will be conducting related to *The Relationship Between Teacher Attrition and Student Achievement in Reading among Middle School Students*. I have reviewed your research proposal and approve for your research to be completed at all Denton ISD middle schools.

Best wishes with your research!

Sincerely,

[redacted]

Dr. James K. Wilson III
Superintendent of Schools
Denton Independent School District

1307 N. Locust Street | Denton, Texas 76201 | Office: (940) 369-0000 | FAX: (940) 369-4983

APPENDIX B

UNT INSTITUTIONAL REVIEW BOARD APPROVAL

UNT
UNIVERSITY OF NORTH TEXAS
EST. 1890

Research and Economic Development
The Office of Research Integrity and Compliance

December 8, 2016

Dr. David Brackett
Student Investigator: Gwendolyn Perkins
Department of Teacher Education & Administration
University of North Texas
RE: Human Subjects Application No. 16-552

Dear Dr. Brackett:

In accordance with 45 CFR Part 46 Section 46.101, your study titled "The Relationship between Teacher Attrition and Student Achievement in Reading among Middle School Students" has been determined to qualify for an exemption from further review by the UNT Institutional Review Board (IRB).

No changes may be made to your study's procedures or forms without prior written approval from the UNT IRB. Please contact The Office of Research Integrity and Compliance at 940-565-4643, if you wish to make any such changes. Any changes to your procedures or forms after 3 years will require completion of a new IRB application.

We wish you success with your study.

Sincerely,

[redacted]

Chad Trulson, Ph.D.
Professor
Chair, Institutional Review Board

CT;jm

1155 Union Circle #310979
Denton, Texas 76203-5017
940.369.4643
940.369.7486 fax
www.research.unt.edu

APPENDIX C

DEMOGRAPHIC DATA BY STUDENT, TEACHER, AND SCHOOL CHARACTERISTIC – 2014-2015

Characteristics	District	%	State	%
Student				
Total Students	26,746	100.0	5,215,282	100.0
Grade 6	2,074	7.8	383,487	7.4
Grade 7	2,052	7.7	382,838	7.3
Grade 8	1,972	7.4	388,190	7.4
Ethnic Distribution:				
African American	3,323	12.4	659,074	12.6
Hispanic	8,074	30.2	2,714,266	52.0
White	13,872	51.9	1,509,555	28.9
American Indian	217	0.8	21,411	0.4
Asian	732	2.7	201,738	3.9
Pacific Islander	42	0.2	7,085	0.1
Two or More Races	486	1.8	102,153	2.0
Economically Disadvantaged	11,299	42.2	3,068,820	58.8
English Language Learners (ELL)	3,952	14.8	948,391	18.2
Teacher				
Total Teachers	1,886.2	57.1	342,191.8	50.8
African American	134.3	7.1	33,863.7	9.9
Hispanic	230.4	12.2	87,714.8	25.6
White	1461.6	77.5	210,044.8	61.4
American Indian	6.6	0.4	1244.6	0.4
Asian	10.0	0.5	4,890.6	1.4
Pacific Islander	0.0	0.0	758.8	0.2
Two or More Races	43.3	2.3	3,674.5	1.1
Females	1,409.6	74.7	262,243.9	76.6
Teachers by Experience:				
Beginning Teachers	72.4	3.8	29,256.4	8.5
1-5 Years	452.0	24.0	89,247.1	26.1
6-10 Years	510.8	27.1	77,168.2	22.6
11-20 Years	597.7	31.7	91,890.7	26.9
Over 20 Years	253.4	13.4	54,629.4	16.0

Note. (Texas Education Agency, TEA Division of Performance Reporting, 2014; 2015)

APPENDIX D

DEMOGRAPHIC DATA BY STUDENT, TEACHER, AND SCHOOL CHARACTERISTIC –

2013-2014

Characteristics	District	%	State	%
Student				
Total Students	26,047	100.0	5,135,880	100.0
Grade 6	2,039	7.8	376,456	7.3
Grade 7	1,917	7.4	385,387	7.5
Grade 8	1,904	7.3	379,597	7.4
Ethnic Distribution:				
African American	3,138	12.0	650,919	12.7
Hispanic	8,020	30.8	2,660,463	51.8
White	13,448	51.6	1,511,700	29.4
American Indian	211	0.8	20,142	0.4
Asian	725	2.8	189,483	3.7
Pacific Islander	33	0.1	6,778	0.1
Two or More Races	472	1.8	96,395	1.9
Economically Disadvantaged	11,022	42.3	3,092,125	60.2
English Language Learners (ELL)	3,751	14.4	899,780	17.5
Teacher				
Total Teachers	1898.4	58.8	334,510.5	51.0
African American	135.4	7.1	32,073.5	9.6
Hispanic	241.3	12.7	84,412.9	25.2
White	1,461.5	77.0	208,434.7	62.3
American Indian	9.0	0.5	1,219.3	0.4
Asian	6.0	0.3	4,552.5	1.4
Pacific Islander	0.0	0.0	284.6	0.1
Two or More Races	45.2	2.4	3,533.1	1.1
Females	1,431.4	75.4	256,699.0	76.7
Teachers by Experience:				
Beginning Teachers	100.4	5.3	27,783.8	8.3
1-5 Years	486.5	25.6	84,723.1	25.3
6-10 Years	470.9	24.8	76,407.4	22.8
11-20 Years	584.6	30.8	90,394.5	27.0
Over 20 Years	255.9	13.5	55,201.7	16.5

Note. (Texas Education Agency, TEA Division of Performance Reporting, 2013; 2014)

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