

THE RELATIONSHIP BETWEEN PRINCIPAL TURNOVER AND STUDENT
ACHIEVEMENT IN READING/ENGLISH LANGUAGE ARTS AND MATH
GRADES SIX THROUGH EIGHT

by

Darren Andrew Berrong

Liberty University

A Dissertation Presented in Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

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April, 2012

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ABSTRACT

This study examined the relationship between principal turnover rate, percentage of minority students, percentage of students with disabilities, and percentage of students who are economically disadvantaged and student achievement in reading/English language arts and math measured by Adequate Yearly Progress (AYP) on the Georgia Criterion Referenced Competency Test (CRCT). Eighty-six public middle schools (grades 6-8) comprised the sample for the study; all of these schools were located in Region 1 on the Georgia Department of Education (GaDOE) School Improvement Map. Data was collected from (AYP) reports publicly accessed on the Georgia Department of Education website. CRCT pass percentages were used to determine student achievement in the areas of math and reading/English language arts. Data was collected on the frequency of principal turnover by email and phone calls to all 86 schools. Data were statistically analyzed through multiple regression. The results showed that principal turnover rates are weakly correlated with student achievement in math and reading/English language arts. However, minority rate, students with disabilities rate and economically disadvantaged rate were significant predictors of reading/English language arts achievement. Additionally, minority rate and economically disadvantaged rate were significant predictors of math achievement.

Descriptors: principal turnover, student achievement, multiple regression.

Dedication

I dedicate this dissertation to my wonderful wife, Dionne, who has supported me through many endeavors. Thank you for your support, patience, and love. I could have never finished this process without your unwavering understanding and support. I am who I am today because I fell in love with you.

I also dedicate this dissertation to my two magnificent boys, Evan and Aidan, who have provided me with the inspiration to see this process through to the end. I hope you will both look back on this as evidence that you can achieve anything through hard work and persistence.

Finally, I dedicate this dissertation to my parents, Dwight and Martha Berrong, who have always been there for me. Thank you for believing in me and pushing me to be the best I can be.

Acknowledgements

I would like to thank Dr. Toni Stanton, for serving as my dissertation committee chairperson and supporting me through some of the most frustrating times of my life. We took this journey together!

Thank you to Dr. Richard Behrens and Dr. Linda Holcomb, for serving as my second and third committee members and for giving priceless feedback and advice. Thank you for giving up your time to ensure that I completed this dissertation.

To Dr. Amanda Rockinson-Szapkiw: Thank you for serving as my research consultant. Your feedback was invaluable and ultimately made this study stronger.

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List of Abbreviations

AYP: – Adequate Yearly Progress

CRCT: – Criterion Referenced Competency Test

ELA: – English Language Arts

GaDOE: – Georgia Department of Education

GPS: – Georgia Performance Standards

NCLB: – No Child Left Behind

QCC: – Quality Core Curriculum

RESA: – Regional Educational Service Agency

SES: – Socioeconomic Status

SPSS: – Statistics Package for the Social Sciences

SWD: – Students with Disabilities

CHAPTER ONE: INTRODUCTION

The No Child Left Behind (NCLB) Act of 2001 has placed immense pressure on school systems to increase their students' achievement from year to year. NCLB guidelines have targeted the school principal for removal if student achievement does not meet the states requirements for Adequate Yearly Progress (AYP; Anthes, 2002). This constant change in administrators may have more negative consequences than positive ones because of the possible detrimental affects on school culture and student achievement. The purpose of this study was to determine if schools that experience larger amounts of principal turnover also experience lower student achievement.

This chapter discusses the background to the study, presents the problem statement, gives a statement of the study's purpose, and outlines the significance of the study. Chapter 1 also establishes the research questions, hypotheses, and null hypotheses; it also identifies and operationally defines all variables involved in the research. The research plan for this study is presented as well.

Background

Very little research has been conducted that explores the effects of principal turnover rates on student achievement. A significant direct effect of leadership on teacher collaboration has been found and a significant direct effect of collaboration on student achievement was observed (Goddard, Miller, Larsen, Goddard, Madsen, & Schroeder, 2010). The study found that the indirect effect of leadership on student achievement was significant. Research has also been conducted on which principal traits lead to higher student achievement but little has been done to address the resultant outcomes when a school changes principals (Waters,Marzono & McNulty, 2003). This is

a serious research oversight since it has been acknowledged for decades that the principal is the key figure of change in education (Goodlad, 1955). This study extends what is already known and provides insight into what impact the change of principal has on a school. The role of the principal as it relates to student achievement and change was understood by Goodlad in 1955. He stated that the principal is affected by many forces, and the principal's success depends on his ability to bring these forces under his control. Scholars have confirmed that the work of school leaders has an indirect effect on student achievement, mostly through administrative support of teachers (Leithwood & Mascal, 2008; Louis, Drezke, & Wahlstrom, 2009). Research is still being conducted on how the principal's role can effect student achievement. Most research identifies multiple characteristics of school principals that are critical to successful school leadership. For example, Waters, Marzano, and McNulty (2003) identified 21 leadership responsibilities associated with student achievement.

With the NCLB (2001) law well established, all public school principals are held accountable for meeting AYP. AYP, as defined by NCLB, allows the U.S. Department of Education to determine how every public school and school district in the country is performing academically according to results on standardized tests (NCLB, 2001). Each year, the student achievement indicators in reading and math increase until the year 2014, when 100% of all students are expected to pass the standardized tests in each state. In 2003, consequences for schools and states who did not raise student achievement were put into place in accordance with NCLB (Anthes, 2002). The consequences vary from replacing the school administration to the school being taken over by the state. For these reasons, the primary role of principals has become a focus on school improvement and change instead of the traditional role of managing the school. The added accountability

on the principal has placed administrators at the head of the line for replacement if student achievement does not increase.

Even though it is increasingly the principals who are blamed for poor student achievement, other variables seem to have more of an impact on student achievement than the quality of the schools' principal. The percentage of economically disadvantaged students, the percentage of students with disabilities (SWD), and the percentage of minority students are variables that have been proven to have a negative impact on student achievement. Researchers have noted that one of the most reliable predictors of student performance in education is their socioeconomic status (Rainwater & Smeeding, 1995; Rodgers & Payne, 2007). It has also been well established that Caucasian students nationwide typically score above their African American peers on standardized student achievement measures (Flowers & Keating, 2005).

The Georgia Department of Education (2010a) reports that the only subgroup that did not make AYP in the state of Georgia on the 2011 Criterion Referenced Competency Test (CRCT) in both reading and math was SWD. SWD face a wide range of challenges aside from academics. According to Dyson (2010) SWD students may have difficulty in the areas of "listening, speaking, reading, writing, reasoning, and mathematical abilities" (p. 44). These challenges generally account for the students' inability to acquire knowledge at the same rate as their nondisabled peers (Cortiella, 2007a).

Socioeconomic status has long been suggested to be the number one predictor of student achievement; however, Bankston and Caldas (1998) determined that the correlation between student achievement and minority status was stronger than that of socioeconomic status and student achievement. Nettles (2003) concluded that upon entering kindergarten the Caucasian students are already considerably ahead of their

African American peers in cognitive skills. Adam (2005) collected data from the states of Arizona, Massachusetts, and Texas and found that Hispanic students' pass percentages were as much as 30 percent lower than their Caucasian peers.

This study determined if principal turnover rate has an equally negative impact on student achievement as other variables that exist within the school. It is critical to determine how principals can effectively bring about change with the intention of increasing student achievement. It is imperative that principals have the skills necessary for increased student achievement. This research identified the need for school systems to provide principals with training in leadership traits that improve student achievement, and provide time for them to develop these traits.

Problem Statement

School systems are replacing their principals for various reasons in an attempt to increase student achievement, and this may have a negative impact on student achievement. Principal turnover potentially has a serious impact on school morale and values because staff must adjust to the new administrator and shift in focus (Meyer & Macmillan, 2011). School reform that takes place at the school level involves a change in the school culture, and this change takes time. The culture of a school is built upon over many years, and a new principal can not expect to change the school culture in a one year period. Noonan and Goldman (1995) concluded that a change in principal does not necessarily effect the climate of the school; rather they credit any positive change to the strong organizational influence that already exists within the school. More recent studies indicate that rapid principal turnover has a negative impact on a school (Meyer, Macmillan, & Northfield, 2009). The primary negative effect was on the school's culture

(Blair & Leithwood, 2010). Studies which have attempted to examine the effect of principal succession on student achievement have been inconclusive since the majority of research has been conducted in non-school organizations, but it is believed that principal succession is underutilized as a means of renewing a schools community (Jones & Webber, 2001). Although there are times in which a change in principal is necessary and even positive, regular and constant change in the principal position negatively effects the life of the school organization significantly (Blair & Leithwood, 2010). One possible remedy for schools in which test scores fail to meet the state's standards for effectiveness is to change principals (NCLB, 2001). In the attempt to improve student achievement by improving leadership, schools may undermine the organizational structure of the school by continuously disrupting the school culture (Partlow, 2008). Meanwhile, they ignore much more relevant factors such as the impact of the various subgroups on student achievement.

The gap that exists in the research is the effect of principal turnover on student achievement. With principals being held accountable and being replaced because of poor standardized test scores, it raises the question: Does principal turnover rate have as much of an impact on student achievement in grades six through eight reading/English language arts (ELA) classes or math classes as the percentage of minority students, the percentage of economically disadvantaged students, or the percentage of students with disabilities?

Purpose Statement

The purpose of this study is to determine the relationship between frequency of principal turnover in Georgia middle schools, the percentage of economic disadvantaged

students, the percentage of minority students, the percentage of students with disabilities and student achievement on the grades six through eight math and reading/ELA Criterion Reference Competency Test (CRCT) scores as calculated for AYP in Georgia. The strength of the relationships was measured using multiple regression. An F-test was utilized to determine the overall contribution of all variables as well as the individual influence of each variable on student achievement in math and reading/ELA. Georgia averages test results on the math and reading/ELA in grades six through eight to achieve one math percentage and one reading/ELA percentage. These two averages are what determine AYP success in Georgia for all schools. This information provides public school systems with valuable research to aid in future principal hiring and firing procedures, as well as principal transfers within systems.

Significance of the Study

The CRCT was implemented in Georgia in 1997. The CRCT is the Georgia accountability standardized test given to all Georgia public school students in grades one through eight. In 2006, Georgia curriculum was changed from the Quality Core Curriculum (QCC) to the Georgia Performance Standards (GPS). The new curriculum is standards based and was intended to replace the QCC curriculum that was considered too broad (Georgia Department of Education, 2007). The subjects tested are reading, ELA, math, science and social studies. The new curriculum was phased in over a three year period. Reading and ELA were assessed in 2006; math and science were added in 2007, and social studies was first assessed in 2008. Georgia eighth grade students must pass the reading and math portions of the CRCT to be promoted to the ninth grade; however, Georgia public middle schools are assessed on AYP by the student achievement in grades

six through eight math and reading/ELA. The Reading and ELA scores are combined to result in one overall pass/fail score for AYP purposes.

The new GPS curriculum showed a statewide drop in student achievement in all areas in the first year of its implementation. The new curriculum is more rigorous than the old QCCs, so student performance dropped on the standardized tests. This drop in student achievement is now having a direct effect on schools' AYP student achievement indicators. As student achievement decreases, principals are being held more accountable and experiencing added pressure to increase scores.

This study is significant to Georgia school districts experiencing a high level of principal turnover. Researching the effects of principal turnover on student achievement early in the state curriculum change from QCCs to GPS provides insight for school districts to attract and retain highly qualified principals with the ability to create and sustain a school culture that promotes student achievement. This study is also significant to student achievement, specifically in demonstrating how students score in reading/ELA and math in relation to the tenure of the principal. Information in this study will assist school districts as the requirements for schools to meet AYP under NCLB are increased. This study is also significant as it compares the strength of the relationship between principal turnover and student achievement with the strength of the relationship between AYP subgroups and student achievement. This comparison significant information because it clearly shows which variables have a bigger impact on student success. The study will also add to the body of literature that already exists on principals and how they affect student achievement. The majority of the research is in the area of principal qualities and traits that are present in successful leaders. This study helps fill a gap in the

research by determining if stability in the principalship has an impact on student achievement.

Research Questions

The following research questions were investigated:

1. Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students and 2011 reading/ELA CRCT scores in grades six through eight?
2. Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students and 2011 math CRCT scores in grades six through eight?

These research questions led to the following sub research questions:

- 1.1 Is there a statistically significant relationship between principal turnover rate and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.2 Is there a statistically significant relationship between the percentage of minority students and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.3 Is there a statistically significant relationship between the percentage of economically disadvantaged students and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.4 Is there a statistically significant relationship between the percentage of SWD students and 2011 reading/ELA CRCT scores in grades six through eight?
- 2.1 Is there a statistically significant relationship between principal turnover rate and 2011 math CRCT scores in grades six through eight?

2.2 Is there a statistically significant relationship between the percentage of minority students and 2011 math CRCT scores in grades six through eight?

2.3 Is there a statistically significant relationship between the percentage of economically disadvantaged students and 2011 math CRCT scores in grades six through eight?

2.4 Is there a statistically significant relationship between the percentage of SWD students and 2011 math CRCT scores in grades six through eight?

Research Hypotheses

The purpose of this study was to determine whether principal turnover rate, percentage of SWD students, percentage of minority students, and the percentage of economically disadvantaged students is related to student achievement as determined by AYP. In regards to these questions, the researcher developed the following hypotheses:

H1. The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2. The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

The following sub research hypothesis were also developed:

H1.1 Principal turnover rate is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.2 The percentage of minority students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.3 The percentage of economically disadvantaged students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.4 The percentage of SWD students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2.1 Principal turnover rate is a statistically significant predictor of 2011 math CRCT scores in grades six through eight. The percentage of minority students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H2.2 The percentage of minority students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H2.3 The percentage of economically disadvantaged students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2.4 The percentage of SWD students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

Null Hypotheses

This study was guided by the following research null hypotheses:

H₀1: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

This study is guided by the following sub research null hypotheses:

H₀1.1: Principal turnover rate is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.2: The percentage of minority students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.3: The percentage of economically disadvantaged students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.4: The percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2.1: Principal turnover rate is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.2: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.3: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.4: The percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

Identification of Variables

For the purpose of this study, the following were the variables of interest.

1. *AYP math and reading/ELA calculations:* The federal NCLB act requires that states establish performance goals for all schools, districts, and the state to ensure that all students reach 100% proficiency on state assessments by 2014. AYP refers to the intermediate yearly goals that each state must establish. Test scores are analyzed yearly to determine if schools, districts and states have reached the intermediate goals, or in other words, making AYP. Georgia averages test results on the math and

reading/ELA CRCT in grades six through eight to achieve one math percentage and one reading/ELA percentage. These two average's are what determine AYP success in Georgia (Georgia Department of Education, 2006). The mean scores of the reading/ELA and math CRCTs were utilized for this study. The CRCT ranges in score for reading from 750 to 920, in ELA from 750 to 930, and in math from 750 to 950. A score of 800 constitutes a passing score.

2. *Economically Disadvantaged:* Economically disadvantaged is defined in this study as the percentage of students who qualify for free or reduced lunch in the state of Georgia (Georgia Department of Education, 2006).

3. *Minority:* Minority students is defined in this study as the percent of students who are categorized as either Black, Hispanic, American Indian/Alaskan Native, Asian/Pacific Islander, or multiracial under Georgia guidelines (Georgia Department of Education, 2006).

4. *Principal Turnover:* Principal turnover is defined in this study as the number of occurrences in which a school changed principals during the 2001-02 through 2010-11 school years (Bruggink, 2001).

5. *Students with Disabilities:* Percentage of students who are receiving special education services in the school (Georgia Department of Education, 2006).

Research Plan

This study used a correlational research design to determine if there was a significant relationship between principal turnover rate, economically disadvantaged rate, students with disabilities rate, minority rate and student achievement. The correlational research design was best suitable for this study because the variables already existed and no treatment was applied by the researcher (Ary, Jacobs, Razavieh, & Sorensen, 2006). The researcher did not employ experimental manipulation, pre or post testing or random assignment of subjects to conditions because events had already occurred and manipulation of variables would have been unethical. Ex Post Facto design was not chosen because the researcher did not want to determine if principal turnover rates cause student achievement as this may be deemed impossible given all the extraneous variables. The researcher was only concerned in determining the relationships that exists between principal turnover rate, students with disabilities rate, minority rate, economically disadvantaged rate, and student achievement.

CHAPTER TWO: REVIEW OF THE LITERATURE

Introduction

As early as 1955, Goodlad had already recognized that the principal was the key figure in regards to school change and identified the principal as the most important factor in student achievement. Research is still being conducted on the effects of the principal on student achievement. Most research identifies multiple characteristics of school principals that are critical to successful school leadership. Waters et al. (2003) identified 21 leadership responsibilities associated with student achievement. Among those 21 responsibilities were school culture, order, discipline, situational awareness, input, and intellectual stimulation. It is difficult for principals to positively impact student achievement with important responsibilities such as these taking up their time, energy, and resources.

With the No Child Left Behind law well established (NCLB, 2001), all public school principals are held accountable for meeting adequate yearly progress (AYP). Principals are now being held responsible for actuating change and school improvement (Anthes, 2002). Determining the significance of the impact that leadership has on student achievement has eluded many researchers (Glanz, Shulman, & Sullivan, 2007). Glanz et. al. (2007) stated that students are directly impacted by their teachers and the instruction they are given in the classrooms. The principal usually does not have this direct contact with the student body unless he/she teaches a class during the day. The majority of the research that has been conducted attempts to link the indirect effects of leadership on student achievement through the principal's ability to create a positive school culture,

ability to be an instructional leader, and ability to be a data-driven leader (Cash, 2008; Williams, Persuad, & Turner, 2008)

Even though it is increasingly the principals who are blamed for poor student achievement, other variables seem to have more of an impact on student achievement than the quality of the schools' principal. The percentage of economically disadvantaged students, the percentage of students with disabilities (SWD), and the percentage of minority students are variables that have been proven to have a negative impact on student achievement. Researchers have noted that one of the most reliable predictors of student performance in education is their socioeconomic status (Rainwater & Smeeding, 1995; Rodgers & Payne, 2007). It has also been well established that Caucasian students nationwide typically score above their African American peers on standardized student achievement measures (Flowers & Keating, 2005).

The Georgia Department of Education (2010a) reports that the only subgroup that did not make AYP in the state of Georgia on the 2011 Criterion Referenced Competency Test (CRCT) in both reading and math was SWD. SWD face a wide range of challenges aside from academics. According to Dyson (2010) SWD students may have difficulty in the areas of "listening, speaking, reading, writing, reasoning, and mathematical abilities" (p. 44). These challenges generally account for the students' inability to acquire knowledge at the same rate as their nondisabled peers (Cortiella, 2007a).

Characteristics of leadership were studied to determine how effective they are in improving student achievement. The principal's ability to be an instructional leader, data-driven leader, and creator of a school culture conducive to learning was reviewed. The accountability placed on principals and other school leaders for their students' achievement makes this study critical to the field of school leadership.

Conceptual or Theoretical Framework

The theoretical framework for this review is that principals do affect student achievement through instructional leadership and school organization, despite the myriad other responsibilities they have. Educators, scholars, and citizens all believe that what principals do makes a difference in schools (McGuigan & Hoy, 2006). The principal has a powerful influence on what goes on in his or her building. Therefore, it would be inconceivable to think that the principal does not have an effect on student learning within their school.

School climate has been shown to have a significant relationship to student reading gains (Williams et al., 2008). Their study supported the implication that principals can directly affect the school climate in their school, thereby indirectly affecting student achievement. It is difficult to create a strong school climate if there is a constant change in leadership at the school level. This study will explore what research describes as effective leadership as it evolves due to the new pressures from the government and state to increase student achievement.

Review of the Literature

Leadership Defined

Leadership in American culture tends to be romanticized. From these romanticized depictions, leaders acquire misconceptions about how they should structure the organizations that they lead (Elmore, 2000; Leithwood & Mascall, 2008). The idea of the gifted educational leader, for example, paints a picture that a school leader must possess a gift to successfully lead a school reform project (Copland, 2003). This has led some to believe that the way to correct the downfalls of education is to simply find a

gifted leader; however, Brown (2006) believed that the definition of leadership is improved practices through experience, reflection, and discourse.

Elmore (2000) believed that leadership could be learned, and is not subject merely to individual characteristics and traits. He defined leadership as instructional improvement through guidance and direction. This definition of leadership focuses on a quality of instruction that is driven by excellent leadership. Copeland (2003) built on this definition, adding that leadership is the process of improving schools through the collective model. Copeland's collective model suggests a theory of distributed leadership and shared decision making where all school stakeholders provide input and make decisions collectively.

Leadership is difficult to define and often is dependent on the context of a given situation. This leads to inconsistencies and multiple variations of the definition of a successful leader; at the same time, research does suggest that effective leadership skills can be learned (Northouse, 2007). Northouse (2007) provided the leadership definition of a process where a single individual influences a group to accomplish a common goal. The common goal in education is often identified as increased student achievement.

The Importance of School-Level Leadership

Research over the past 30 years has demonstrated the importance of school leadership. While researching the effect of school principals, Hallinger and Heck (1998) discovered that principals have a significant effect on the overall outcomes of student achievement within their schools. Waters et al. (2003) conducted a meta-analysis that examined research studies on the academic affect of principals over the past 30 years. Their research supported the outcomes of Hallinger and Heck's study, finding a highly significant relationship between student achievement and school level leadership. An

increasing body of evidence supports the assertion that student achievement and learning are impacted by school principals (Fuller, Young, & Orr, 2007).

Principals may have the largest impact on school outcomes and student learning because of their role in hiring and retaining quality teachers for the classrooms in their schools (Papa, Lankford, & Wychoff, 2002). The principal is influential in building a stable teaching staff and creating a stronger school culture. Schools with large populations of teachers hired by the sitting principal have been linked to increased student outcomes (Brewer, 1993). Brewer believed that this increase in student achievement is due to the principals' freedom to hire quality teachers that support his vision for the school. Strauss (2003) confirmed Brewer's assertions with research that showed principals have an indirect effect on student outcomes through the hiring and firing process.

While previous research indicates that school level leadership plays a role in determining the members of the teaching team, the role that the principal plays in the quality of teachers in the school has been the focus of recent research. Baker and Cooper (2005) studied the relationship between principal educational background and the educational background of the faculty hired. They found that there is a strong correlation between the principal educational background and faculty's educational background. It was also found that principals who attended more selective undergraduate universities and worked in high poverty schools were 3.3 times more inclined to hire faculty members who also attended more selective institutions. There is little argument that a significant factor of student achievement is the quality of the school's teachers (Sanders & Rivers, 1996). Sanders and Rivers (1996) determined that students who attend classes with higher quality teachers typically generate higher test scores.

The Career Path of the Principal

The generally accepted rule to school administration progression is that a principal's career must flow through the classroom teaching position due to the increase in teacher and leadership preparation and certification requirements (Rand, 2004). The number of principals who were previously teachers in the classroom is over 85% (Fuller, et al., 2007). This percentage of principals who were formerly teachers will only increase as more schools require previous teaching experience before one can apply for a principal position. Fuller et al. (2007) discovered that teachers decide whether they will pursue a career in leadership within the first 5 to 7 years of teaching. Fuller et al.'s study concluded that secondary teachers are more likely to earn their leadership certification than elementary teachers; further, individuals who scored in the top 10% on their leadership certification test were more likely to become school leaders. It was also found that physical education teachers were 50% more inclined to pursue a career in administration than any other certification area (Fuller et al., 2007).

Teachers pursuing school leadership positions are more involved in programs and activities that enhance their likelihood of gaining a leadership position. One study found that teachers actively looking for a leadership position are more likely to belong to professional organizations and are often more involved in school leadership committees (Fladeland, 2001). In addition to committees, teachers pursuing leadership positions may serve on intervention teams and leadership councils, serve as department chairs, or sponsor activities.

Principals and Student Achievement

The literature suggests that there is a detectable correlation between the principalship and student achievement (Hallinger & Heck, 1998; Waters et al., 2003).

The majority of the evidence shows that the instructional influence flows through classroom instruction and school climate factors (Goldring, Huff, Pareja, & Spillane, 2008). Although the effects of the principalship are indirect, leadership drives both school climate and classroom instruction.

Due to ethical constraints, experiments on leadership are lacking. Researchers are constrained to studying natural occurrences in principal leadership. Evidence of student achievement influenced by the principal is limited to observational data with few longitudinal studies (D'Agostino, 2000). Since randomly assigning principals to schools would be unethical, no study has been found that has randomly assigned principals to a given school to study the individual principal affects on student achievement. Supovitz, Sirindes, and May (2007) examined the impact of principal professional development on student achievement. Firm conclusions could not be offered due to fidelity problems of implementation; however increased student achievement across five subject areas correlated with greater levels of principal participation in professional development.

Principal Turnover

Because of constantly increasing responsibilities and high stress levels, principal turnover rates are typically high. For example, principals in Illinois and North Carolina have a yearly turn-over rate between 14-18% (Rand, 2007). New York administrative data shows that two-thirds of the state's principals leave their initial position within the first six years on the job (Papa et al., 2002). It was found that the majority of these principals were either moved to a different position within the same district or moved to another district with a similar position to the one they left. In addition, principal turnover in New York also increased in schools with higher student populations (Papa, 2004). Researchers discovered that principal turnover percentages were smaller in suburban

areas, schools with small student populations, and schools with higher principal salaries. Similarly in Texas, an alarming 50% of administrators left their positions within the first five years in their career (Fuller et al., 2007). Fuller et al. (2007) also discovered that within 10 years, 75% of principals left school-level leadership positions. The authors stated that females tend to leave leadership position at a higher rate than their male counterparts. Additionally, Fuller et al. (2007) found that age played a significant role in principal turnover. Principals aged 46 or younger were more likely to retain their leadership position than older principals.

When principal changes and career paths specific to schools in urban areas is examined, troubling trends emerge. It is very difficult to attract and retain principals at schools with high percentages of low income students (Mitang, 2003). Urban schools in New York tend to be led by inexperienced principals and principals who graduated from less prestigious colleges in their leadership preparation (Papa et al., 2002). Papa et al. (2002) also found that New York urban principals moved to new positions out of their school district more often than their peers in suburban districts. The suburban principals remained in their principal positions more often than urban principals, who left the principalship at a higher rate.

Fuller et al. (2007) used poverty and socioeconomic status (SES) to evaluate the turnover rates for principals in Texas. They found that principals in low SES schools were promoted to district leadership positions at a higher rate than principals at high SES schools. This created higher principal turnover rates in mid to high SES schools with the increased opportunity to move to district level leadership through low SES schools. The highest rate of principal turnover in North Carolina also occurred at schools with the highest percentage of poverty (Clotfelter, Ladd, Vigdor, & Wheeler, 2006). Clotfelter et

al. (2006) discovered that the principals in the high poverty North Carolina schools tended to have previously been teachers or assistant principals at the school they were leading. Furthermore, the principals of the low achieving, high poverty schools in North Carolina typically had lower certification test scores than principals at high achieving, low poverty schools.

Correlations have been found between schools with poor student achievement on standardized tests and the building level leader. Schools with larger numbers of uncertified teachers were found to be led by school leaders who had to take their certification exam more than once due to failure (Baker & Cooper, 2005). Baker and Cooper (2005) also discovered that schools with higher percentages of minority students were led by principals who had failed their certification exam. High performing schools tend to function under the exact opposite circumstances. Principals who attend prestigious universities are more likely to hire and retain highly qualified teachers than principals who attend less selective colleges (Clotfelter et al., 2006). In addition, the principals who acquired their training at highly selective colleges found principal positions at a faster rate than their peers who received their training from less selective universities (Fuller et al., 2007).

Assessment/Data Driven Leadership

In an attempt to meet AYP, increasing student achievement has become the number one concern for most public school systems. It is vital that principals support their teachers' use of assessments and data utilization to improve learning (Stiggins & Duke, 2008). Principals themselves must be trained to use these assessments and data if they are going to be able to implement and monitor their use. Reviewing student data is often the first step a school makes when trying to improve student achievement. It is

often the trigger that begins the shift and enables schools to be successful in improving student learning and student achievement (Ford, 2008).

Thorton & Perreault (2002) wrote that implementing a complete program of data collection and analysis leads to overall improvement of the educational process. They believed that this benefits leaders by providing feedback to students, documenting instructional improvements, measuring program success or failure, guiding curriculum development, and instilling accountability for all stake holders. Reeves (2008) added that analyzing data would supply teachers and leaders with the knowledge they need to adjust the curriculum and instruction based on individual students needs, creating the atmosphere for true differentiated instruction. Ford (2008) supported the use of data for finding root causes for lack of student achievement. Ford described how a small high school used data meetings three times per year to determine each student's strengths and weakness, which allowed them to make realistic goals to help meet the needs of those students. The principal of this school had an effect on student achievement by providing the teachers the opportunity to meet and discuss the data on each child.

High stakes testing and the standards-based movement for student achievement have brought data-based decision making to the top of every educator's agenda (Thorton & Perreault, 2002). Thorton & Perreault (2002) described how data-based decision making requires more than simply looking at the data. It requires a systematic approach that includes developing a plan, implementing the plan, analyzing the results, and taking action on those results. This approach calls for quality assessments that provide quality data to analyze. Classroom assessment, when used effectively, has been proven to greatly enhance student learning (Stiggins & Duke, 2008). This process can begin with

the principal leading teams through the analysis of the student data to gain a deeper knowledge of each student (Ford, 2008).

Scherer (2003) described data as another word for information. Without information a principal cannot make an informed decision. Scherer warned principals of the negative effect he/she may have if data is used for finger pointing as opposed to creating a plan for school improvement. Scherer suggested looking at data such as attendance, demographics, test scores, and school spending to provide the key to bettering instruction rather than finger pointing. Checkley (2000) supported this use of data and suggested that the principal must be data driven and goal oriented. The principal must have a vision for improvement of the school. This vision must be accompanied by specific goals that are based on the individual needs of each child. To accomplish this responsibility, principals must be assessment/data-driven leaders.

Curriculum and Instructional Leadership

There are many different definitions of instructional leadership. Nettles and Herrington (2007) identified five instructional leadership roles of effective principals. Those leadership roles are defining and communicating the schools mission, managing curriculum and instruction, supporting and supervising teaching, monitoring student progress, and promoting a climate conducive to learning. The different roles and responsibilities of the school principal begin to intertwine because an effective instructional leader must address elements of school culture, data analysis, and curriculum and instructional support.

Dufour (2002) summarized the role of the principal and stated that the principal must serve as the instructional leader of their school. The vast majority of principals see instructional leadership as a key mission that is essential for an effective school leader

(Johnson, 2008). It is essential because principals are relied upon to be the instructional leaders within their schools. They are expected to understand instructional strategies, regularly visit and coach classroom teachers, and understand student assessment data so that better instructional decisions can be made (Anthes, 2002). Ruebling, Stow, Kayona, and Clarke (2004) wrote that student mastery of the curriculum is the school's reason for existence.

Nettles and Herrington (2007) studied the importance of the direct effects of principals on student achievement. They implied that there is much left to be known about the impact of the principal on student achievement because most research was conducted on the practices of the principal and not on actual student achievement. They found that one of the key responsibilities of an instructional leader was to maintain a schoolwide focus on critical instructional areas. Principals in effective schools took personal interest in instructional matters and allowed time for teachers to plan and meet on instructional issues. A three part study on the impact of instructional supervision on student achievement has indicated that principals who closely monitor instructional matters in the classroom effect successful teaching, and therefore effect student learning (Glanz et al., 2007). The researchers concluded that student achievement is influenced indirectly by the school organization that is set in place by the principal.

Mackey, Pitcher, & Decman (2006) conducted a study on the influence of the principal on school reading programs and test scores where the principal was the key component in the implementation of the reading program. They found three responsibilities of the principal that significantly impacted test scores: the vision of the principal, the educational background of the principal, and the principal's role as the instructional leader. The success of the reading programs were significantly correlated to

the principals ability to effectively carry out those three responsibilities. The authors of this study also found that the principals who had knowledge of the instruction and a strong vision for the school not only increased student achievement during the year of the reading implementation, but for the following year after implementation as well.

Research has also shown that the influence of instructional leadership may be strengthened or weakened by variables such as school size, demographics, faculty experience, and the student themselves (Glanz et al., 2007). Instructional supervision was still seen as a critical component for enhancing teacher growth while it encompassed a culture of collaboration, reflection, and improvement. One example was a successful New York principal who encouraged professional development aimed at promoting student achievement. In this school, instructional supervision was central to school wide instructional initiatives (Glanz et al., 2007).

A study of 87 elementary schools in Tennessee found no significant indication that leadership had a direct effect on student achievement, but did find a strong correlation between principal leadership and a strong school mission. A strong school mission influenced student opportunity to learn and influenced teacher expectations for student achievement (Hallinger, Bickman, & Davis, 1996). In addition, the researchers found that parents who had a higher SES had a stronger influence on the leadership of the principal as well as teacher expectations for the students. Lastly, they concluded that a principal's instructional leadership was stronger in schools with a higher SES because of this parental influence. A strong school mission, high SES, and strong instructional leadership resulted in higher test scores for students.

School Climate/Culture Leadership

School culture is about general attitudes, relationships, and perceptions within schools. The set of values, assumptions, traditions, and patterns of behavior that are unique to each school are reflected in the school's culture (Williamson & Blackburn, 2009). Moos (1979) defined school climate as the learning environment set in place by the school. He divided this social atmosphere into three categories: relationship, personal growth, and system maintenance and change.

Hallinger et al. (1996) found that principals affect student achievement through intervening school climate variables. There was a significant positive correlation between school climate and principal leadership. Principal leadership also had an indirect effect on increased student achievement. These results would indicate that the principal can create a positive school climate where students are given the opportunity to learn and be successful.

A study conducted within a Metro Atlanta School district gives some insight on the effects of school culture on student achievement (Williams et al., 2008). As a result of parental complaints about school climate, the district was court ordered to desegregate its system by hiring more African American teachers and principals. The district developed a leadership evaluation tool that allowed teachers to anonymously evaluate their administration in an effort to ensure fair treatment from both the Caucasian and the African American principals. School climate data was also gathered from the teachers along with the principal evaluations. They found that school climate was the only variable that predicted student reading on the 4th grade Criterion Referenced Curriculum Test (CRCT). Williams et al. (2008) concluded that school climate had a small but significant relationship to student reading gains. The Williams et al. study supported the

implication that principals can directly affect the school climate in their school, thereby indirectly affecting student achievement.

McGuigan & Hoy (2006) researched how creating a school culture of academic optimism can improve student achievement. Their study was developed to identify school properties that have the largest impact on student achievement. They wanted to determine if these properties could overcome the negative influences of low SES. Their theoretical framework was that academic optimism enhanced student achievement, and school culture was the key component to developing academic optimism. The study produced three school properties that were just as important as SES: the faculty's collaborative efficacy, the faculty's trust in students and parents, and the school's academic emphasis. McGuigan & Hoy believed that each of these properties can be affected by the actions of the principal. They defined academic optimism as "a shared belief among faculty that academic achievement is important, that the faculty has the capacity to help students achieve, and that students and parents can be trusted to cooperate with them in this endeavor-in brief, a schoolwide confidence that students will succeed academically" (p. 204). The authors of this study concluded that principals can make measureable differences in student achievement by setting up structures and processes that allow teachers to do their work. MacGuigan and Hoy (2006) stated, "They [principals] organize schools for success" (p. 221). Other research has suggested that it is the principal's main priority to ensure that quality learning is taking place in every classroom for every student (Lewis, Cruzeiro, & Hall, 2007). Lewis et al. (2007) also recognized that principals should spend more time establishing a school vision, building relationships with people, and developing a positive school climate that promotes teaching and learning.

D'Agostino (2000) conducted similar research in a dissertation that concluded that the growth of student achievement can be improved by instructional practice modification and the organizational structure of the school. He found that principals have the ability to provide an organizational structure that promotes student learning. Zainal (2008) studied the relationship between effective leadership and school achievement. He determined that teachers' morale is higher when the principal has open communication. This boost in morale results in the teachers working as a strong team, which builds a strong school culture. The study concluded that there is a strong link between quality school leadership and quality school achievement.

Chirichello (1999) researched the effects of transformational leadership on student achievement. Transformational leadership was defined by Chirichello as "an influencing relationship between inspired, energetic leaders and followers who have a mutual commitment to a mission that includes a belief in empowering the members of the organization to affect, through a collaborative responsibility and mutual accountability, lasting change or continuous improvement that will benefit the organization's clients" (p. 2). The six schools that participated in the study were all academically successful schools. All six principals were identified as having transformational leadership characteristics. Transformational leadership was also each principal's preferred style of leadership. Chirichello concluded that there may be a connection between successful schools and principals who exhibit the characteristics of a transformational leader.

Korir & Karr-Kidwell (2000) felt that principal performance was a significant determinant of the success of the school as a learning community. The principal's belief system played a focal role in the creation of a positive or negative school climate and structure. They found that principals must have a realistic vision for the success of their

school and have a plan for achieving this vision. Korir & Karr-Kidwell did acknowledge that not all principals would be able to motivate and empower their students and faculty. In their research, only principals that possessed high levels of self-esteem were able to act as the bridge between the school and community for the common goal of increasing student achievement.

The Achievement Gap

There are well documented variables that correlate to low student achievement. Quality educational leaders analyze these factors in an attempt to overcome them. This section will discuss the variables associated with lower student achievement that are outside of an educational leader's control.

Minority. The achievement gap between minority and Caucasian students is known and well documented (Haycock, 2001). According to Haycock's (2001) research, African American and Latino students' reading and math skills at the end of high school are equivalent to the reading and math skills of Caucasian students in the eighth grade. Jehlen (2009) concluded that the achievement gap between ethnic groups has decreased since the implementation of NCLB. However, Jehlen's research also concluded that the achievement gap was decreasing at an even faster rate before the NCLB implementation in 2001. In contrast, another study found that there has been no significant decrease in the achievement gap since the passing of the NCLB legislation (Lee, 2006). The study suggested that by 2014, the achievement gap between Caucasian and disadvantaged minority students will still exist. Lee (2006) predicted that only 25% of economically disadvantaged minority students will have achieved reading proficiency, and only 50% of those students will have achieved proficiency in math by 2014 on the National Assessment of Educational Progress (NAEP) exam. The NCLB accountability system

may even be contributing to the discrepancies between schools on issues such as race, economics, and geography (Kim & Sunderman, 2005; Lee, 2004; Linn, 2004).

SES has long been thought to be the number one predictor of student achievement; however, Bankston and Caldas (1998) determined that the correlation between student achievement and minority status was higher than that of SES and student achievement. Minority status and poverty are highly correlated within themselves. Rector, Johnson, & Fagan (2001) found that Caucasian children had a 13.5% likelihood of living in poverty compared to 33.1% of African American children. These percentages help explain the disproportioned representation of African American students in Title I schools (Puma, 2000). Additionally, minority status is also highly correlated to poor teacher qualifications, including lack of teacher certification and lack of teaching experience (Darling-Hammond, 1999).

The achievement gap between minority students and Caucasian students is evident throughout the grade levels. Nettles (2003) concluded that upon entering kindergarten, Caucasian students are already considerably ahead of their African American peers in cognitive skills. The results of the Ohio Department of Education proficiency tests in 2001 indicated that sixth grade Caucasian students had a 68.4% pass rate, compared to only 25.8% for their African American peers. In reading, Caucasian students received a pass rate of 65.3%, while only 25% of African American students met proficiency (Gehring, 2002). In 2001, inequality was evident on the national Scholastic Aptitude Test (SAT) where Caucasian students scored an average of 506 and 514 on verbal and math scores, compared to 433 and 426 for their African American counterparts (Roach, 2001). There was also a large achievement gap between the percentage of Caucasians and minority students taking Advanced Placement (AP) courses

in high school. In 2001, Ohio AP students were comprised of only 4% African American students, compared to 89% Caucasian students (The Education Trust, 2003). Only 31% of African American students earned a passing score on the AP exams, compared to 69% of Caucasian students. By the age of 24, nearly 90% of Caucasian students have earned their GED or high school diploma, compared to only 81% of African American students. Caucasian students were also twice as likely to graduate college with a bachelor's degree compared to African American students (Haycock, 2001).

Adam (2005) collected data from the states of Arizona, Massachusetts, and Texas. The results showed that Hispanic students pass percentages were as much as 30% lower than their Caucasian peers. Arizona English Language Learners (ELL) had a 13% pass rate in reading, compared to a 74% pass rate for Caucasians in Arizona (Adam, 2005). The overlap of ELL and Hispanic students created a larger concern for how to combat this issue. Lightbrown and Spada (2000) suggested that a student's fluency in his first language directly affects their ability to learn a second language. This language barrier contributes to the achievement gap for Hispanic students. Also, Geneva (2000) determined that only one out of every four immigrants from Mexico is enrolled in high school between the ages of 15 and 17. This would indicate a 25% graduation rate at best for this population. The remainder of the immigrants secured low paying jobs to help support their families instead of attending school. Dresser (1996) stated that this was indicative of a population who values family over education.

Martin (2000) conducted a case study of 35 African American students in an attempt to understand the issues related to the achievement gap. Martin concluded that in the African American school culture, it was not popular to achieve in school. There were students who were successful in school, but they attempted to hide their achievement by

doing their work at home in isolation. A similar study suggested that negative influences such as peer pressure, poor neighborhoods, and low achieving schools factor into the lack of success experienced by African American students (Maton et. al, 1998). Students who attend high minority and high poverty schools typically do not receive the quality of education that students who attend low poverty school schools receive. Heibel (2003) revealed that teachers in high poverty schools have fewer qualifications than teachers in low poverty schools. This indicated a teacher gap that accompanies the achievement gap. Heibel's research also showed that Caucasian student enrollment in private schools makes a difference in the achievement of African American students. That is, the achievement gap between ethnic groups proved to be greater in school districts where many Caucasian students attend private schools as opposed to public schools (Bankston & Caldas, 2000).

Educational expectations also contribute to the achievement gap. Cheng (2002) found that the parental expectations as well as expectations from society are lower for Hispanic and African American students. This assertion was supported with research that showed that teachers of Caucasian students focused on higher order thinking skills and problem solving, while teachers of African American students focused on single solution problems and simple drill strategies (Lubienski, 2002). One quantitative study showed that more than 67% of African American students attend schools where minority students make up the majority of the school. Of those students, 33% attend a school where over 90% of the student population is a member of a minority group. In contrast, over 90% of Caucasian students attend schools where a majority of the students are Caucasian (Nettles, 2003). Most schools where the majority of students are members of a minority group have high poverty rates and few resources, which inhibits the learning process

(Milner, 2002). Students who attend such schools do so in older buildings that are poorly funded. Those students are more likely to have untrained teachers, to receive different treatment by those teachers, to get suspended more frequently, to have distracting peer cultures, and to be placed in special education classes (Steele, 2004). Finally, the research clearly suggested that there are a small percentage of minority students who are high achievers on standardized tests throughout the nation (Sheppard, 2005).

Socioeconomic status (SES). One of the most reliable predictors of student performance in education is their SES (Rainwater & Smeeding, 1995; Rodgers & Payne, 2007). Jencks and Phillips (1998) stated that African American and Hispanic students are generally more poverty stricken, and the number one predictor of student achievement in school is poverty. With this in mind, it has also been well established that Caucasian students nationwide typically score above their African American peers on standardized student achievement measures (Flowers & Keating, 2005). Coleman's (1966) influential study found that high-poverty schools were comprised of students who were segregated economically by the attendance boundaries of public schools. The populations of these schools were primarily poor minority students. Coleman (1996) was one of the first reports labeling SES as a predictor of student achievement. Although there have been high-poverty schools that have produced high student achievement (Reeves, 2003), the data shows that high-poverty schools are well below average in graduation rate, student performance, and other school-level categories (Machtinger, 2007)

In many instances, low academic achievement is attributed to a student's lack of effort or general ability when, in actuality, the effects of poverty are the true contributors to low performance (Meyerson, 2000). One study indicated that the achievement gap between low and high poverty students exists across all grades and subject areas (McCall,

Hauser, Cronin, Kingsbury, & Hauser, 2006). It also suggested that high-poverty school students retain less information over the summer than the students from affluent schools. Payne and Biddle (1999) found that the United States would have ranked second out of the 23 countries involved on the Second International Mathematics Study (SIMS) if their only representation were school districts with low poverty. They also discovered that if only the high-poverty school districts were used, the United States would have ranked 21st out of the 23 countries involved.

The Council of Great City Schools (2001) study found that large concentrations of low SES families in school districts predict lower student achievement. This was supported by a report which concluded that high-poverty schools produced test scores significantly lower than low-poverty schools (Ward & Chavis, 1997). Many of the students with low SES tended to have self-esteem issues that could have been caused in part by feelings of helplessness (Woolfolk, 1995) derived from witnessing their parents and peers struggle with poverty (Woolfolk, 1995). These students soon began to believe that there was no hope and subsequently dropped out of school.

It is safe to say that the SES of students also plays a significant role in student truancy (Reid, 1999). Absentee rates have been shown to be the highest at schools with extremely high free and reduced lunch percentages and low SES (Heaviside et. al., 1998). Although the relationship between family income and attendance rates isn't well documented, students from high-poverty families generally attend school less frequently than their low-poverty peers (Bell, Rosen, & Dynlacht, 1994). Many of these students are confronted with drug abuse, single parent households, and homelessness (Cromwell, 2006). Furthermore, teenage students from high-poverty homes often find it necessary to work after school, impeding their academic success. It is not unusual for these students

to work 30 to 40 hours per week while they attempt to attend school (Kleitman, 2005). As a result, the need for employment contributes to the truancy issues of low SES students (Railsback, 2004).

Pellerin (1999) found that lower SES students had higher truancy rates and higher dropout rates when compared to higher SES students. The results of his study indicate that low SES students miss approximately 30% more days of school than higher SES students. Other studies support the fact that students who attend schools with higher SES peers are generally more likely to attend school and stay in school (Railsback, 2004). Attendance at school is a critical component of a student's academic success. Roby (2000) found that 60% of the variance in a ninth grade student's academic success was accounted for by their attendance rate. He indicated that higher student achievement is consistent with higher attendance rates. Attendance was also one of the contributing variables to Ward and Chavis's (1997), study which determined that schools serving large populations of low SES students produced significantly lower test scores.

Low SES factors are contributors to many school-level outcomes, including test scores, attendance, motivation, and parental involvement (Toutkoushian & Taylor, 2005). Parental involvement in low SES schools is generally very low due to cultural barriers, lack of time, and lack of education (Ward & Chavis, 1997). Huttenlocher and Dabholkar (1997) emphasized how important a high protein diet and educational support was at home, but high-poverty students generally do not receive either. Hoynes, Page, and Stevens (2005) stated that high poverty parents are more reluctant to go to the school, contact the teachers, or participate in school functions and events; they rarely have any faith in the educational system. Greene and Winters (2005) found that more affluent families tend to move their children to private schools or to more affluent neighborhoods

for a safer learning environment and better education. The result is a higher concentration of low SES students in public schools. Even though it has been shown that students whose peers have a higher SES are more likely to be successful in school, statistics have also shown that African American and Hispanic students are more likely to be enrolled in low SES schools, where more than 75% of the students qualify for the free and reduced lunch program (The National Center for Education, 2004).

Gardner (2007) suggested that there are numerous achievement gaps that exist, but the largest gap in education is the one between students who qualify for free and reduced lunch programs and those who do not. There is a significant correlation between academic success in reading and math and high poverty students who qualify for free and reduced lunch (Dorman, 2001). A report by the H.W. Wilson Company (2003) found that 77% of the variance of reading test scores in grade five was due to poverty rate. They concluded that high poverty rate predicted low student achievement. Neal (2007) researched Pennsylvania student achievement records to determine if low poverty schools provided a better education to high poverty students. He chose 99 schools that contained at least 90% low poverty students and then examined only the high poverty students in those schools. Neal (2007) concluded that the high poverty students in these affluent schools scored 8.77 points lower than the state average on the Pennsylvania state exam. Research shows that the more affluent schools have not performed any better at teaching the high poverty students than the high poverty schools have. Bainbridge & Lasley (2002) believed that the achievement gap that exists between races is primarily due to poverty factors faced by the race, as opposed to the race itself.

Students with Disabilities (SWD)

The Georgia Department of Education (2010a) reported that the only subgroup that did not make AYP in the state of Georgia on the 2011 CRCT in both reading and math was SWD. According to Georgia's 2010 AYP Report, nearly 46% of SWD did not meet the standard in mathematics, compared to 27% of African Americans, 18% of Hispanics, and 17% of all students tested. The report also showed that 30% of SWD did not meet the standard in reading/English language arts, compared to just 12% of African Americans, 10% of Hispanics, and 8% of all students tested. One report concluded that poor student performance among SWDs was the cause of the majority of schools across four states failing AYP (Johnson, Peck, & Wise, 2007). This is not surprising considering the thirteen categories that make up the SWD eligibility. One can see from reading the list of disabilities that each of the 13 disabilities listed has a major impact on student learning, but NCLB requires all students to have access to standards based content, as well as meet the grade level expectations, regardless of disability. Students are eligible for special education services in Georgia for the following areas:

- Autism
- Deaf/Blind
- Deaf/Hard of Hearing
- Emotional and Behavioral Disorder
- Mild Intellectual Disability
- Moderate, Severe, Profound Intellectual Disability
- Orthopedic Impairment
- Other Health Impairment
- Significant Developmental Delay

- Specific Learning Disability
- Speech-Language Impairment
- Traumatic Brain Injury
- Visual Impairment & Blindness (Georgia Department of Education, 2010b)

Students with disabilities face a wide range of challenges aside from academics. According to Dyson (2010), SWD may have difficulty in the areas of “listening, speaking, reading, writing, reasoning, and mathematical abilities” (p. 44). These challenges generally account for the students’ inability to acquire knowledge at the same rate as their nondisabled peers (Cortiella, 2007a). For many of these students, academic failure becomes normal as they feel helpless in the classroom. Oftentimes, the students are aware of their classification as SWD, and therefore believe they are limited in academic ability (Baird, Scott, Dearing, & Hamill, 2009). It has been shown that SWD with average intelligence are not as successful as students without disabilities of equal intelligence because of their cognitive processing deficits (Johnson, Humphrey, Mellard, Woods, & Swanson, 2010)

According to Johnson et al. (2010), a primary characteristic of SWD is poor academic performance. Many students classified as SWD require specialized individual instruction to meet their individual needs (Mattison, 2008). Mattison (2008) believed that SWD require extensive academic interventions, such as continuous progress monitoring and daily tutoring, especially those who are well below grade level. The poor academic achievement in basic reading and math skills is oftentimes attributed to the low cognitive abilities of SWD (Dyson, 2010; Sze, 2009). Low cognitive ability among SWD makes connecting new information with previous or prior knowledge difficult (Sze, 2009). Students then struggle to recall and express new information at the correct time.

Many students with disabilities find it difficult to read fluently. Reading fluently is a skill necessary for students to develop at a young age or reading comprehension issues may arise (Chard, Vaughn, & Tyler, 2002). According to Torgesen (1989), many students with signs of poor reading skills experience early and continued hardships in learning and indentifying printed words. Further, research suggests that students who struggle to read early rarely catch up due to lack of reading practice to restore missing skills (Rashotte, Torgesen, & Wagner, 1997).

Data collected from the United States Department of Education, Digest of Education Statistics (2001) showed that students with disabilities are more than twice as likely to drop out of school. Poor academic performance was the primary cause of SWD dropouts. Despite billions of dollar in federal funding, the achievement gap between SWD and students without disabilities remains flat (Meyer, 2004). Despite the NCLB performance goal of decreasing the achievement gap between SWD and students without disabilities, SWD are simply not performing as well as their peers on national and state assessments.

According to Cortiella (2007b), there are over 6.6 million students who receive services from special education in the United States. The number of SWD students continues to rise since the initiation of the Individuals with Disabilities Education Act (IDEA) (US Department of Education, 2007). NCLB requires that all students regardless of a disability take that state annual assessments for determination of AYP. Because of this requirement, schools are held accountable for increasing student performance of all subgroups including students with disabilities with state assessments being the chosen method for measurement (McLaughlin, 2010). In 2004, three out of four schools in the

nation made AYP according to the US Department of Education (2007) with the subgroup of SWD being the sole reason for school failure at making AYP.

Summary

According to research, there is a substantial relationship between student achievement and principal leadership (Waters et al., 2003). The research does indicate that this relationship has an indirect effect on student achievement. Principals play an enormous role in creating the atmosphere and school climate that is necessary for students to be academically successful (Miller, 1976). Principal leaders must believe that they can promote change within their school and effect student achievement. If principals do not believe that they can promote change, they have little chance in establishing an environment that accepts change (Lucas, 2003). Cash (2008) wrote that “While there may be no clear definition of the word leadership, the research is very clear in always identifying effective leadership as one of the most critical components in effective schools” (p. 23).

Gilson (2008) found that principals believe that they have too many responsibilities. They also feel as though most of their time is spent on problems that have little to do with student achievement. The numerous responsibilities of the principal are what make it almost impossible to determine if a principal has a direct impact on student achievement.

Further research should be conducted to determine if principals have a significant impact on student achievement. Research should be conducted on principal stability and its impact on student achievement. It takes time for a principal to establish a positive school culture and strong vision. It could be argued that research implies that principals

who have the time to implement their vision have a greater impact on student achievement than principals who change schools often.

CHAPTER THREE: METHODOLOGY

Introduction

The purpose of this study was to determine whether principal turnover rate, percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students are related to student achievement, as determined by CRCT scores. Chapter three presents a plan for answering these research questions through quantitative data analysis. Demographic information is provided on the subjects of the study, the setting of the research is described, the instruments used to collect the data are examined, the procedures used to carry out the study are explained, and the methods of data analysis are given. A summary of the study methodology concludes the chapter.

Research Design

This study used correlational research and multiple regression to determine if there was a statistically significant relationship between the number of principals over a ten year period and CRCT success. The correlational research design was best suited to this study because the criterion variables were already in existence and no treatment was applied by the researcher (Ary, Jacobs, Razavieh, & Sorensen, 2006). The researcher did not employ experimental manipulation, pre or post testing, or random assignment of subjects to conditions because events had already occurred and manipulation of variables would have been unethical. Ex Post Facto design was not chosen because the researcher did not want to determine if principal turnover rates cause student achievement, as this may be deemed impossible given all the extraneous variables. The researcher was only concerned with determining the relationship that exists between principal turnover rate, percentage of minority students, percentage of SWD, and percentage of economically disadvantaged students and student achievement.

The following research hypotheses were used to determine whether principal turnover rate, percentage of minority students, percentage of SWD, or percentage of economically disadvantaged students were related to student achievement, as determined by the CRCT and AYP:

H1. The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2. The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

The following sub research hypothesis were also developed:

H1.1 Principal turnover rate is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.2 The percentage of minority students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.3 The percentage of economically disadvantaged students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H1.4 The percentage of SWD students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2.1 Principal turnover rate is a statistically significant predictor of 2011 math CRCT scores in grades six through eight. The percentage of minority students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H2.2 The percentage of minority students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H2.3 The percentage of economically disadvantaged students is a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H2.4 The percentage of SWD students is a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

Null Hypotheses

This study was guided by the following research null hypotheses:

H₀1: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

This study is guided by the following sub research null hypotheses:

H₀1.1: Principal turnover rate is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.2: The percentage of minority students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.3: The percentage of economically disadvantaged students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.4: The percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2.1: Principal turnover rate is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.2: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.3: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.4: The percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

Participants

The population for this study was public middle school students in grades six through eight in Region One on the Georgia Department of Education School Improvement Regions Map (see Appendix A for a complete Georgia RESA map). Georgia schools collaborate with Regional Education Service Agency's (RESAs) as mandated by NCLB (2001). There are 16 RESAs throughout the state of Georgia. These 16 RESAs fall into one of five regions. Northwest Georgia RESA, North Georgia RESA, Pioneer RESA, and Northeast Georgia RESA form Region One. Region One was chosen because most of the schools within this region have similar demographics, and the geographic location in the mountains of Northern Georgia provides the researcher with similar school characteristics to study.

Northwest Georgia RESA consists of ten counties: Dade, Walker, Catoosa, Chattooga, Gordon, Floyd, Bartow, Polk, Paulding, and Haralson. North Georgia RESA has six county partners: Whitfield, Murray, Fannin, Gilmer, Pickens, and Cherokee. Pioneer RESA partners with twelve counties: Union, Towns, Rabun, Lumpkin, White, Habersham, Stephens, Dawson, Hall, Banks, Franklin, and Hart. Northeast Georgia RESA is partnered with ten counties: Jackson, Madison, Elbert, Barrow, Clarke,

Oglethorpe, Walton, Oconee, Morgan, and Greene. There are 100 total middle schools within this 38 county region.

Participating schools were in existence and fully operational for 10 consecutive years prior to the study; all others were excluded. A minimum of 84 schools' data out those 100 schools was needed to ensure sufficient power of .80 for a multiple regression analysis (Cohen, 1992). Tabachnick and Fidell (2007) also provided a rule of thumb formula for testing multiple correlation of $N \geq 50 + 8m$. Therefore, using 4 predictors, 82 participants were needed.

Setting

The participating schools for this study were in the northern region of Georgia and were all partners with RESAs that fall within Region One of the Georgia Department of Education School Improvement Regions Map. Although the schools that fall within these counties had similar geography, they also had a diverse array of characteristics. There were several city and urban schools located within this region, as well as numerous county and rural schools that were located in the Appalachian Mountain region of Georgia. The schools had an extreme range of enrollment. The population varied from 200 students to nearly 3,000, and had other differences such as a varying percentage of SWD, ELL, and economically disadvantaged students. The researcher chose not to restrict participation due to these differences, but rather compare these variables with the frequency of principal turnover. Therefore, only middle schools not made up of grades six through eight were excluded from the study.

Instrumentation

The researcher used various instruments in the data collection process of this study. For the purpose of this study, the 2011 student scaled scores from the CRCT were

used, as calculated for AYP by the state of Georgia in reading/English language arts and math. Principal turnover rate was measured by the number of principals which led a given school over the past ten years. Schools with the same principal for the past ten years were given a one as the principal turnover rate. Schools with ten separate principals over the past ten years were assigned a ten as the principal turnover rate. The percentage of SWD was measured by the state of Georgia as the percentage of students at a given school who were qualified and participated in the given schools special education program for the year. The percentage of minority students was reported to the state of Georgia as the percentage of students at a given school who are not Caucasian. The percentage of economically disadvantaged students was calculated by the state of Georgia as the percentage of students in a given school who qualify for the free or reduced lunch program. The principal turnover rate, the percentage of SWD, the percentage of minority students, and the percentage of economically disadvantaged students for each school were the predictors for this study.

CRCT

The CRCT is a test that is unique to Georgia elementary and middle schools; it measures the GPS. The CRCT is designed to measure student knowledge, concepts, and skills provided in the state curriculum. The testing program serves a dual purpose: 1) diagnosis of individual student and program strengths and weaknesses as related to instruction of the GPS and 2) a measurement of the quality of education in the state. Students in grades one through eight are tested in reading, English language arts, and mathematics; students in grades three through eight are also administered science and social studies tests. Academic achievement is assessed and reported on each student, class, building, system, and on the entire state.

Student performance standards for the CRCT are developed by educators from across the entire state of Georgia. These educators volunteer their time during the summer months to review test questions and determine the validity of the questions. The participating educators provide recommendations that define what scores meet each performance category (Georgia Department of Education, 2007). Table 1 shows guidelines for reporting student scaled scores and performance levels.

Table 1

Georgia Performance Level Scaled Score Indicators

Performance Level	GPS Scale Score
Does Not Meet	Below 800
Meets	800 – 849
Exceeds	850 or Above

To ensure that the CRCT meets the highest standards of technical quality, the testing division meets with an independent panel of experts, Georgia’s Technical Advisory Committee (TAC), on a quarterly basis. TAC members are experts in the field of educational measurement. They review all aspects of test development and the implementation process on a continual basis. Reliability is evaluated by statistical methods, with reliabilities ranging from 0.79 to 0.86 for reading/English language arts and 0.87 to 0.91 for mathematics (Georgia Department of Education, 2007).

For the purposes of this study, the percent of students in each school who received a passing score represents the student achievement percentage for each school. A test score of 800 and above represents a passing score. The state of Georgia calculates and

publicly posts this student achievement data on the Georgia Office of Student Achievement website.

Procedures

The GaDOE granted permission to use Georgia public school data stating that consent for participation was not needed since all data collected is public information and archived by the Georgia public school system (See Appendices B & C). The researcher performed the research after submitting an IRB packet and gaining approval to collect data (see Appendix D for IRB approval letter).

Upon collection of all pertinent data, the information was organized in a Microsoft Excel spreadsheet. The first column of the spreadsheet contained the names of the participating schools, the second column contained the 2011 reading score, the third column contained the 2011 math score, the fourth column contained the principal turnover rate, the fifth column contained the percentage of SWD, the sixth column contained the percentage of minority students, and the seventh column contained the percentage of economically disadvantaged students. The schools were randomly arranged and the names of the schools were changed to numbers rather than actual school names (Appendix F).

The data was imported into the Statistics Package for the Social Sciences (SPSS) for analysis, where the mean and standard deviations were calculated for each variable. An F-test was then performed to determine the combined significance of all variables and student achievement.

Data Sources

The Georgia Department of Education collects data annually for publication in the Georgia Public Education Report Card and the annual AYP report. Data is collected

through electronic surveys that are completed by each public school system. The surveys collect data on prescribed areas including system staffs, financial records, student information, and Full Academic Year (FAY) students and student achievement.

Once data has been collected, reports are sent to each school to ensure data quality. School system personnel are responsible for making any changes that need to be made to their data. After corrections have been made, the final reports are submitted once again. The system report cards are then released to the public via the Georgia Office of Student Achievement, as well as on the AYP reports found on the Georgia Department of Education website. The archived data from these two public websites formed the data sources for this study in the areas of math and reading/English language arts student achievement, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD.

Access to the Data

The Georgia Governor's Office of Student Achievement website and the Georgia Department of Education website were used to collect the data for each grades 6-8 middle school in Georgia. An Excel file was created listing each school in the left hand column. Four columns were created; one for principal turnover rate, one for percentage of SWD, one for percentage of minority students, and one for percentage of economically disadvantaged students. Each school AYP report was accessed through the Department of Education website. Then the data was transferred to the participating schools' corresponding Excel column. The end result was one Excel file with all participating schools' data listed in one location (see Appendix F for the Excel data file). All data was publicly available for viewing on each website.

The request for the principal turnover rate data was sent via email and by

individual school phone calls (See Appendix D). A mass email was sent to all 100 middle school principals. After the initial response was received, the researcher placed phone calls to the schools that did not provide the data through email. If the principal was not available, the secretary or assistant principals provided the principal turnover rate if it was known. All data collected and entered into Microsoft Excel was checked twice for accuracy from the AYP reports. Principal turnover data was entered as soon as the data was received to ensure data was entered correctly.

Demographic Profiles

Demographic profiles were created and stored in a Microsoft Excel database. Each grades 6-8 middle school was represented if it had been in continuous operation over the previous ten year period and was located in Region One of the Georgia Department of Education School Improvement Region Map. Then the principal turnover rate was calculated for each school. This range was from one to ten; one represented a school with only one principal over the past ten years and ten represented a school with ten different principals over the past ten years. The number of principals over the past ten years was the principal turnover rate for this study. The math and reading/ELA pass percentages were also stored for the 2011 school year. Lastly, AYP subgroup data were stored for 2011 in the areas of percentage of SWD, percentage of economically disadvantaged students, and percentage of minority students.

Reading/ELA and Math Achievement

AYP scores calculated from the CRCT in math and Reading/ELA were published and provided to each school district by the Georgia Department of Education in the annual AYP report; therefore, no permission to use this information was necessary (See Appendices B and C for email permissions). Student names were not used since the data

collected represented the average scores of the entire school, with only principal succession frequency being identified. Each schools' information was compiled into an Excel spreadsheet.

Principal Turnover Rate

Principal turnover rates were collected through phone calls to individual schools. The researcher attempted to collect the data verbally from the school principals. The school secretary or assistant principal was contacted if the school principals were not able to provide the data.

Data Analysis

Quantitative data was sorted and stored in Microsoft Excel. The standard multiple regression was used to test significance. SPSS was used to run the multiple regression analysis. This procedure was utilized in order to determine differences in student success in reading/ELA and math on the 2011 CRCT in schools where principal tenure and turnover varies. The researcher tested the number of principal changes for each school over the past 10 years against student achievement on the 2011 CRCT test. A multiple regression was used for the 2011 school year. This determined if there was a significant relationship between principal turnover rate, percentage of minority students, percentage of SWD, and percentage of economically disadvantaged students and student achievement.

Standard Multiple Regression

A standard multiple regression analysis was conducted to evaluate the null hypothesis that the predictor variables, principal turnover rate, percentage of minority students, percentage of SWD, and percentage of economically disadvantaged students does not significantly predict student achievement in reading/ELA on the Georgia CRCT

in middle schools grades 6-8. A multiple regression analysis was also conducted to evaluate the null hypothesis that the predictor variables, principal turnover rate, percentage of minority students, percentage of SWD, and percentage of economically disadvantaged students does not significantly predict student achievement in math on the Georgia CRCT in middle grades 6-8 middle schools.

Multiple regression is a method of data analysis with the flexibility to be appropriate whenever a quantitative variable is going to be examined in relationship to any predictor variables. Independent variables may be quantitative or qualitative, and one can examine the effects of a single variable or multiple variables with or without the effects of other variables taken into account (Cohen et. al, 2003).

To control for error due to correlation among the variables, this study examined principal turnover rate, percentage of minority students, percentage of SWD, and percentage of economically disadvantaged students simultaneously. Therefore multiple regression was the most appropriate analysis for the study. Based on a medium effect size of .15 and an alpha level of .05 for a multiple regression with four variables, 84 participants were needed for statistical power of .80, according to Cohen's (1992) power analysis. Tabachnick and Fidell (2007) provided a rule of thumb formula for testing multiple correlation of $N \geq 50 + 8m$. Therefore, using 4 predictors, 82 participants were needed.

Multiple Regression Assumptions

Multiple regression assumes that all predictor and criterion variables follow an approximately normal (bell-shaped curve) distribution. Many mental test scores such as the CRCT are known to follow a normal distribution. Histograms and normal probability plots were created to ensure normality (Appendix G). It is assumed that the relationship

between the independent and dependent variables is linear. The sample size for this study was substantial and it is well known among statisticians that the F test from multiple regression is robust to violation of the normality assumption when sample size is large (Bradley, 1978). Scatterplots were constructed as a visual aid used in determining if the relationships between the independent and dependent variables were linear (Appendix H).

This study assumes that all variables were measured reliably and without error. The CRCT is a valid and reliable assessment instrument. The validity and reliability data was provided by the GaDOE Testing and Assessment Department. Multiple regression also assumes homoscedasticity. Homoscedasticity assumes that data is evenly spread around the best fit line of the bivariate relationship. This was determined by examining the bivariate scatter plots between the predictor and dependant variables (Appendix H for bivariate scatter plots). The multicollinearity assumption was addressed by creating a correlation matrix to determine how each variable correlated with the others. Multicollinearity assumes that the variables are not extremely correlated with one another at the .7 or higher r value. The independence of residuals assumption was tested by creating a scatterplot of the residuals. The independence of residuals assumption is satisfied if the trend line approximates zero (see Appendix I for residual scatterplots). Lastly, the few extreme values were not excluded from the data since they were not deemed to be statistical outliers. According to Tabachnick and Fidell (2007), if the sample size is relatively small, then including or excluding specific data points that are not clearly outliers may have a profound influence on the regression line and the correlation coefficient.

Summary

Due to NCLB accountability measures, school districts are searching for every advantage to maximize student knowledge and performance. Understanding how principal turnover affects student achievement could provide many districts with knowledge to make informed decisions that benefit their students. This chapter presented a plan that could provide that understanding. Using the CRCT results as calculated for AYP utilizes data across all three middle school grade levels (six through eight), providing a school wide picture of academic success. The results of this study could help schools determine a realistic timeline for improvement of academic achievement once a new principal is hired. Chapter Four present those results.

CHAPTER FOUR: FINDINGS

The primary purpose of this study was to determine if principal turnover rates significantly affect student achievement in middle school grades six through eight located in the northern portion of Georgia. The secondary purpose of this study was to determine if principal turnover rates combined with the percentage of SWD, the percentage of minority students, and the percentage of economically disadvantaged students significantly affect student achievement.

Student achievement data on the 2011 math and reading/ELA CRCT was gathered for the 86 participating middle schools in North Georgia from the annual AYP reports publicly viewable on the Georgia Department of Education website. The AYP reports also provided the percentages for the economically disadvantaged, minority, and SWD for each school. Principal turnover rates were collected through email as well as phone calls to individual schools in order to determine the total number of principals at each school over the past ten years.

The following research questions guided this study:

1. Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD and 2011 reading/ELA CRCT scores in grade six through eight?
2. Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD and 2011 math CRCT scores in grade six through eight?

These research questions led to the following subresearch questions:

- 1.1 Is there a statistically significant relationship between principal turnover rate and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.2 Is there a statistically significant relationship between the percentage of minority students and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.3 Is there a statistically significant relationship between the percentage of economically disadvantaged students and 2011 reading/ELA CRCT scores in grades six through eight?
- 1.4 Is there a statistically significant relationship between the percentage of SWD students and 2011 reading/ELA CRCT scores in grades six through eight?
- 2.1 Is there a statistically significant relationship between principal turnover rate and 2011 math CRCT scores in grades six through eight?
- 2.2 Is there a statistically significant relationship between the percentage of minority students and 2011 math CRCT scores in grades six through eight?
- 2.3 Is there a statistically significant relationship between the percentage of economically disadvantaged students and 2011 math CRCT scores in grades six through eight?
- 2.4 Is there a statistically significant relationship between the percentage of SWD students and 2011 math CRCT scores in grades six through eight?

This chapter discusses the organization of the data, displays results of assumption testing, gives relevant descriptive statistics, presents results of the statistical analyses, and concludes with a summary of the findings.

Assumption Testing

This study utilized correlation and regression analysis to determine if a significant relationship existed between principal turnover rate, percentage of minority students,

percentage of SWD, and percentage of economically disadvantaged students and CRCT scores. There were several assumptions that had to be met before regression analysis could be conducted. First, the sample size had to be sufficient. Using Cohen's (1992) power analysis, it was determined that 84 participants were needed for statistical power of .80 because four predictor variables were used. A-priori sample size calculations confirmed that 84 participants were needed for a medium effect size of $f^2 = .15$ at a probability level of .05 and a statistical power of 0.80 with four predictor variables. According to Tabachnick and Fidell's (2007) formula ($50 + 8M$), only 82 participants were needed for the study. Since 86 schools participated in this study, the sample size was deemed to be sufficient.

The second assumption was that all variables were normally distributed. Histograms were constructed to determine univariate normality. The normal probability plot (Chambers, Cleveland, Kleiner, & Tukey, 1983) assesses whether or not a data set is approximately normally distributed using a graphical technique. The data were plotted against a theoretical normal distribution in such a way that the points should form an approximate straight line. Departures from this straight line indicate departures from normality. Normal probability plots were constructed for math and reading/ELA achievement, and they formed an approximately straight line, thus satisfying the normality assumption (Appendix G).

Visual inspection of the plots indicated that few extreme values were present in the data. According to Tabachnick and Fidell (2007), if the sample size is relatively small, then including or excluding specific data points that are not clearly outliers may have a profound influence on the regression line and the correlation coefficient. The few

extreme values found in the data were not excluded from the data analysis due to overfitting that may have occurred if outliers or extreme values were deleted.

A third assumption for regression analysis in this study is that the bivariate relationship between variables was linear. The bivariate relationships are illustrated in Figures 3, 4, 5, 6, 7, 8, 9, and 10 (Appendix H) using scatterplots of the data observations. All bivariate relationships were linear.

Another assumption that had to be met in this study was that the variables were measured reliably and were free from error. As stated in Chapter 3, the GaDOE provided dependable data for the CRCT, which showed this test to be a valid and reliable instrument. All data that was collected and entered into Microsoft Excel was checked twice for consistency with the AYP reports. Principal turnover data was entered as soon as the data was received to ensure that the data was entered correctly.

The assumption of homoscedasticity assumed that data was evenly spread around the best fit line of the bivariate relationship. Slight heteroscedasticity has little to no effect on significance testing (Berry & Feldman, 1985). The bivariate relationship between variables is illustrated in Appendix H and clearly indicates that the assumption of homoscedasticity was met.

The correlation matrix that presents the relationships between the variables is presented in Table 2. This table was used to determine multicollinearity between predictor variables. The percentage of SWD was significantly correlated at the $p < .05$ level with percentage of economically disadvantaged students. The percentage of economically disadvantaged students was also significantly correlated with percentage of minority students at the $p < .05$ level. No other pair of variables was significantly correlated. Multicollinearity can be indicated when r values are close to one (Tabachnick

& Fidell, 2007). Given the r values of .28 and .58, the multicollinearity assumption was not violated.

Table 2

Inter Correlation Matrix

Variable	Printurnover	Disablerate	Minorityrate	Econdisadv
Printurnover	-	0.10	0.05	0.01
Disablerate	-	-	-0.11	0.28*
Minorityrate	-	-	-	0.58*

* $p < .05$

Lastly, multiple regression assumes an independence of residuals. To test for independence, the residual scatterplots were examined, which test the assumptions of normality, linearity, and homoscedasticity between the predicted scores and the errors of prediction. To meet independence of residuals, the residuals must be normally distributed among the predicted scores, the residuals must have a linear relationship with the predicted scores, and the variance of the residuals around the predicted scores must be the same for all predicted scores (Tabachnick & Fidell, 2007). Figures 11 and 12 (See Appendix I) show that the independence of residuals assumption was met because the residuals were normally distributed and the linear trend line approximated zero.

Descriptive Statistics

Table 3 presents descriptive statistics data (mean, standard deviations, and sample size). The statistics were based on a sample size of 86 schools. There was more variability to the math scores since the standard deviation for CRCT Math 2011 was

higher than the standard deviation for CRCT Reading 2011. Due to the limited range of principal turnover rates, principal turnover rate has the lowest amount of variability.

Percentage of minority students and percentage of economically disadvantaged students had the highest amount of variability among the variables. CRCT Reading 2011

represents the combined reading/ELA scores in 2011, as reported for AYP purposes.

Percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students represent the percent of these populations as reported for AYP purposes.

Table 3

Descriptive Statistics for Achievement and Demographic Variables

Variable	Mean	Std. Deviation	N
CRCT Reading 2011	93.14	3.27	86
CRCT Math 2011	84.78	6.54	86
Principal Turnover Rate	3.14	1.37	86
% of SWD	12.25	3.07	86
% of Minority Students	29.45	21.70	86
% of Econ. Disadvantaged Students	54.81	17.32	86

Hypothesis Testing Results

Pearson Correlations

Pearson correlations between each demographic factor and the reading/ELA and math achievement test scores were performed. The following variables had moderate correlations with CRCT Reading 2011: percentage of minority students and percentage of economically disadvantaged students. The percentage of SWD had a weak negative

relationship with CRCT Reading 2011. The aforementioned correlations were statistically significant. The correlation between principal turnover rate and CRCT Reading 2011 scores was not statistically significant.

A similar pattern was observed on CRCT Math 2011. There were moderate negative correlations between the percentage of minority students and CRCT Math 2011 scores as well as between percentage of economically disadvantaged students and CRCT Math 2011 scores. There was also a negative correlation between the percentage of SWD and CRCT Math 2011 scores. These correlations were statistically significant. The correlation between CRCT Math 2011 scores and principal turnover rate was nonsignificant.

Research Question One

Results of the standard multiple regression analysis indicated that the linear combination of principal turnover rate, percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students significantly predicted reading/ELA achievement on the Georgia CRCT, $R^2 = .54$, $\text{adj. } R^2 = .52$, $F = 23.70$, $p < .05$. The R^2 represents the proportion of the variation in the criterion variable accounted for by the predictor variables. Adjusted R^2 adjusts for higher magnitude of chance fluctuations due to smaller sample sizes in R^2 . For this reason, adjusted R^2 is generally considered to be a more accurate measure than R^2 (Tabachnick & Fidell, 2007). Table 4 shows the sums of squares and overall F test for the model being tested. A significant F test implied that the predictor variables, taken together, were a significant predictor of CRCT reading/ELA 2011 scores. The overall F test was significant at $p < .05$.

Table 4

Multiple Regression for CRCT Reading by Demographic Variables

Statistic	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>
Regression	490.72	4	122.68	23.70*
Residual	419.37	81	5.18	
Total	910.09	85		

* $p < .05$

The adjusted R^2 statistic for this analysis shows that 52% of the variance in CRCT Reading 2011 scores was predicted from principal turnover rate, percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students. This reflects moderate model fit (Tabachnick & Fidell, 2007).

Sub Research Questions 1.1, 1.2, 1.3, and 1.4

Table 5 shows unstandardized β weights, standard error of β , t values, partial r , zero-order and p values for each t value in this analysis. The contribution of each individual variable was determined by examining the individual β weights and part correlation coefficients. The following variables were significant predictors of CRCT Reading/ELA 2011: Percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students. Disability rate had an alpha level less than .05, and a β of -.357. The part correlation coefficient of -.298 indicates that disability rate explains 9% of the variance of reading achievement. High economically disadvantaged rates are associated with lower reading achievement. Disability rate made the greatest contribution to the criterion variable. Minority rate had an alpha level of less than .05 and a β of -.054. The part correlation coefficient of -.269 indicates that minority rate explains 7% of the variance of reading achievement. Minority rate made the second highest

contribution to the criterion variable. Economically disadvantaged rate had an alpha level of less than .05 and a β of -.064. The part correlation coefficient of -.245 indicates that economically disadvantaged rate explains 6% of the variance of reading achievement. The previous relationships indicated that as rates increased student achievement decreased. Principal turnover was not a significant predictor of 2011 Reading/ELA student achievement.

Table 5

Regression Coefficients for CRCT Reading by Demographic Factors

	Zero-order	Partial	<i>B</i>	Std. Error	Beta	<i>t</i>	<i>p</i>
Principal Turnover Rate	-.111	-.083	-.136	.181	-.057	-.751	.455
Disability Rate	-.396*	-.401*	-.357	.091	-.335	-3.945	.000*
Minority Rate	-.517*	-.368*	-.054	.015	-.356	-3.563	.001*
Economically Disadvantaged Rate	-.641*	-.340*	-.064	.020	-.337	-3.252	.002*

* $p < .05$

Research Question Two

Results of the standard multiple regression analysis indicated that the linear combination of principal turnover rate, percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students significantly predicted reading/ELA achievement on the Georgia CRCT, $R^2 = .52$, adj. $R^2 = .49$, $F = 21.71$, $p = .05$. Table 6 shows the sums of squares and overall F test for the model being tested. A significant F test implied that the predictor variables, taken together, were a significant predictor of CRCT Math 2011 scores. The overall F test was significant at $p < .05$.

Table 6

Multiple Regression for CRCT Math by Demographic Variables

Statistic	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>
Regression	1879.78	4	469.95	21.71*
Residual	1753.48	81	21.65	
Total	3633.26	85		

* $p < .05$

As shown in Table 6, the model fit was moderate when predicting CRCT Math 2011 scores from principal turnover rate, percentage of SWD, percentage of minority students, and percentage of economically disadvantaged students. Approximately 49% of the variance in CRCT Math 2011 scores was predicted by these four predictors.

Sub Research Questions 2.1, 2.2, 2.3, and 2.4

Table 7 shows unstandardized β weights, standard error of β , t values, and p values for each t value in this analysis. The contribution of each individual variable was determined by examining the individual β weights. The following variables were significant predictors of CRCT Math 2011: percentage of minority students and percentage of economically disadvantaged students. Minority rate had an alpha level of less than .05 and a β of -.083. The part correlation coefficient of -.207 indicates that minority rate explains 4% of the variance of math achievement. Economically disadvantaged rate had an alpha level of less than .05 and a β of -.182. The part correlation coefficient of -.351 indicates that economically disadvantaged rate explains 12% of the variance of math achievement. Economically disadvantaged rate made the greatest contribution to the criterion variable. The previous relationships indicated that as the percentage of minority students and economically disadvantaged students increased,

student achievement decreased. Principal turnover and percentage of SWD were not significant predictors of 2011 math student achievement.

Table 7

Regression Coefficients for CRCT Math by Demographic Variables

	Zero-order	Partial	B	Std. Error	Beta	t	p
Principal Turnover Rate	-.046	-.017	-.058	.371	-.012	-.157	.876
Disability Rate	-.258	-.189	-.321	.185	-.151	-1.733	.087
Minority Rate	-.539*	-.286*	-.083	.031	-.275	-2.682	.009*
Economically Disadvantaged Rate	-.685*	-.451*	-.182	.040	-.482	-4.549	.000*

* $p < .05$

Summary of the Results

The hypothesis that the percentage of SWD was related to CRCT Reading 2011 scores was supported by this data. The corresponding β weight was negative and statistically significant. High scores on percentage of SWD were associated with low scores on CRCT Reading 2011 scores and vice versa. Similarly, the hypothesis that the percentage of minority students was related to CRCT Reading 2011 scores was supported by this data. The corresponding β weight was negative and statistically significant. High scores on the percentage of minority students were associated with low scores on CRCT Reading 2011 scores and vice versa. Lastly, the hypothesis that the percentage of economically disadvantaged students was related to CRCT Reading 2011 scores was supported by this data. The corresponding β weight was negative and statistically significant. High scores on percentage of economically disadvantaged students were associated with low scores on CRCT Reading 2011 scores; likewise, low scores on the

CRCT Reading 2011 test were associated with high scores on percentage of economically disadvantaged students.

The hypothesis that principal turnover rate was related to CRCT Reading 2011 scores was not supported by the data. The corresponding β weight was not statistically significant; however, the hypothesis that the combined demographic factors were significant predictors of CRCT Reading 2011 scores was supported by the data. The overall F test was statistically significant.

The hypothesis that the percentage of SWD was related to CRCT Math 2011 scores was not supported by this data. The corresponding β weight was not significant. The hypothesis that the percentage of minority students was related to CRCT Math 2011 scores was supported by the data. The corresponding β weight was negative and statistically significant. High scores on percentage of minority students were associated with low scores on CRCT Math 2011 scores and vice versa.

Similarly, the hypothesis that the percentage of economically disadvantaged students was related to CRCT Math 2011 scores was supported by the data. The corresponding β weight was negative and statistically significant. High scores on percentage of economically disadvantaged students were associated with low scores on CRCT Math 2011 and vice versa.

As with Reading, the hypothesis that principal turnover rate was related to CRCT Math 2011 scores was not supported by the data. The corresponding β weight was not statistically significant; however, the hypothesis that the combined demographic factors were significant predictors of CRCT Math 2011 scores was supported by the data. The overall F test was statistically significant.

Chapter 5 discusses the results of this study as they pertain to relevant literature. It also presents practical recommendations based on the results and recommendation for further research.

CHAPTER FIVE: DISCUSSION

Chapter Four presented multiple regression data analysis that examined the relationships between the percentage of minority students, percentage of SWD, percentage of economically disadvantaged students, and principal turnover rate. The previous chapter also presented descriptive statistics and summaries of the data. Chapter Five is organized into sections that revisit the problem statement summarize the findings, discuss the findings in light of relevant literature, present study limitations, and give recommendations for future research.

Review of Null Hypotheses

This study was guided by the following research null hypotheses:

H₀1: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2: The combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

This study is guided by the following sub research null hypotheses:

H₀1.1: Principal turnover rate is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.2: The percentage of minority students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.3: The percentage of economically disadvantaged students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀1.4: The percentage of SWD students is not a statistically significant predictor of 2011 reading/ELA CRCT scores in grades six through eight.

H₀2.1: Principal turnover rate is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.2: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.3: The percentage of minority students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

H₀2.4: The percentage of SWD students is not a statistically significant predictor of 2011 math CRCT scores in grades six through eight.

The null hypotheses were tested using Pearson Correlations and an *F*-test for multiple regression using SPSS software and Microsoft Excel. The findings were summarized in the 6 tables in Chapter 4.

Summary of the Findings

This study used correlational research and multiple regression to determine if there was a statistically significant relationship between the number of principals who lead a school over a ten year period and CRCT success in grades 6-8 middle school students. The data showed that the combined factors of percentage of SWD, percentage of minority students, percentage of economically disadvantaged students, and principal turnover rate were significant predictors of the 2011 reading/ELA and math Georgia CRCT scores, given that the overall *F*-test was significant.

The data also showed that the percentage of minority students and the percentage of economically disadvantaged students individually were significant predictors of the 2011 reading/ELA and math Georgia CRCT scores. The percentage of SWD was a

significant predictor in reading, but not in math. Principal turnover rate alone was not a significant predictor of either reading/ELA or math.

Research Question One

Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD and 2011 reading/ELA CRCT scores in grade six through eight?

The hypothesis that the combined demographic factors were significant predictors of CRCT reading 2011 scores was supported by the data. The overall F test was statistically significant. When studied individually, percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD were significant predictors of student achievement, while principal turnover rate was not. The data indicated that the combination of the four factors were significant predictors of student achievement, while principal turnover rate had the lowest impact, as shown by the corresponding β weights. The data also indicated that principal turnover rate had the least amount of influence in the comparison. Although the overall F Test was significant, the results of the test were influenced by the high correlations between percentage of SWD, percentage of economically disadvantaged students, and percentage of minority students. The data was clear in showing that principal turnover rates had little relationship with student achievement.

Research Question Two

Is there a statistically significant relationship between the combination of principal turnover, percentage of minority students, percentage of economically

disadvantaged students, and percentage of SWD and 2011 math CRCT scores in grade six through eight?

The hypothesis that the combined demographic factors were significant predictors of CRCT math 2011 scores was supported by the data. The overall F test was statistically significant. When studied individually, percentage of minority students and percentage of economically disadvantaged students were significant predictors of 2011 math CRCT, while principal turnover rate and percentage of SWD were not. The data did expose a weak relationship between CRCT math 2011 success and SWD rate; however, that relationship was not significant when analyzing the β weights. The data indicated that the combination of the four factors was a significant predictor of 2011 CRCT math scores, while principal turnover rate, as with reading, had the lowest impact of the four variables.

Sub Research Question 1.1

Is there a statistically significant relationship between principal turnover rate and 2011 reading/ELA CRCT scores in grades six through eight?

The hypothesis that principal turnover rate was related to 2011 reading/ELA CRCT scores was not supported by the data. The corresponding Pearson Correlation Coefficient also indicated a nonsignificant relationship at $-.11$, with a significance of $.31$. The data indicated that students' 2011 reading/ELA CRCT scores could not be predicted by principal turnover rate alone in North Georgia middle schools. The corresponding β weight for multiple regression was $-.06$, with a significance of $.46$. Based upon results from the analyses for Sub Research Question 1.1, Null Hypothesis 1.1 was accepted because there was not a statistically significant relationship between principal turnover rate and 2011 reading/ELA CRCT scores.

It was found in the data that some of the schools which had the highest principal turnover rate also had the highest student achievement. This study indicated that the percentage of SWD, the percentage of minority students, and the percentage of economically disadvantaged students had a much higher impact on student achievement than principal turnover rate. Therefore a school with a very low number of SWD, minority students, and economically disadvantaged students, in conjunction with high principal turnover rates, could still be a high performing school on the CRCT.

Sub Research Question 1.2

Is there a statistically significant relationship between the percentage of minority students and 2011 reading/ELA CRCT scores in grades six through eight?

The hypothesis that the percentage of minority students was related to 2011 reading/ELA CRCT scores was supported by the data. The corresponding Pearson Correlation Coefficient also indicated a significant relationship, at $- .52$ with a significance of $.00$. The corresponding β weight for the multiple regression was $- .37$, with a significance of $.00$. Based upon results from the analyses for Sub Research Question 1.2, Null Hypothesis 1.2 was rejected because there was a statistically significant relationship between percentage of minority students and 2011 reading/ELA CRCT scores.

Sub Research Question 1.3

Is there a statistically significant relationship between the percentage of economically disadvantaged students and 2011 math CRCT scores in grades six through eight?

The hypothesis that the percentage of economically disadvantaged students was related to 2011 reading/ELA CRCT scores was supported by the data. The corresponding

Pearson Correlation Coefficient also indicated a significant relationship at $- .61$, with a significance of $.00$. The corresponding β weight for the multiple regression was $- .34$, with a significance of $.00$. The data revealed that the percentage of economically disadvantaged students had the largest relationship with student achievement amongst all of the variables studied. Based upon results from the analyses for Sub Research Question 1.3, Null Hypothesis 1.3 was rejected because there was a statistically significant relationship between the percentage of economically disadvantaged students and reading/ELA achievement.

Sub Research Question 1.4

Is there a statistically significant relationship between the percentage of SWD and 2011 reading/ELA CRCT scores in grades six through eight?

The hypothesis that the percentage of SWD was related to 2011 reading/ELA scores was supported by the data. The corresponding Pearson Correlation Coefficient also indicated a significant relationship, at $- .40$, with a significance of $.00$. The corresponding β weight for the multiple regression was $- .34$, with a significance of $.00$. Although the data showed a significant negative relationship between these two variables, the relationship was weaker than that of the percentage of minority students and the percentage of economically disadvantaged students. Based upon results from the analyses for Sub Research Question 1.4, Null Hypothesis 1.4 was rejected because there was a statistically significant relationship between the percentage of SWD and reading/ELA achievement.

Sub Research Question 2.1

Is there a statistically significant relationship between principal turnover rate and 2011 math CRCT scores in grades six through eight?

The hypothesis that principal turnover rate was related to 2011 math CRCT scores was not supported by the data. The corresponding Pearson Correlation Coefficient also indicated a nonsignificant relationship, at $- .05$, with a significance of $.68$. A correlation coefficient this close to zero indicated that there was practically no relationship between principal turnover rates and 2011 math CRCT scores. The corresponding β weight was $-.01$, with a significance of $.88$. Principal turnover rate was the only variable in this study that was not directly related to the student. Based upon results from the analyses for Sub Research Question 2.1, Null Hypothesis 2.1 was accepted because there was not a statistically significant relationship between principal turnover rate and 2011 math CRCT scores.

Sub Research Question 2.2

Is there a significant relationship between the percentage of minority students and 2011 math CRCT scores in middle schools grade six through eight?

As in Reading, The hypothesis that Minority Rate was related to CRCT Math was supported by this data. The corresponding Pearson Correlation Coefficient also indicated a significant relationship at $-.54$ with a significance of $.00$. The corresponding β weight from multiple regression was $-.28$ with a significance of $.01$. Based upon results from the analyses for sub research question 2.2, Null Hypothesis 2.2 was rejected because there was a statistically significant relationship between the percentage of minority students and math achievement.

Sub Research Question 2.3

Is there a significant relationship between the percentage of economically disadvantaged students and 2011 math CRCT scores in middle schools grade six through eight?

Similarly, the hypothesis that the percentage of economically disadvantaged students was related to 2011 math CRCT scores was supported by the data. The corresponding Pearson Correlation Coefficient also indicated a significant relationship, at $-.69$, with a significance of $.00$. These results mirrored the results in reading/ELA. The corresponding β weight for multiple regression was $-.48$, with a significance of $.00$. Based upon results from the analyses for Sub Research Question 2.3, Null Hypothesis 2.3 was rejected because there was a statistically significant relationship between the percentage of economically disadvantaged students and math achievement.

Sub Research Question 2.4

Is there a significant relationship between the percentage of SWD and 2011 math CRCT scores in middle schools grade six through eight?

In contrast to reading, the hypothesis that the percentage of SWD was related to 2011 math CRCT scores was not supported by the data. The corresponding β weight was not significant. When calculating the Pearson Correlation Coefficient, there was a weak negative correlation between the percentage of SWD and 2011 math CRCT, which was significant, with a coefficient of $-.26$, and a significance of $.02$. However, when all factors were considered together, the percentage of SWD did not significantly predict CRCT outcomes in math, with a corresponding β weight of $-.15$ and a significance of $.09$. These results indicated that there was a relationship between 2011 math CRCT success and the percentage of SWD, although it made up much less of the impact than the percentage of minority students and the percentage of economically disadvantaged students. Based upon results from the analyses for Sub Research Question 2.4, Null Hypothesis 2.4 was accepted because there was not a statistically significant relationship between the percentage of SWD and Math achievement.

Discussion of the Findings in Light of the Relevant Literature

Research Questions One and Two

Research Question One asked if there was a significant relationship between principal turnover rate, combined with percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD and 2011 reading/ELA CRCT scores in grade six through eight middle schools.

Research Question Two asked if there was a significant relationship between principal turnover rate, combined with percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD and 2011 math CRCT scores in grade six through eight middle schools.

The findings of this study supports research that suggests the percentage of minority students, percentage of economically disadvantaged students, and percentage of SWD have a combined negative effect of student achievement (Rodgers & Payne, 2007; Flowers & Keating, 2005; Dyson, 2010; Johnson, Humphrey, Mellard, Woods, & Swanson, 2010). Although the combined effect of all four variables was significant, the findings support research indicating that student achievement is not affected by high principal turnover rates (Blair & Leithwood, 2010).

Sub Research Question 1.1

The findings of this study support research that indicates that a change in principal does not necessarily effect the climate of the school or student achievement (Blair & Leithwood, 2010; Noonan & Goldman, 1995). Contrary to the results of this study, other research has indicated that schools who experience regular principal turnover do experience a change in school culture that has an indirect effect on student achievement (Jones & Weber, 2001; Meyer & Macmillan, 2011; Meyer, Macmillan, &

Northfield, 2009). A possible explanation of these results is that all principals in this region of Georgia are making student achievement their highest priority due to the NCLB and AYP mandates. Thus, regardless of principal change, a strong focus on student achievement remains a part of each school's culture.

Sub Research Question 1.2

The findings of this study support research that indicates that minority students perform at a lower academic level when compared to Caucasian students (Bankston & Caldas, 1998; Flowers & Keating, 2005; Gehring, 2002; Haycock, 2001; Lee, 2006; Nettles, 2003; Rodgers & Payne, 2007). In contrast, research has indicated that the achievement gap between ethnic groups had decreased since the implementation of NCLB (Jehlen, 2009). The achievement gap between minority students and Caucasian students has been well documented, so the results of this study were not surprising. Many minority students have lower parental expectations as well as lower expectations from society (Cheng, 2002). Education is not the highest priority to parents who are struggling to ensure there is enough food to eat each night.

Sub Research Question 1.3

The findings of this study support research that lists SES as one of the most reliable predictors of student achievement (Flowers & Keating, 2005; Jencks & Phillips, 1998; Machtinger, 2007; Rainwater & Smeeding, 1995; Rodgers & Payne, 2007). The research findings in this study align with decades-old research that suggests that many economically disadvantaged students are confronted with drug abuse, single parent households, and homelessness that leads to school truancy and poor academic performance (Bell, Rosen, & Dynlacht, 1994; Cromwell, 2006; Kleitman, 2005; Landin, 1995; Railsback, 2004). This study suggests that low SES students in Region One of the

North Georgia RESA have yet to overcome the negative side effects of being economically disadvantaged.

Sub Research Question 1.4

The findings of this study also supports research that indicates that SWD struggle to acquire knowledge at the same rate as their nondisabled peers, which leads to lower student achievement on standardized tests (Baird, Scott, Dearing, & Hamill, 2009; Cortiella, 2007; Dyson, 2010; Johnson, Humphrey, Mellard, Woods, & Swanson, 2010; Johnson, Peck, & Wise, 2007). With the wide range of classifications for SWD, determining an exact reason why SWD score lower on standardized tests than their peers is difficult, if not impossible. SWD students face a wide range of challenges aside from academics, such as disabilities in the areas of listening, speaking, reasoning, and mathematical ability (Dyson, 2010).

Sub Research Question 2.1

As with reading/ELA achievement, the findings of this study support research that indicates that a change in principal does not necessarily effect the climate of the school or student achievement (Blair & Leithwood, 2010; Noonan & Goldman, 1995). Contrasting research suggests that there is a detectable correlation between the principalship and student achievement (Goldring et al., 2008; Hallinger & Heck, 1998; Waters et al., 2003,). Although the effects of the principalship are indirect, principal leadership drives both school climate and classroom instruction. The findings of this research found no correlation between principal turnover and student achievement. Student achievement is the number one priority of all schools under NCLB, and regardless of principal change, the culture of increased student achievement remains the same.

Sub Research Question 2.2

The findings of this study support research that indicates that minority students perform at a lower academic level when compared to Caucasian students (Bankston & Caldas, 1998; Flowers & Keating, 2005; Gehring, 2002; Haycock, 2001; Lee, 2006; Nettles, 2003; Rodgers & Payne, 2007). These results were expected because very little research exists to the contrary. Previous research has shown that many minority students are also considered economically disadvantaged. Therefore, there are many factors that minority students must overcome to be academically successful. Unlike SWD students, minority students are not as protected by state policies and laws. These students are not afforded an Individual Education Plan (IEP), and interventions for these students are left up to the purview of each school. Georgia does not allow for CRCT accommodation for minority students unless they qualify for special education accommodations.

Sub Research Question 2.3

The findings of this study support research that indicates that SES is one of the most reliable predictors of student achievement (Flowers & Keating, 2005; Jencks & Phillips, 1998; Machtinger, 2007; Rainwater & Smeeding, 1995; Rodgers & Payne, 2007). Economically disadvantaged students may not have had the same parental support at home due to parents working multiple jobs and not being available to help their children do homework or study. It has also been shown that many economically disadvantaged students live in single parent households where the parent works at night and the student relies on his or her own motivation to compel them to complete school work (Bell, Rosen, & Dynlacht, 1994; Cromwell, 2006; Kleitman, 2005; Landin, 1995; Railsback, 2004). As with minority students, economically disadvantages students do not

qualify for special education based solely on their SES, so they do not receive an IEP or accommodations in the CRCT in Georgia unless they have a recognized disability.

Sub Research Question 2.4

The findings of this study also support research that indicates that students with disabilities are closing the achievement gap with their peers in math. The Georgia Department of Education (2010a) reported that the only subgroup that did not make AYP in the state of Georgia on the 2011 CRCT in both reading and math were SWD. The results of this study indicate that the percentage of students with disabilities in a school has a less negative impact on student achievement than the percentage of minority students or the percentage of economically disadvantaged students.

It appears that increased academic time in math through intervention classes while the student remains in inclusive regular education classrooms for instruction have made a large impact on the math success of SWD. SWD are required to have an IEP that addresses their specific educational needs and necessary accommodations. The students who receive accommodations throughout the year per their IEPs are also eligible for accommodations on the CRCT, which allows them to be more successful.

The current study further contributes to the field of existing research by adding a quantitative study on the impact of principal turnover on student achievement. Due to ethical constraints, experiments on leadership are lacking. Researchers are limited to studying natural occurrences in principal leadership. Evidence of the impact of a principal on student achievement is limited to observational data, with few longitudinal studies (D'Agostino, 2000, Goldring et al., 2008; Supovitz et al., 2007; Waters et al., 2003).

Study Limitations and Recommendations for Further Research

The study was based on student achievement scores on the 2011 CRCT in math and reading/ELA and their relationship with the percentage of SWD, the percentage of minority students, the percentage of economically disadvantaged students, and principal turnover rate. Data was collected from 86 grades six through eight middle schools located in Region 1 on the Department of Education School Improvement Regions Map. Although it may not be suitable to generalize the results to all populations of students, schools, and states, the data provides information that may be significant to other populations. The limitations section discusses weaknesses of the study such as design, analysis, instrumentation, sample, and threats to external and internal validity. The recommendations section provides recommendations, research implications, practitioner implications, policy implications, and areas for future research.

Implications

The primary purpose of this study was to research the relationship between principal turnover rate and student achievement and determine if that relationship is a significant predictor of student achievement on the Georgia CRCT. The findings have implications for policy makers, superintendents, and researchers. The most important finding of the study is that the relationship between principal turnover rate and student achievement in math and reading/ELA is minor and was found to have no significance. Researchers would benefit from knowing what characteristics and traits are common among successful principals, as it appears that the number of principal changes in a school is insignificant. Researchers should also be interested in the factors of a school's culture that allows for high student achievement despite high principal turnover rates.

The implication for principal preparation programs is that colleges need to provide future administrators with the skills required to be a successful leader starting with the first day on the job since it is more important to have a quality leader in place than to be concerned about principal turnover, according to the findings of this study. While most principal preparation programs are rigorous in reading and theory, it would be beneficial for aspiring principals to have a field study under a successful principal who has proven that academic success is possible even with high percentages of SWD, minority students, and economically disadvantaged students in their schools. Those successful principals could be utilized as class speakers for principal preparation classes as well.

The implication for superintendents and local school boards is a need to improve the principal hiring process. The number of principal changes in a school may not impact student achievement, but many qualitative studies have found that having a quality principal in place is crucial to improved teacher morale and a positive school culture, which leads to improved student achievement. The results of this study imply that hiring quality principals each time the position comes open is more important than how often the position is open.

Limitations

A number of limitations of this study must be acknowledged. The study examined North Georgia public middle school archival data only; therefore, any significant findings and conclusions made in the study is restricted to North Georgia public middle schools, grades six through eight. The findings and conclusions can only be applied to other schools in North Georgia that have similar demographic characteristics.

The schools selected for this study were public middle schools, grades six through eight, in operation during the 2010-11 school year whose history of principal employment could be traced to the 2001-02 school year via email and phone calls to the individual schools. Schools built after 2001-02 were not included in this study. There were several schools in the region studied that could not participate due to either opening after the 2001-02 school year or not being in continuous operation for the ten year period.

Only public schools in the 38 county region making up Region one of the Georgia Department of Education School Improvement Regions Map were included. Private schools and schools located in other regions were omitted from the study. The different RESA regions have unique demographic compositions, so they were excluded from this study.

The frequency in which schools change principals was the focus of this study. The reasons for the change in principal assignment (removal, retirement, transfer, illness, death, or promotion) were not part of this study. It is possible that many principals in the schools studied were not removed due to poor performance, but rather promoted due to superior leadership. Not identifying the reason for the change in principal is a limitation that could affect the interpretation of the results of the study.

Quantitative data was the focus of this study. A mixed study design implementing qualitative methods to gather data such as principal leadership styles and reasons for principal turnover could increase the amount of data being gathered, allowing for more in-depth conclusions.

Principal turnover data was collected over a ten year period, while Georgia CRCT data was only collected for the 2010-11 school year. Expanding the study to include a three year trend in CRCT scores may provide different outcomes. It is possible that

student achievement drops during the first year of principal turnover and increases as the new principal establishes their leadership. This study was limited as it only looked at principal turnover rates over a ten year period.

Student achievement was measured by success on the Georgia CRCT. The CRCT was the standardized test designed specifically to assess student mastery of the GPS; therefore, generalizations outside the state of Georgia may not be valid.

Recommendations

Based on the findings of this study, the following recommendations for further research are made:

Research should be conducted that compares student achievement the year before and the year after a change in principal. This would provide information on what academic impact the change of principal has on students.

This study should be replicated in school districts that include the inner city of Atlanta and the southern portion of Georgia in order to increase the number of low achieving schools being studied. Of the 86 schools used in this study, 79 schools met AYP in 2010-11. Many schools in city regions have higher percentages of minority and economically disadvantaged students, which may yield different results if studied. Principal turnover rates may be higher in those schools as well, increasing the range of principal turnover rate in the data.

The study could be expanded to include qualitative data on principal and teacher perceptions of principal turnover and its effect on student achievement. Adding this qualitative piece would provide insight into how teachers feel the change in the principal affects them and the student achievement at their school. It would also offer the

principals insight into how this fundamental change in a school affects the teachers and students.

Research is needed that examines the leadership styles of principals who lead schools that achieve student success in places where the percentages of SWD, minority students, and economically disadvantaged students are high. Qualitative research has been conducted in this area in the past, but that was before the new era began that placed so much pressure on schools and school leaders to be successful on standardized testing.

Research should be conducted on principals to determine the extent that NCLB and AYP mandates drive their decision making. A qualitative study could indicate what changes principals have made in their leadership styles since the new mandates were put in place in 2002. Principals may be forming their leadership styles around student achievement, meaning that when a new principal is hired, they have the same focus on student achievement as the previous principal.

Research is needed at the elementary and high school level to determine the relationship between principal turnover rate and student achievement. Leading an elementary and high school are completely different than leading a middle school. This research could be replicated in high schools where end of course and graduation test scores could be examined to determine if principal turnover affects student achievement at that level. It could be found that elementary schools are affected more by the change of the principal as younger students are more susceptible to change.

Research should be conducted to determine if it is more effective to hire principals from within the school system or from outside the school system. It could be possible that hiring principals from within the school district would provide a fluid change that does not disrupt the school culture. It may also be possible that hiring from

outside the system would bring new ideas and programs that may lead to increased student achievement.

Conclusion

Overall, the findings of this study show that there are many factors to overcome when it comes to high student achievement in North Georgia public middle schools. The achievement gap between minority students, economically disadvantaged students, and SWD is still prevalent despite an intense focus on these subgroups for the past 10 years. The gap has been reduced when it comes to SWD through individual modifications and accommodations on classwork as well as state mandated tests.

This study found that the number of principal changes that a school underwent did not significantly impact the student achievement at the given school. This could be due to factors such as improved school culture and increased student achievement caused by the replacement of ineffective principals. Schools with high principal turnover rates could also have been continuously losing good principals to central office positions, indicating a higher turnover rate while still maintaining high student performance.

Sergiovanni (2001) stated that it is everyone's tendency to emphasize the significance of the principal's role when it comes to student achievement, but the principal cannot do it alone. Principals, teachers, support staff, and the individual student play a role in determining the academic success of the students in a school. Research has been contradictory when it comes to determining if principal turnover affects a school negatively. The answer truly depends on the unique situation of each school. There will always be times when the change of a principal is necessary.

The results of the research contributed to the body of knowledge surrounding principals and their impact on student achievement in North Georgia. Researchers may

never be able to quantify the effects of the principal on student achievement because there are numerous variables that affect individual student achievement that cannot be controlled. It appears that hiring the best principal for the job and providing them with training and support to prepare them to improve student achievement is more important than principal turnover rate.

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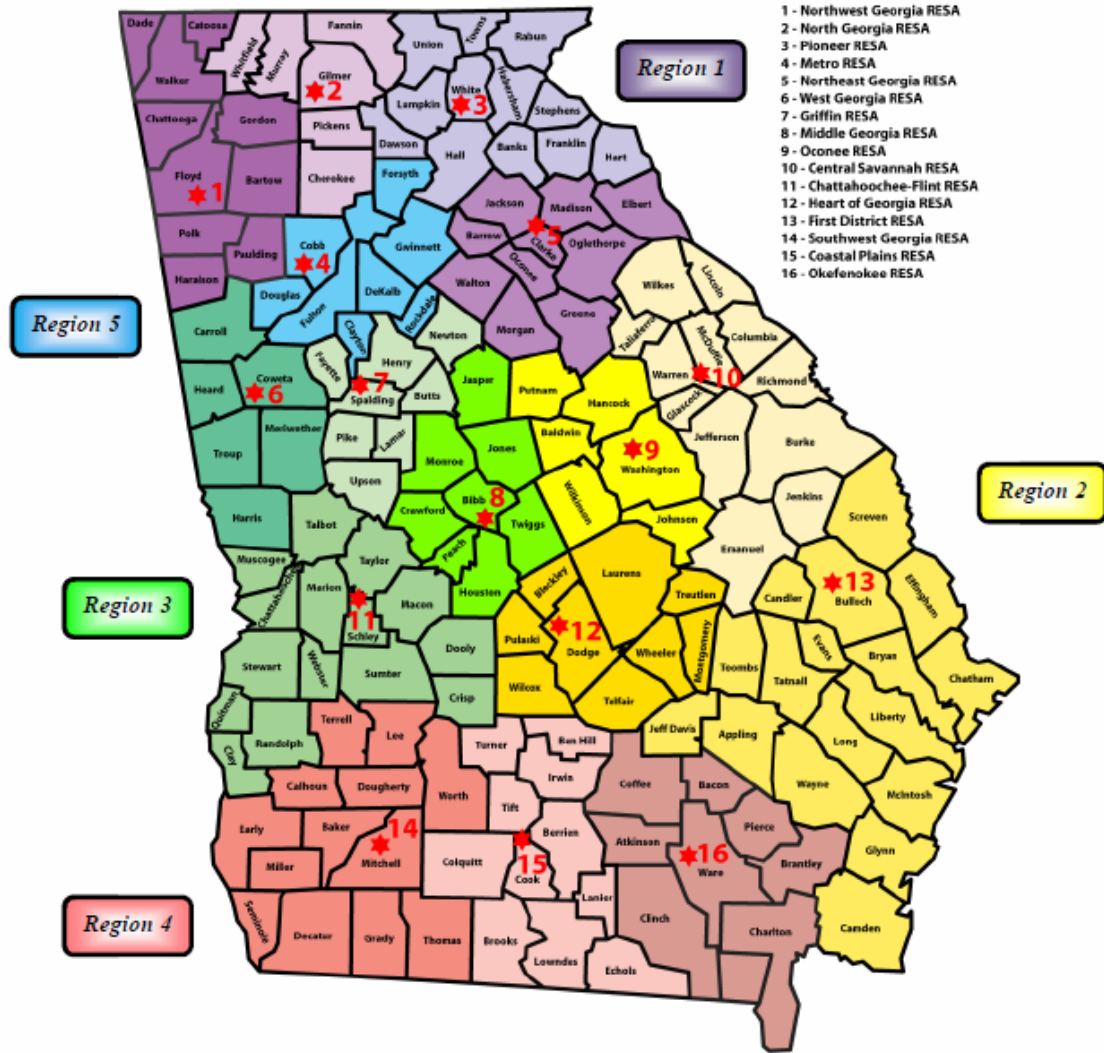
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Appendix A: School Improvement Regions Map



Georgia Department of Education School Improvement Regions Map with RESAs and Collaborative Partners



Collaborative Partners

- Georgia Department of Education – All Divisions
- Colleges and Universities
- Educational Technology Centers (ETCs)
- Georgia Learning Resource System (GLRS)
- Regional Educational Service Agencies (RESA)
- Southern Association of Colleges and Schools/Council on Accreditation and School Improvement (SACS/CASI)

Appendix B: Email Requesting Permission to use State CRCT Data

Darren Berrong

From: Darren Berrong [dberrong@towns.k12.ga.us]
Sent: Tuesday, February 21, 2012 10:37 AM
To: 'state.superintendent@doe.k12.ga.us'
Subject: Dissertation Permission

Dr. Barge,

I'm currently doing research on the effects of Principal Turnover rate on student achievement in Georgia. I am using the 2011 CRCT scores for public middle schools in Georgia. Even though the data is publicly accessible, I've been informed that I need permission to be able to use the data for research. I'm asking you for permission to use the 2011 CRCT school mean scores. No students or schools will be identified in the research.

Thank you for your consideration,

Darren Berrong, Principal
Towns County Middle School
1400 Hwy 76 East
Hiawassee, Ga. 30546
(706)896-4131 ext. 1011
<http://www.towns.k12.ga.us>



Appendix C: Permission to use State CRCT Data

Darren Berrong

From: Jennifer Hackemeyer [jhackeme@doe.k12.ga.us]
Sent: Tuesday, February 21, 2012 5:18 PM
To: dberrong@towns.k12.ga.us
Subject: Dissertation Permission

Your recent email to Dr. John Barge about use of data publicly available from the Department's website has been forwarded to my office for review and response. There is no requirement that you obtain prior approval to use such data.

I hope this is responsive to your inquiry.

Best regards,

Jennifer L. Hackemeyer
General Counsel
Georgia Department of Education
2052 Twin Towers East
205 Jesse Hill Jr., Dr. SE
Atlanta, GA 30334
jhackeme@doe.k12.ga.us
404-657-2529 - Phone
404-657-8376 - Fax

Appendix D: Institutional Review Board Approval



The Graduate School at Liberty University

October 26, 2011

Darren Berrong
IRB Exemption 1200.102611: The Relationship between Principal Turnover and Student Achievement in Reading/English Language Arts and Math Grades Six through Eight

Dear Darren,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and that no further IRB oversight is required unless your data collection extends past the one year approval granted by this memo, in which case you would submit the annual review form attached to your approval email.

Your study falls under exemption category 46.101 (b)(4), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

While you are directly contacting people for the portion of your protocol involving phone calls to district principals, you will not be collecting personally identifiable information in these phone calls, which allows us to certify this application as exempt despite the direct contact with principals.

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

If you have any questions about this exemption, or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

A handwritten signature in black ink, appearing to read "Fernando Garzon".

Fernando Garzon, Psy.D.
IRB Chair, Associate Professor
Center for Counseling & Family Studies

(434) 592-5054

The Liberty University logo, consisting of the word "LIBERTY" in a large serif font above "UNIVERSITY" in a smaller spaced-out serif font, with a horizontal line below.

40 Years of Training Champions for Christ: 1971-2011

Appendix E: Data File

Middle School's	reading10	math10	printurnover	disablerate	minorityrate	lunchstat
School 1	90.4	80.4	7	17	11.5	46
School 2	88.1	68.2	6	13.3	83.2	100
School 3	95	88.1	4	15.8	10.6	38.6
School 4	93.9	87.9	4	11.4	25	69.3
School 5	94.2	92.5	2	14.5	10.2	36.2
School 6	97.4	94.7	9	10.2	21.8	26.3
School 7	97	90.4	2	10	8	23
School 8	86.2	69.4	3	13.9	92	87.3
School 9	94.1	87.6	2	12.6	25	35.4
School 10	95.1	87.5	4	9.2	39.9	42.2
School 11	94.5	82.6	3	8.3	40.6	49.8
School 12	91.2	77.7	3	11.5	43.2	60.2
School 13	92	82.6	2	12.1	25.2	47.6
School 14	91.1	83.5	4	14.8	39.2	65.7
School 15	95.3	89.5	2	15.2	10.4	65.2
School 16	90.1	81	2	12.8	42.2	58.1
School 17	87.5	78.7	3	16.3	67.9	63.4
School 18	92.3	85.6	5	10.7	20.4	65.9
School 19	88.6	72.9	4	12	95.7	93
School 20	96.8	89.4	2	13.5	25.4	55
School 21	94	84.7	1	15.8	26.7	62.5
School 22	92	78.8	2	15	5	52.9
School 23	94.1	87.4	1	7.3	76.6	77.9
School 24	89.1	82.1	4	12.2	56.1	78.1
School 25	95.4	88.7	4	15.6	16.3	67
School 26	93	80.2	4	10.3	40.4	42
School 27	90.5	76.3	3	10.3	63.9	85.4
School 28	90.4	77	2	8.7	47.8	66.9
School 29	95.5	86.7	3	14.3	7.5	57.3
School 30	90.9	75.3	1	10.9	18.8	57.1
School 31	98.2	96.9	2	10.9	18.2	17.4
School 32	88.2	77.5	4	8.8	81.3	78
School 33	93.4	84.8	2	8.2	25.9	70
School 34	96.9	91.5	3	7	2	15
School 35	89.4	80.7	4	16.2	6.8	56.6
School 36	93.1	83.1	2	8.6	32.2	55.9
School 37	89.9	78.9	3	12.1	45.3	59.7
School 38	90.8	75.4	3	16.4	75	71.5
School 39	93.5	82.8	5	8.4	47.1	46.5

School 40	94	86.2	3	10.5	5.3	55
School 41	98.1	95.5	2	8.6	18.7	35.1
School 42	95.2	86.6	3	13.5	9.5	69
School 43	93.1	84.5	3	17.3	13	64.6
School 44	94.6	88.4	2	9.2	30.2	30
School 45	95	91.2	4	8.5	20.3	33.5
School 46	92.8	86.1	4	11.7	9.4	53.4
School 47	93.1	81.3	2	15	17.1	57.7
School 48	97.5	93.3	2	10.5	15.8	19.8
School 49	97.3	92.6	2	16.9	12.8	46.8
School 50	95.4	88.6	3	10	33.5	45.3
School 51	96.2	86.7	3	10.8	20.9	67.8
School 52	96.4	82.5	2	5.7	37.6	57.7
School 53	95.4	87.4	3	16.7	13.6	45.9
School 54	95.9	88.8	3	8.8	15.1	31.8
School 55	92.2	75.9	2	11.2	37.7	67
School 56	96.7	95.6	6	8.1	13.1	20.4
School 57	92.8	92	2	8.2	27.7	54.8
School 58	92.2	82.3	4	18	16.2	58.8
School 59	93.8	90.1	1	11.3	4.2	52.2
School 60	93.4	90.4	3	11.1	11.7	62.3
School 61	90.4	77.9	4	15.9	22.5	53.5
School 62	96.2	92.6	3	11.7	68	69.9
School 63	90.6	80.6	3	17.6	14.6	81.6
School 64	97.5	94.3	3	11.4	17	25.7
School 65	91.9	83.9	4	11.8	32.1	51.5
School 66	93	84.5	3	11.8	32.4	55.4
School 67	91.3	86.9	4	10.9	16.1	55.3
School 68	91.5	80.5	5	12.8	23.1	61.9
School 69	83.1	83.1	3	18.8	46.3	63.6
School 70	90.3	84	2	13.7	62.7	69.7
School 71	93.9	84.1	3	8.6	24.1	38.2
School 72	95.5	89.5	3	15.3	17	57.7
School 73	81.2	63.4	4	20.5	25.4	84
School 74	93.1	87.3	5	14	25.7	47.3
School 75	96.2	87.5	3	8.6	1.1	53.2
School 76	99.1	94.2	2	11.8	6	32.1
School 77	96.7	89.6	4	15.8	5.4	57.8
School 78	91.3	74.4	4	11.4	41.2	71.5
School 79	87.6	79.4	3	12.2	53.8	65
School 80	94.5	91.5	6	13.9	20.2	43.6
School 81	94	81.2	1	10.6	21.2	51.9
School 82	94	87.9	2	12.3	40.2	61.8

School 83	95.2	92.9	3	13.9	9.3	53.4
School 84	93.1	80.8	3	9.9	37.8	60.2
School 85	91.4	81.9	1	14.6	18.2	34.2
School 86	97.2	91.8	4	10.3	37.8	39.5

Appendix F: Principal Email Requesting Principal Turnover Data

Darren Berrong

To: Principals
Subject: Principal Turnover data

Mr. Principal,

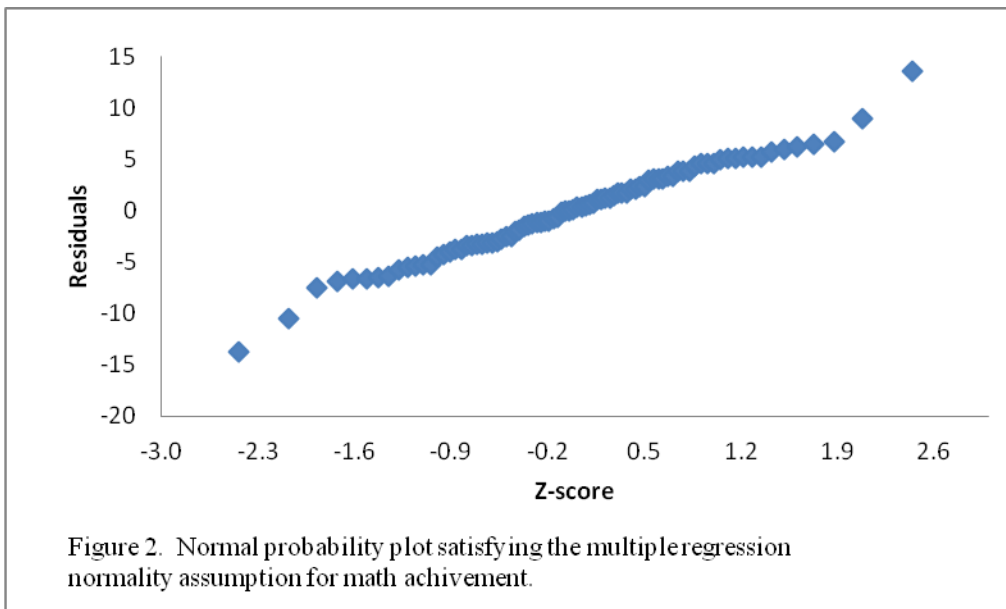
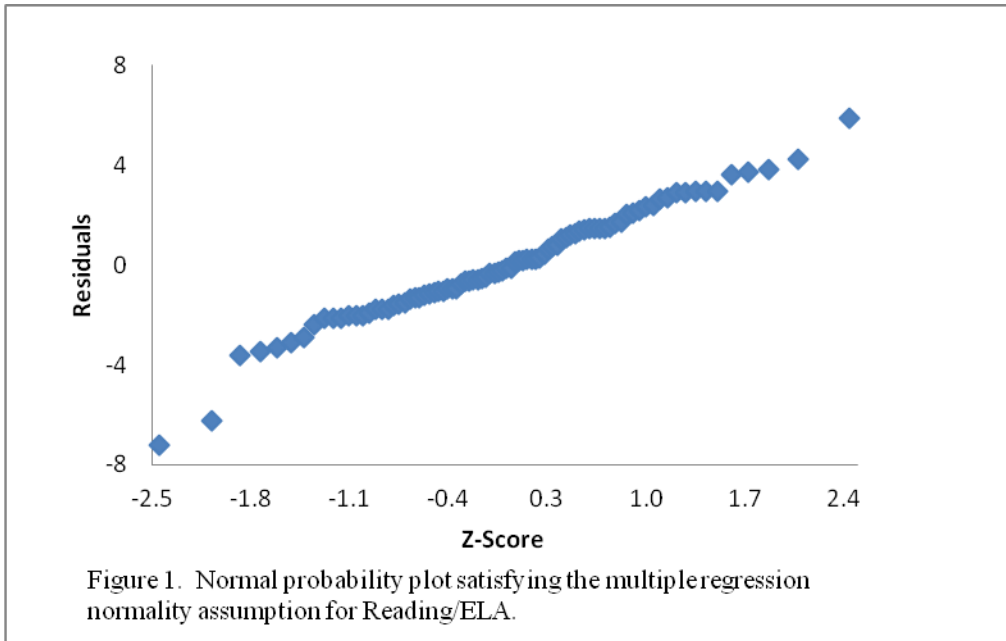
I am currently performing research for my dissertation at Liberty University in Virginia. I'm studying the effects of principal turnover rates on student achievement in all North Georgia Schools. I need to know how many principals have worked at your school from the 2001-2002 school year through the 2010-2011 school year. I do not need nor want any names of principals, just the number that have worked there for the past 10 years. For example, if you have been the principal there since 2005, and the preceding principal was there since the year 2000, then I would simply need the number 2 since there have been only 2 principals over that 10 year period. Once again, no principal names will be used in this research nor will any school names be used in the research other than informing the readers that the school was part of the 84 school study.

Thank you for your time,

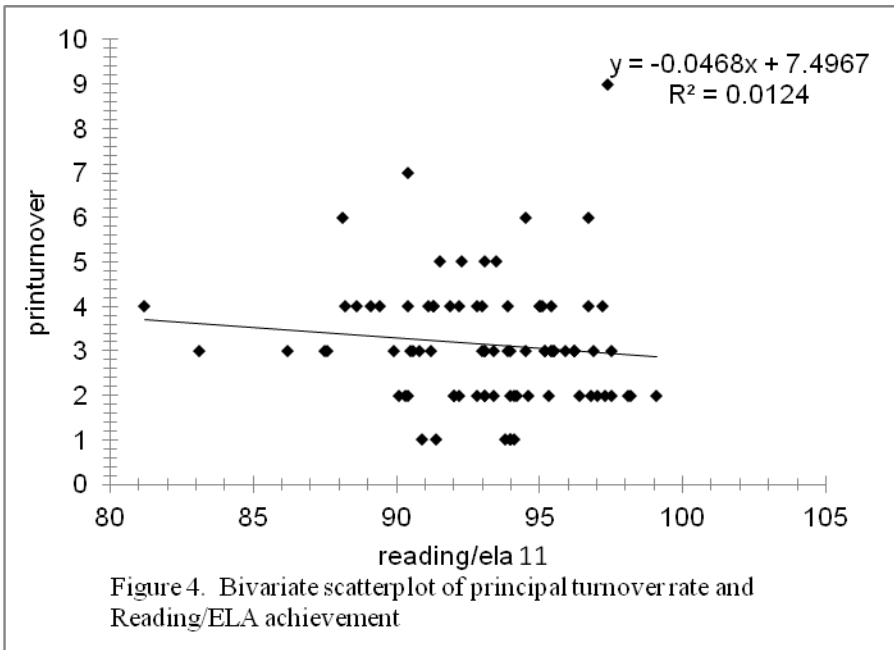
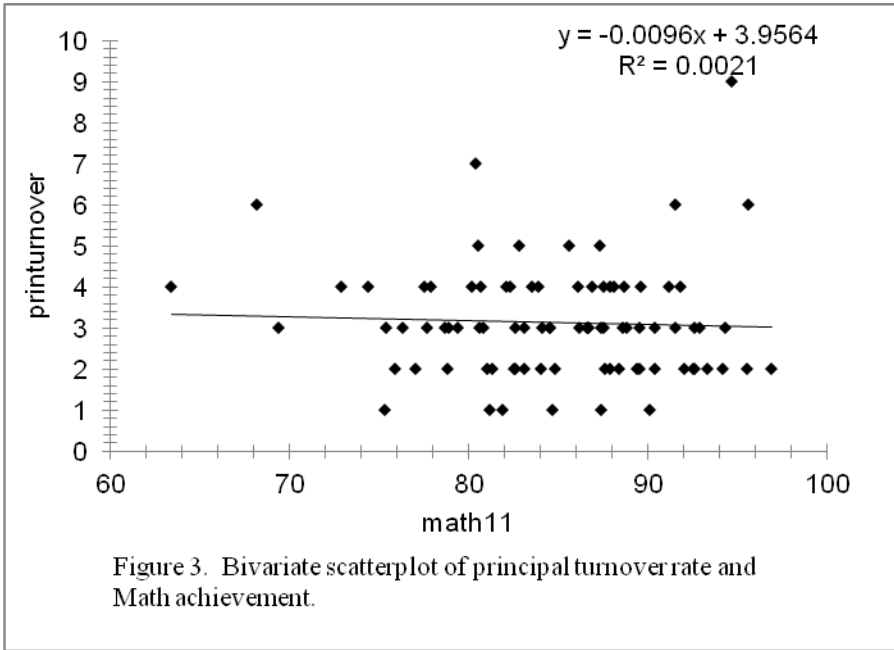
Darren Berrong, Principal
Towns County Middle School
1400 Hwy 76 East
Hiawassee, Ga. 30546
(706)896-4131 ext. 1011
<http://www.towns.k12.ga.us>

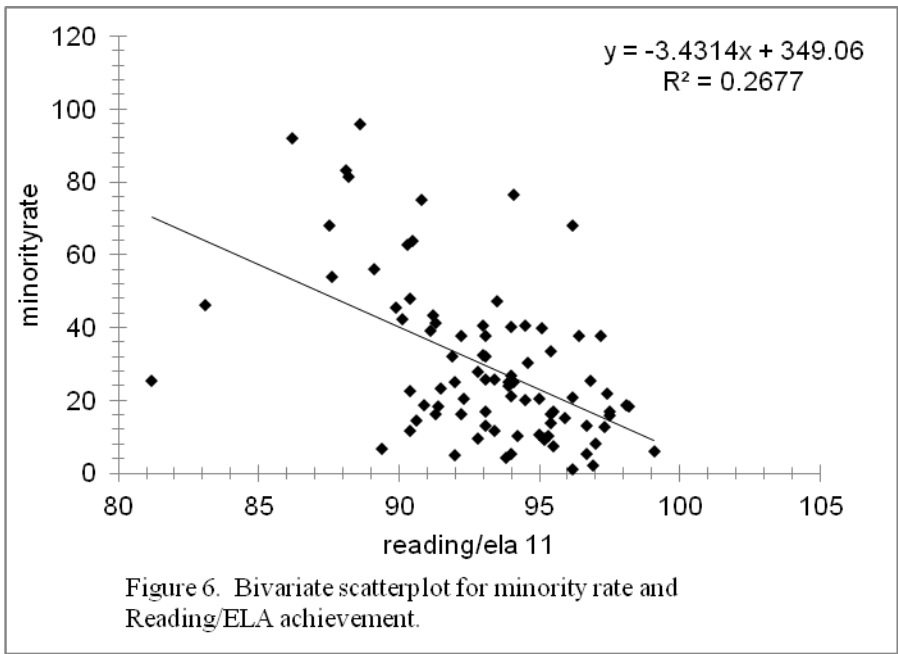
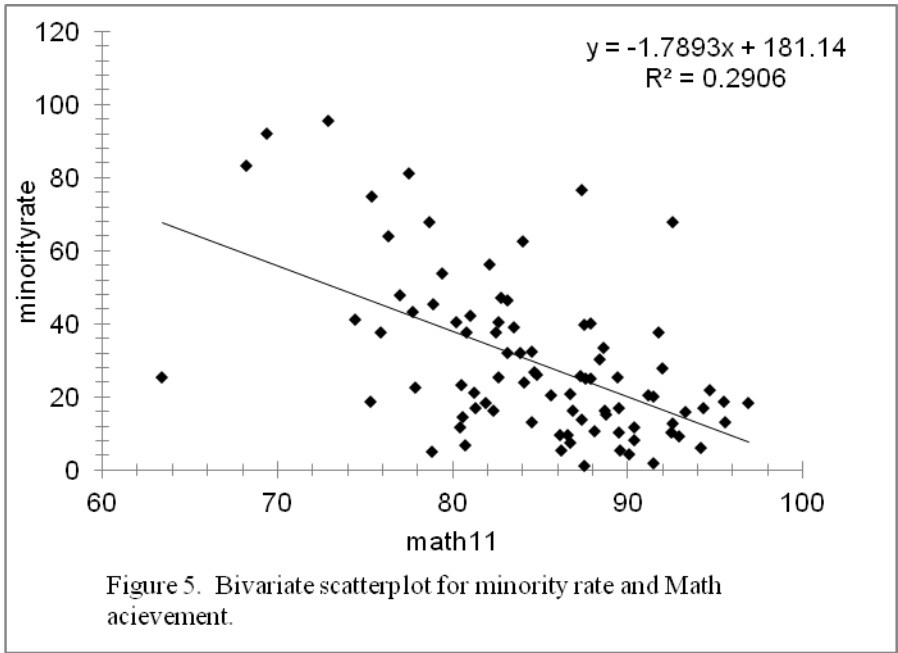


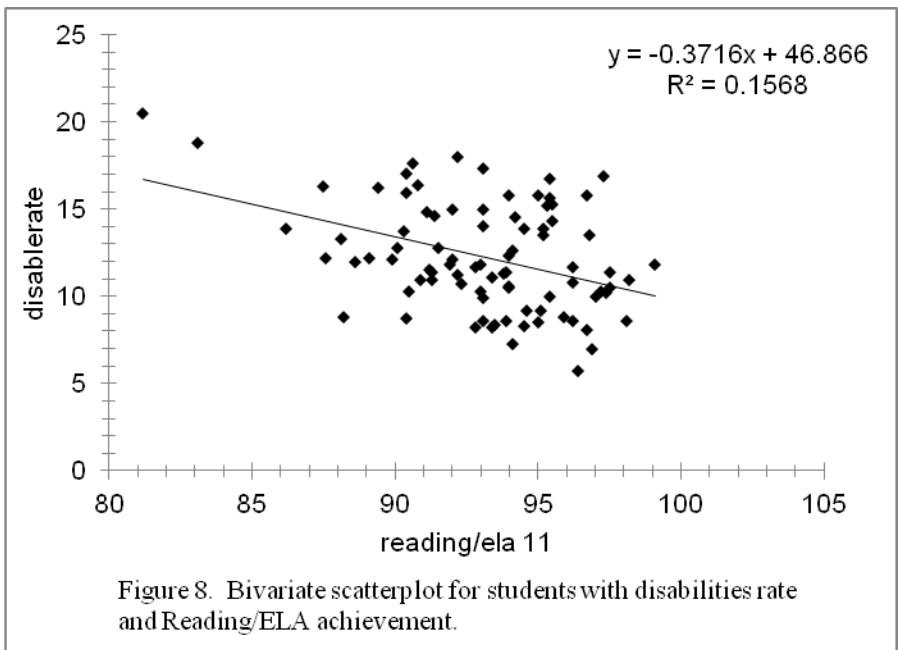
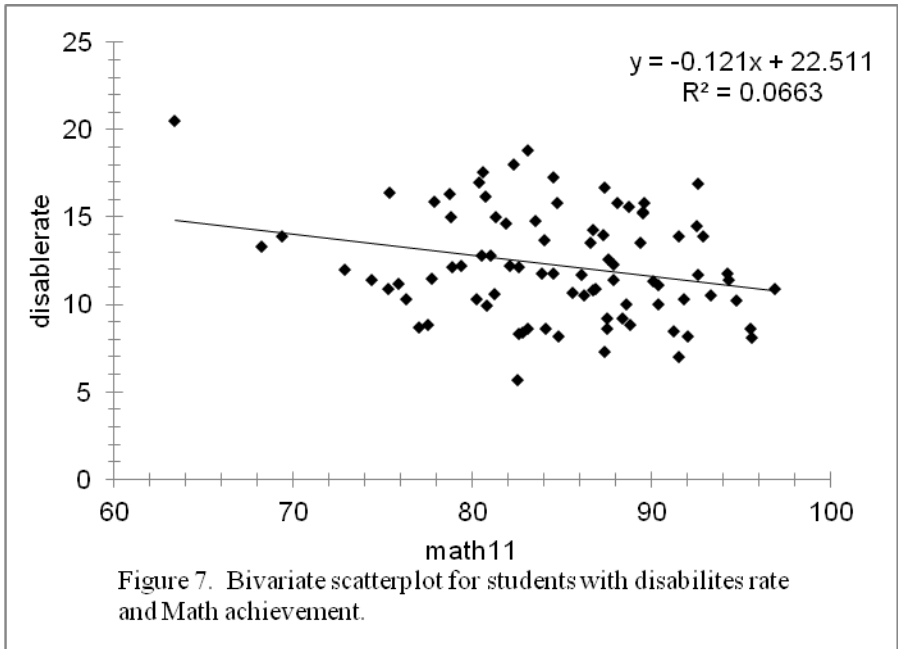
Appendix G: Normal Probability Plots

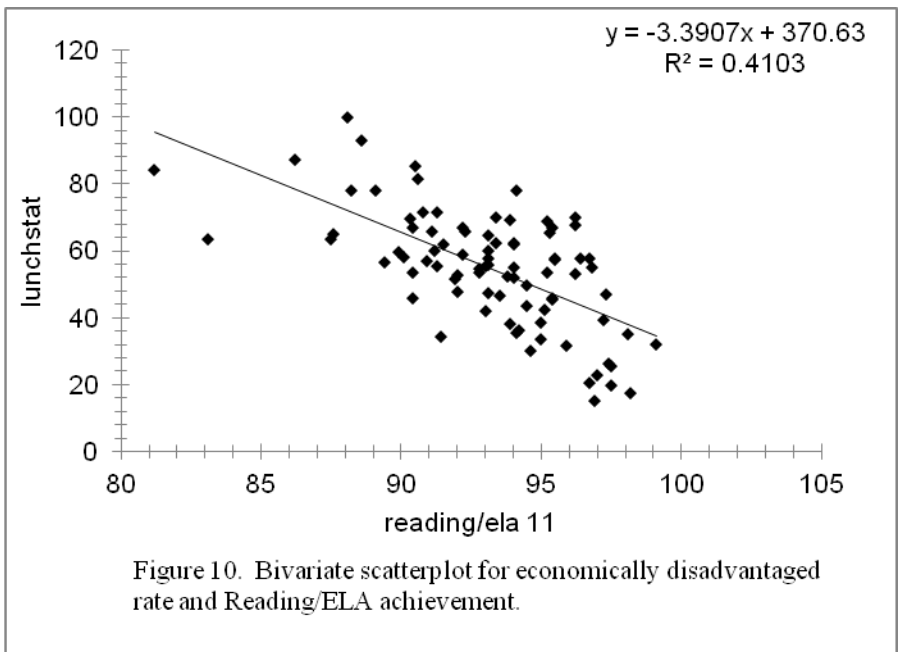
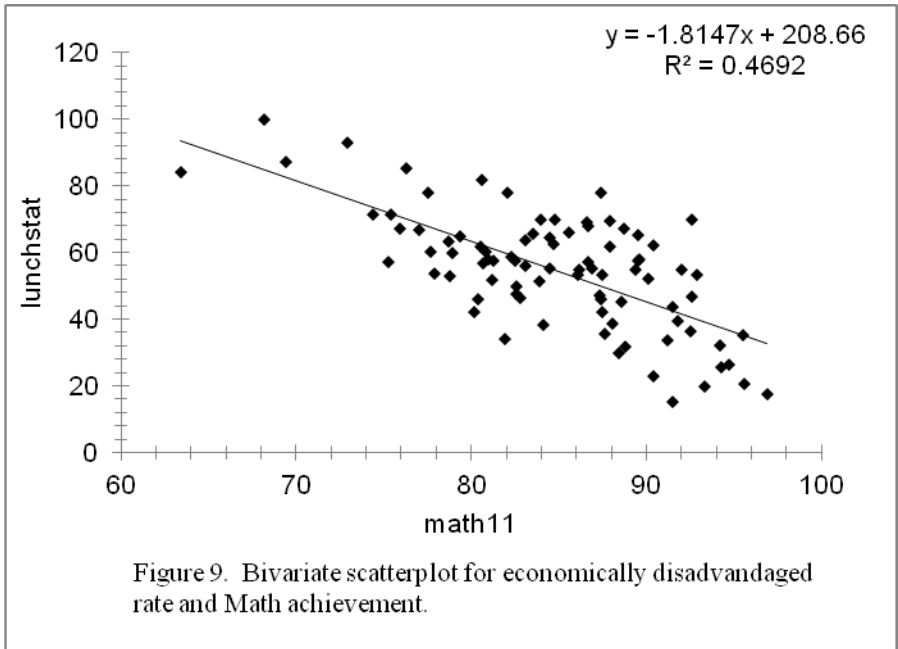


Appendix H: Bivariate Scatter Plots









Appendix I: Independence of Residuals Test

