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An Examination of Academic Growth of Minority Elementary Magnet School Students

David Wayne Snapp
Gardner-Webb University

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By
David Wayne Snapp

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Approval Page

This dissertation was submitted by David Wayne Snapp under the direction of the persons listed below. It was submitted to the Gardner-Webb University School of Education and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Gardner-Webb University.

Donald L. Martin, Jr., Ed.D. — Date
Committee Chair

Timothy Y. Lee, Ed.D. — Date
Committee Member

David W. Shellman, Ed.D. — Date
Committee Member

Jeffrey Rogers, Ph.D. — Date
Dean of the Gayle Bolt Price School
of Graduate Studies

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Abstract

An Examination of Academic Growth of Minority Elementary Magnet School Students. Snapp, David Wayne, 2013: Dissertation, Gardner-Webb University, Magnet Schools/Minority Students/Academic Growth/ Controlled Choice

This research was designed to examine the difference in student performance between minority magnet school students who live in the residential area for those magnet schools and minority students assigned to a non-magnet residential school. This difference in performance was measured by scale score differences from the North Carolina End-of-Grade tests in reading and math after the sample scores were converted to z scores using the state mean and standard deviation for the given years in the study. Performance growth was measured for students who were in the third grade in 2009-2010 and remained at their school through the fifth grade in 2011-2012.

Participants used in the study were selected based on their race, the size of the school they attended, the percent of minority students attending that school, and whether they lived in the residential boundary for their school.

The Statistical Package for Social Sciences (SPSS) was used to import and evaluate data received from the district's accountability department. A mixed, two-factor repeated measures analysis of variance was used to examine the data through multiple independent variables and the dependent variables of math and reading tests.

A mixed, two-factor repeated measures analysis of variance (ANOVA) revealed that there was a *p* value of .007 for groups over time, where the magnet and zone schools performed differently. A univariate, repeated-measures ANOVA of math scores determined that there was no statistically significant interaction between the groups over time in math. However, the same univariate analysis, when performed for reading scores, showed a *p* value of .005, meaning the type of school may have impacted the achievement of the students in the study.

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Chapter 1: Introduction

Historical Background

Public education in the United States, much like many government-funded initiatives, emphasizes equality. The United States Supreme Court has heard a number of cases dealing with equality in education and has traditionally decided in favor of students who have experienced discrimination based on their race, ethnicity, or gender. In 1954, the decision in *Brown v. Board of Education* declared that it was unconstitutional for states to establish separate settings or schools for children of different races (*Brown v. Board of Education*, 1954). In addition to *Brown v. Board of Education*, the Free Appropriate Public Education (FAPE) Act assigns rights to students with disabilities (U.S. Department of Education, Office of Civil Rights, 2010). Disability classifications are modified and expanded as psychologists and medical professionals discover that a child's disability may prevent him or her from learning in a typical classroom environment (U.S. Congress, 1973).

As the United States' population has grown over the last 50 years, the American educational system has attempted to meet the needs of all students. During this time, the socioeconomic status and racial makeup of the country has also changed, resulting in school districts that are very diverse. Since schools typically serve neighborhoods, many students in schools that are economically disadvantaged have struggled since parental expectations were low. Curriculum, pedagogy, funding, culture, and community are additional factors that can affect a school's performance.

There are several factors to consider when attempting to improve the performance of a school. One component that can impact the success of a school is the demographic composition of the student population (Everett, 2006). Many judicial decisions since

Brown v. Board of Education have directed school boards to bus students in order to achieve racial balance in individual schools. However, some Congressmen argued that busing students to achieve racial balance throughout a district would violate the Constitution, as the students would be assigned to a school according to race (Oakes, 1986). The "Coleman Report" (Equality of Educational Opportunity), by James Coleman in 1966, contained over 700 pages of findings after studying more than 150,000 students across the United States (Coleman, 1966). One conclusion of the Coleman Report was that socially disadvantaged Black students who were bused to primarily White schools benefited from learning in mixed-race classrooms. The report also found that predominantly Black schools were not significantly underfunded compared to White schools in the South (Coleman, 1966). The report argued that in order to achieve racial equality, it was not necessary or appropriate to solely provide more funding to segregated schools. Rather, busing disadvantaged minority students to a more racially balanced school, according to Coleman, could impact their learning (Coleman, 1966).

One way to address minority isolation and racial balance in schools came about in the 1970s through the creation of magnet schools. According to the United States Department of Education, magnet schools "serve a purpose to assist in the desegregation of schools served by local educational agencies by providing financial assistance to eligible local educational agencies" (U.S. Department of Education, 2004a, p. 1). In doing so, magnet schools improve struggling schools and reduce the minority isolation of students. Allocation of such funds must be for the purpose of eliminating minority isolation, implementing programs, developing innovative educational methods, and creating other accountability measures (U.S. Department of Education, 2004a). Magnet schools attempt to desegregate public schools by offering a special curriculum capable of

attracting substantial numbers of students of different racial backgrounds.

Magnet schools were not an invention but rather a movement. This concept of attracting a diverse group of students stems from the idea that all students do not learn in the same manner; but that by finding a unifying theme or organizational structure for students of similar interests, each student will excel in all areas of the curriculum (Waldrip, 2002). In the 1970s, some large school districts in the United States had success by incorporating various organizational structures within each school district. Minneapolis, Minnesota, for example, created a district school choice model with different organizational systems in an effort to increase achievement and success (Waldrip, 2002). According to Waldrip (2002), elementary schools that featured either open classrooms, *continuous progress*, *free-form* (similar to a Montessori approach), and traditional elementary schools all appeared successful due to the fact that the teachers and families made a choice to attend that particular type of school. In 1971, Dallas, Texas, opened a high school with career strands to attract different students from various ethnic backgrounds. The school offered programs during the day, on a part-time basis, and in the evening. Around the same time, a performing and visual arts school in Houston stated that it attracted students from the area like a *magnet*, and the phrase quickly became the one used to characterize schools that were designed to attract students from suburban neighborhoods to schools in the city (Waldrip).

Adoption of No Child Left Behind

In 1965, Congress passed into law the Elementary and Secondary Education Act (ESEA) which emphasized equal access, high standards, and accountability. ESEA intended to close the achievement gap between students by guaranteeing them equal access to education and materials (U.S. Department of Education, 2004b). Adopted more

than a decade after *Brown v. Board of Education of Topeka* (1954), ESEA was designed by President Johnson to close the achievement gap in reading, writing, and mathematics between children from low-income households who attended urban or rural school systems and children from the middle class who attended suburban school systems (Farkas & Hall, 2000). Since the initial adoption of the Elementary and Secondary Education Act of 1965, there have been multiple reauthorizations of the act. The No Child Left Behind (NCLB) Act of 2001 proposed by President George W. Bush, is the most recent reauthorization of ESEA. NCLB places a stringent accountability burden on schools, as they must achieve a predetermined improvement in the performance of different groups of students on end-of-year tests. NCLB also requires schools to inform parents of the school's performance as well as provide an explanation of the terms and statistics accompanying the school report card (U.S. Department of Education, 2002).

One specific provision of ESEA, a program referred to as Title I, provides funding to schools to assist their high-poverty students in achieving higher scores on standardized tests. Schools with more than 50% of their enrollment from low-income families may use the funds for school-wide initiatives (U.S. Department of Education, 2008). In his 2009 fiscal year budget, President Barack Obama proposed a $406 million increase in Title I funds to help struggling schools (Education World, 2011).

Explanation and Significance of Adequate Yearly Progress

NCLB requires that each school must achieve Adequate Yearly Progress (AYP), a series of performance targets, each year (North Carolina Department of Public Instruction [NCDPI], 2011). Failure to make AYP for 3 consecutive years results in sanctions imposed by the state. Funding provided by Title I is expected to assist schools failing to make AYP by helping them attain better results on the standardized tests. These

standardized tests in reading and math are developed by individual states, and the requirements for passing these assessments are determined by each state. Under NCLB, students enrolled in schools failing to meet AYP for 2 or more consecutive years must be offered the chance to transfer to higher-performing local schools, receive free tutoring, or attend after-school programs (U.S. Department of Education, 2008). Magnet schools are often created following NCLB sanctions so that the new program and diverse group of students attracted to the school will be able to improve student achievement.

Since the 2002-2003 school year, AYP was the term used to describe student progress. However, beginning in the 2011-2012 school year, the term was changed to Annual Measurable Objectives (AMO) after North Carolina's NCLB waiver proposal to the U.S. Department of Education was approved. North Carolina is no longer required to designate whether a school met AYP, but rather North Carolina reports the number of AMOs met by each school. Unlike AYP where the target is the same for all subgroups, AMO targets are determined based on the previous performance of the subgroup on standardized tests.

Magnet Schools and Choice

In 1966, Coleman reported that minority schools are not underfunded, but rather minority students learn better in a diverse classroom. Since the report, several ways to increase diversity have been established (Coleman, 1966). Cambridge Public Schools in Massachusetts implemented a controlled choice student assignment plan in the early 1980s. One researcher claimed that this district was one of the first in the nation to have a successful choice program (Fiske, 2002). After Fiske (2002) determined that "controlled choice has for the most part succeeded in its primary objective of fostering racial diversity" (Alves, Willie, & Edwards, 2002), his findings have been referenced as

the foundation for supporting new controlled choice plans in growing urban districts such as in Wake County, North Carolina, and St. Lucie County, Florida (Ellinwood, 2011).

The controlled choice program operated by the school district in this researcher's study uses street addresses for students to create what is referred to as a residential boundary. Different from *neighborhood* schools, residential schools are not necessarily the closest school to a student's home. Students are assigned to their residential school using the North Carolina Transportation Information Management System (TIMS) boundary planning computer program. TIMS originally used student information and a map of the school district to design residential boundaries by starting at the county line, working inward toward a school location, and filling seats at the school. Once all spaces at a school were full, the boundary line creation ended. This process was known as boundary optimization. It was then up to the person who oversaw boundary planning to adjust boundaries that may have divided neighborhoods and make minor adjustments to those lines. In order to establish diverse residential school populations through pupil assignments, the district attempts to design their residential boundaries in such a way that the demographics of that area create as much diversity as possible for the particular school (Fava, 1991).

Some larger urban districts may have residential areas that still exhibit signs of racial isolation (Fava, 1991). The U.S. Census Bureau reported that residential segregation had declined in the West and South since 1980, but was still prevalent through the Northeast and Midwest (Iceland, Weinberg, & Steinmetz, 2002). Drawing a larger attendance area for a particular school in such situations would either overcrowd the school or make bus rides very long. Racial isolation can be avoided if parents make choices to leave or enter the school.

Parents participating in the school choice process make the decision for their child to attend a different school other than their residential school for various reasons. NCDPI publishes school report cards which describe each school's AMO (formerly AYP targets). These report cards have the potential to influence a parent's selection by highlighting the achievement or academic growth of schools. Before 2012, the local district also notified parents of any sanctions or restrictions for the schools in that district that did not make AYP. It is the responsibility of each family to determine whether the level of academic growth makes a school more appropriate for their child. When lack of choice by parents to achieve racial balance occurs or leaves schools under capacity, districts often resort to creating a magnet school in the hope of creating a more diverse population (Rossell, 2002).

Some parents may also choose a school based on a specific theme or program that is offered. Each school in the district used in this study operates under a specific theme. Themes offered include academic acceleration, problem-based learning, global exploration, arts and music, writing and publishing, and math and science to name a few. Magnet schools offer a more specific and integrated program that is intended to attract a diverse group of students for that specific program (Waldrip, 2002). A study by the National Center for Education Statistics showed that the most popular magnet school is one that is a *dedicated* magnet, meaning that all students attending the school are there by choice, and no one is assigned by default based on address (Rossell, 2005). Dedicated magnet schools offer a unique atmosphere by removing the population from a residential boundary that may possibly skew parents' perceptions of the demographics or academic performance of the school (Rossell, 2005). Magnet schools which have properly implemented a program need to continue to be monitored by the district leadership to

ensure that they do not have an adverse effect on surrounding schools (Poppell & Hague, 2001).

One study noted that magnet schools may actually exacerbate racial separation (Jones-Sanpei, 2006). The study explained that by placing a program in a magnet school in order to achieve greater diversity, the school may in fact lose a portion of its assigned residential population in order to make space for the program (Jones-Sanpei, 2006). A school in a large urban district in a southeastern state has actually produced this exact effect. The school was included in a successful magnet school assistance grant and emphasized science, technology, engineering, and math (STEM), and also housed the highly-academically gifted population for the district. Most of the students in this highly-academically gifted program are Caucasian. The school is in a predominantly minority, low-income section of the county, and when the magnet program showed success, the residential population chose to attend a nearby school as these students quickly became the minority in just a matter of years. The effect of this particular magnet program was a higher concentration of minority students at the surrounding schools.

Statement of the Problem

The problem examined was the difference in student performance between magnet school students who attended that magnet school as a residential student and students assigned to a non-magnet residential zone school. The benefit of the study was derived from the uniqueness of the district examined. While it is a growing urban district, the controlled choice student assignment plan used in conjunction with magnet schools allows students to be assigned to a magnet school based on their residential assignment and experience the benefits of that program without having to make a conscious decision to attend that school.

Magnet Schools of America makes the claim that the purpose of a magnet school is to increase the diversity of the student population (Waldrip, 2002). In 2012, the United States federal government spent over $96 million on magnet school program funding under ESEA Title V (U.S. Department of Education, 2011). Though it only accounts for a small percentage of the overall education budget, the United States spends millions of dollars each year on programs that are designed to produce results similar to traditional schools (U.S. Department of Education, 2004a). Student achievement in part may be due to parental choice, as the selection of a magnet school also indicates parental involvement which has a positive influence on the child's learning (Beverly, 2009). This researcher was unable to find specific studies that isolate the variables of student characteristics and school size as related to academic achievement in magnet schools when compared to their counterparts in traditional schools.

Purpose

The purpose of this study was to examine the differences in academic growth on North Carolina end-of-grade (EOG) tests in reading and math. The academic growth as measured by these tests was compared between African-American and Hispanic elementary students in Grades 3-5 attending magnet schools as residential students and similar students at zone elementary schools in Grades 3-5. If the magnet program had been implemented as designed throughout the school, the students in the magnet school would be expected to show higher growth. While studies exist regarding magnet schools and minority students, there is little research that demonstrates any direct relationship between minority students and their academic growth in urban magnet school settings who attend it solely because they live in that school's attendance area.

Research Questions

1. Do residential minority students attending elementary magnet schools achieve greater academic growth on the North Carolina EOG (NC EOG) test in mathematics compared to residential minority students in zone elementary schools in a large urban school district in North Carolina?

2. Do residential minority students attending elementary magnet schools achieve greater academic growth on the NC EOG test in reading compared to residential minority students in zone elementary schools in a large urban school district in North Carolina?

Nature of the Problem

While the intention of magnet schools is to create less racial isolation in a district or school, all schools strive to increase student achievement (Waldrip, 2002). A study in San Diego showed that residential students attending magnet schools performed better after implementation of a magnet program at a school than before that program was in place (Frankenberg & Siegel-Hawley, 2008). A lack of research exists as to whether a magnet program alone impacts minority achievement. Awarding grants for programs that may not necessarily increase minority achievement can be perceived to be wasteful if it is solely for the purpose of diversifying the school populations. In 2009, President Obama requested over $100 million to fund magnet schools throughout the country. Since minority students achieve at higher levels in more diverse classroom settings, the conclusion could be made that a more diverse school should demonstrate higher performance on standardized tests (Lee, Maddaus, Coladarci, & Donaldson, 1999). However, some magnet schools, even with government funding, have failed to diversify the student population and have not seen any growth in their overall student performance. Because parental involvement is linked to higher student achievement, in this particular

study the data is comprised of test scores for students assigned to the designated schools as residential students rather than those who chose a school for a particular magnet or zone program (Beverly, 2009).

Definition of Terms

ABC. A North Carolina accountability standard by which schools are evaluated based on student growth and performance. Growth is projected based on previous achievement of the students in the sample.

Adequate yearly progress (AYP). A set of performance targets that subgroups must achieve each year to meet the requirements of NCLB. This target was the same for all subgroups in terms of performance until 2011.

Annual measurable objectives (AMO). North Carolina received a waiver for restrictions placed by the Elementary and Secondary Education Act by specifying that they would no longer use AYP as a tool to identify school performance. Instead, AMOs will be calculated for each subgroup based on the incremental progress over the next year to close the subgroup's performance gap.

Academic growth. The difference, positive or negative, in test scores from one year to the next on NC EOG tests.

End-of-grade test (EOG). A standardized test given by the state of North Carolina to determine proficiency levels of students in Grades 3-8.

Eliminating minority isolation. An objective for a minority-group isolated school that aims to reduce minority enrollments below 50% of the total enrollment (DuBois, 1997).

Magnet school. A school which offers a specific program, using funds supplied by the local education agency, grants, or other sources, to attract students in order to

eliminate, reduce, or prevent racial isolation.

Magnet school program. A strategy that promotes a special curriculum designed for attracting students of different racial backgrounds.

Magnet school selection. A period during the school year when parents may select a designated magnet school. This process differs from the zone school choice period in that only magnet schools may be selected during this time.

Minority student. For the purpose of this study only, minority student refers to a student whose information in the district database classifies him/her as African American or Hispanic.

Race to the Top. A Federal grant program for states. Successful grant recipients must commit to assessing student progress in all classes, identify effective teaching at low-performing schools, and incorporate more technology into instruction.

Residential school. The school in a zone at which a child is guaranteed assignment based on his or her domicile. Domicile is based on the address of the parent/guardian who has legal physical custody of the student.

Residential student. A pupil who attends his/her residential school by default and may or may not have made a conscious decision to select that school. All students used in this study will be considered residential students for either a magnet or non-magnet zone school.

Scale score. A score that has been statistically adjusted and converted from a raw score to a common scale that accounts for differences in difficulty across different versions of a test.

School choice. A process through which parents in a school district may request for their child to attend another public school in the district, either in or out of zone, other

than his or her residential school. If no choice is made to attend a magnet school or school within the zone, the student is assigned by default to his/her residential school.

Subgroup. A category of students identified by ethnicity, SES, English language proficiency, or educational exceptionality.

Zone school. A non-magnet school to which a student is assigned. This assignment may be because the student is residential to that school or the parent made a choice. Different from a *traditional* school, parents have the option of selecting a zone school during a choice period each year of elementary school.

Chapter 2: Literature Review

Magnet School Background

Magnet schools began operating in the 1970s as a way to help desegregate school districts and attract students from outside racially isolated neighborhoods (Waldrip, 2002). Little attention, however, has been paid to the primary goal of education which is to teach students and raise achievement (Poppell & Hague, 2001). Designed with a special theme as the focus, magnet schools may also provide more up-to-date facilities, higher levels of parent engagement activities, smaller classes, and specialized funding (Poppell & Hague, 2001). Dr. Judith Poppell, an assistant professor at the University of North Florida, wrote in a study that "most evaluations of magnet programs are objective driven, with primary emphasis on student characteristics, recruitment and retention of students, parent and community involvement, and other basic outcomes" (Poppell & Hague, 2001, p. 5). Poppell and Hague (2011) claimed that while magnet programs may be achieving their goal of diversifying the population, researchers often fail to fully assess the fidelity of a magnet school because they do not actually identify whether magnet schools are showing that they produce a higher level of academic achievement than schools without such programs. Coincidentally, Poppell and Hague's own study of magnet schools described and evaluated only the implementation of the program itself and not the actual results associated with student achievement. Poppell and Hague used a mixed-methodology approach to answer questions regarding uniqueness and effectiveness of magnet programs, their ability to achieve desegregation, higher academic achievement for all students, and parent and community involvement. Other researchers have criticized Poppel and Hague for not including statistical definitions for certain parameters in their study, including terms such as *disadvantaged*, when referring to a

group of students (Reddout, 2005).

Racial Isolation

Wanzer, Moore and Dougherty (2008) conducted a study surrounding race and magnet school choice in an urban neighborhood in Connecticut. The study alluded to the famous *Sheff v. O'Neill* desegregation lawsuit in which the Connecticut Supreme Court ruled that the state had the obligation to ensure that every student had the right to an equal education that is not compromised by racial or social isolation (Sheff v. O'Neill, 1996). The court decision also declared that school districts may not legally divide attendance lines by town or city boundaries, as it was creating racial isolation due to the township demographics. More than a decade later in 2008, there are 22 inter-district magnet schools in metropolitan Hartford attracting students from throughout the region with attractive curricula and initiatives in order to achieve racial balance among schools in the district (Wanzer et al.).

Wanzer et al.'s (2008) mixed-method study incorporates quantitative and qualitative research methods to extend the understanding of racial balance and its impact on achievement in the magnet schools throughout the Hartford, Connecticut school district. Wanzer et al.'s quantitative research questions asked about the relationship of magnet application rates and standardized test scores for magnet and non-magnet schools, how magnet schools vary geographically with regard to the students' homes who attend the school, and whether application rates vary among different neighborhoods. They also noted whether the individual schools were similar in demographics to their surrounding neighborhoods (Wanzer et al.). Thirty-six door-to-door interviews were conducted for four neighborhoods (two with the highest application rate, two with the lowest) asking how parental opinions varied between the neighborhoods and how parental attitudes on

magnet schools varied by race.

The quantitative results revealed that while higher-performing magnet schools attracted the most applicants, it was not necessarily accurate to say that the lowest-performing neighborhood schools had the most students leaving to attend other schools (Wanzer et al., 2008). There was a small association between proximity to the magnet school and families who selected them, but the school's overall neighborhood racial demographics had quite a large impact on decision making. The data showed that in half the city, Black students were more likely than Hispanics to apply to a magnet school if they were the racial minority in the neighborhood, and Hispanics were less likely to apply when they were the majority in the neighborhood (Wanzer et al., 2008). Wanzer et al. (2008) made the statement that while magnet schools are placed to desegregate a school district, they may actually be counterproductive in a system where a controlled choice pupil assignment plan is not also utilized (Wanzer et al.). Given that African-American students are leaving neighborhoods when they are the minority and Hispanics are staying in those neighborhood schools, the district could slowly resegregate if magnet applications are not monitored or marketed correctly or if another means of assigning the students is not implemented (Wanzer et al.).

Magnet School Choice and Achievement

Ballou, Godlring, and Liu (2006) from Vanderbilt University studied magnet schools and student achievement in an effort to determine if the magnet program affects a child's achievement (Ballou et al.). Over 6,000 test score samples on nearly 2,700 students were collected between 1999 and 2003. With regard to math scores for fourth and fifth graders over the time period, it appeared that the magnet schools had a positive effect on student performance on standardized tests, but it did not necessarily increase

with the number of years spent at the magnet school (Ballou et al.). Contrarily, reading scores did not appear affected by the presence of the magnet program. Similar to math, reading scores did not seem to be affected by the number of years the student attended a magnet program. After applying controls for student demographics, however, the results were not significant, suggesting that even though the students were randomly assigned to these schools, it is not accurate to say that the magnet program actually had an impact on student performance (Ballou et al.).

Parental Involvement

A multitude of factors exist that can either inhibit or enhance a minority student's ability to learn and achievement on standardized tests. Poverty level, size of a school, and minority isolation are believed by some to impact a minority student's ability to learn in a school setting (Louis, Leithwood, Wahlstrom, & Anderson, 2010). Parental involvement also has been shown to be a contributing factor in a child's achievement level (Beverly, 2009).

Magnet schools are typically found in larger urban districts, and parents have the option to choose a magnet school. Given that the parent makes a request to attend such a school, they are expressing an interest in their child's education, thus initiating parental involvement. It has been suggested that a student may see the importance of education through the actions of their parents, therefore directly impacting the student's academic achievement (Beverly, 2009). Conniestene Beverly (2009) completed a study on parental involvement and its impact on student achievement for African-American students at an urban elementary school. "Parental involvement in most inner-city schools with high populations of African American students is typically lower than in most other schools for a variety of reasons such as home/school relationships, time, and parent work

schedules" (Bradley, Rock, & Caldwell, 1987). The study examined reasons for a parent's level of involvement, how it affects attendance, and how parental involvement affects student achievement.

In Georgia, where Beverly's (2009) study was completed, student performance was measured by the Criterion Referenced Competency Test (CRCT). The CRCT measured the students' comprehension in reading, math, science, and social studies. The sample was drawn from an elementary charter school in an urban setting in Georgia with a population of just over 400 students. The researcher studied 76 students who were promoted from third to fourth grade between the 2006-2007 and 2007-2008 school years. Parents were encouraged to attend meetings, volunteer at the school, read at home with their students, and otherwise interact with their child in the second year. The goal was to determine if these interactions made a difference in the students' performances on the CRCT. Parents were also given surveys, and a measurement was assigned to the responses received on these surveys. The findings showed that there was a significant increase in the CRCT achievement scores of African-American students on benchmark assessments in reading due to the parental involvement component (Beverly).

Poverty and Achievement

The Iowa Department of Education completed a study in 2009 to determine district characteristics associated with success on statewide standardized tests. A study examined the impact of poverty indicators such as free and reduced lunch on achievement (Pennington, 2009). The study found that there was a significant correlation between poverty and scores in math, reading, and science over multiple years. The correlation was negative, meaning that as the percent of students eligible for free and reduced lunch decreased, achievement scores increased (Pennington, 2009).

Impact of School Size

Data exists in North Carolina showing that between 1997 and 2000, one-third of the smallest 10% of schools were ranked in the top 25 in the state for performance (Lee & Burkham, 2002). Without much examination, a common misconception may be that smaller schools improve student performance. However, statistical variance clearly is greater with a smaller data set. Therefore, the standard error for schools in the lowest 10% enrollment may have been much greater than the standard error of larger schools, giving the appearance that small schools were overrepresented among the top performing schools.

Herbert J. Walberg, a University Scholar at the University of Illinois at Chicago, is one person who believes that the size of a school may have an impact on student achievement. He believes that although elementary students typically go to a school in the neighborhood where they know many of the students, having a school that is too large can make it impersonal (Berends, Springer, Ballou, & Walberg, 2009). Research on school size does not necessarily show that academic achievement is better in small schools but that school size does have an impact on the overall educational experience of the learner as measured by involvement in activities and behavior (Bloom, Levy Thompson, & Unterman, 2010). Valerie Lee and David Burkam from the University of Michigan conducted a study that was published in the *American Educational Research Journal*. This study analyzed over 3,000 high school students in 190 urban and suburban high schools. Although the relationship is nonlinear, the dropout rate was found to be related to the size of the school (Lee & Burkham, 2002).

When Bill and Melinda Gates, through the Gates Foundation, started the *small schools of choice* (SSC) movement around 2000, they focused on the concept that more

specialized and focused high schools would reduce violence and increase academic achievement, particularly in struggling schools serving impoverished neighborhoods (Bloom et al., 2010). Through 2008, the Gates Foundation had spent nearly $2 billion on small high schools. Nocera (2012) noted that the only variable that changed significantly was violent offense rates, which were lower in the schools following their participation in the SSC project than before they became an SSC site. A comprehensive study funded by the Gates Foundation suggests otherwise. In 2010, the findings of an extensive project to overhaul failing high schools in New York City were released. New York City contains 123 SSC which are small, 4-year public high schools for students in Grades 9 through 12. These schools are open to students at any academic achievement level and are located in historically disadvantaged communities. Small schools were intended to be viable alternatives to the neighborhood high schools that were closing. Not only were SSCs small, but they also were given start-up money for well-planned and innovative organizational structure and curriculum design. The schools were also granted permission to facilitate leadership throughout the school (Bloom et al., 2010).

The Manpower Demonstration Research Corporation (MDRC) provided a report of the study of SSCs in New York City to examine graduation rates, achievement levels, and other data. Each year, nearly 80,000 incoming ninth-grade students start high school in New York City. When these students are in eighth grade, they select schools they would like to attend for high school through what is known as the high school application processing system (HSAPS). These selections are then randomized and the students are assigned to schools through a lottery system. Because these students are randomly assigned, MDRC explains the study is useful in that they could attempt to isolate academic achievement based on the size of the school rather than its location or

neighborhood population (Bloom et al., 2010). The report stated, “The lotteries created by HSAPS together with the unusually large size of the randomized sample they produced allow for a high degree of validity and precision in the present analyses” (Bloom et al., 2010, p. 4). Also, most schools in the SSC category opened in 2002, while two-thirds of the other schools were larger and older. Lastly, ninth-grade classes at SSC schools averaged 129 students per school, while the other schools had an average of over 600 ninth graders per school (Bloom et al., 2010). It is important to note that the study did not only compare SSCs to the large, failing schools they replaced but to a wide range of schools operating under major reform.

During just their first year of high school, students at an SSC site earned one credit more than their controlled-group counterparts (Bloom et al., 2010). These students also were more likely to earn 10 or more credits in their first year of high school and less likely to fail a course their first year than the students in the comparison group (Bloom et al., 2010). The study further claimed that SSCs improve student attendance, as the students at these sites had a higher regular attendance rate than the control group (Bloom et al., 2010). Disadvantaged students, those of a lower socioeconomic status, were the intended target to attend SSC sites. During the course of the study period, the schools primarily served a population that almost exclusively was comprised low-income students of minority background (Bloom et al., 2010).

School and Classroom Diversity

One of the more widely discussed indicators that impacts student achievement is the child’s race and ethnicity and the diversity of the school (Bookman, 1996). Beginning with *Brown v. Board of Education of Topeka,* leaders thought that desegregation in schools was appropriate since it guaranteed equal access to education.

However, studies have attempted to show that equal access to education and resources by minorities may guarantee them the same opportunities as White children, but the more diversity in a school population, the higher the achievement will be for the minority students attending that school (Goldstein, 2007).

Many school districts and states have faced litigation brought about by allegations of creating racial isolation and the effect of minority-isolated schools on a minority student's ability to learn. A report commissioned by The Wallace Foundation in conjunction with the University of Minnesota and the University of Toronto in 2002 pointed out that for nearly 50 years, studies have shown that students learn better in heterogeneous environments, particularly minority and disadvantaged students, due to the influence of peer models of effective learning, pace of instruction, and curricula (Oakes, 1986). As the report noted, teachers and leaders, while knowing this research exists, have concurrently grouped students by ability level in order to focus on specific areas of curriculum and pace (Louis et al., 2010). Likewise, teachers also believe that preexisting behaviors of some students, mainly those who are minority and/or lower achieving, may negatively impact the culture of their classroom (Louis et al., 2010).

Achievement and Racial Isolation through School Choice

Though it was published only 12 years after *Brown v. Board of Education,* Coleman's report in 1966 found, "the social composition of the student body is more highly related to achievement, independent of the student's own social background, than is any school factor" (p. 325). However, as research methods have evolved over the past 40 years, some scholars have questioned the methods of data collection and interpretation done by Coleman (Jones-Sanpei, 2006). A doctoral dissertation by Hinckley Jones-Sanpei (2006) consisted of three separate reports of studies regarding achievement gaps

and racial disparities in schools of choice in urban school districts. One of the studies concerned school choice, racial segregation, and academic outcomes. The study used a multilevel growth model to follow the trajectory of seven cohorts of students from Grades 3-6, 7, or 8 to "examine the impact of attending segregated schools" on performance on NC EOG tests (Jones-Sanpei, p. 78). The multilevel model is based on previous findings discovered by Jones-Sanpei showing that the school system in the study also had an increase in racial isolation and segregation between 1995 and 2002 after the district implemented a controlled choice plan for student assignment (Jones-Sanpei). Jones-Sanpei also included the fact that she discovered peer influence has an effect on student achievement in another study she conducted (Jones-Sanpei). By using the multilevel model approach, she accounted for the changes in the school that occurred during the time of the study to isolate the variable in contention that diverse schools have a positive impact on minority achievement. She noted that the value-added growth model used in the study operates under the assumption that family, neighborhood, and nonpeer school characteristics remain constant (Jones-Sanpei). Jones-Sanpei wrote that while many studies include a combination of private, public and charter schools, location, academic tracking, and other variables, her study was focused solely on public schools and their social composition (Jones-Sanpei).

Data in the analysis done by Dr. Jones-Sanpei (2006) came from the North Carolina Education Research Data Center (NCERDC). Only Grades 3-8 were used, as they take the same format of tests and are often more segregated, as opposed to using high schools that are more integrated and test subjects rather than grade level. Data collection were restricted to students who attended the same elementary school continuously for Grades 3-5 and the same middle school continuously for Grades 6-8,

where EOG tests are required for mathematics and reading at each grade level. Students who left the school temporarily to attend another school were excluded so as not to dilute the impact of that particular school's environment on the research. Jones-Sanpei noted that one should account for the fact that the limitations of the sample cohort requirements make it difficult to generalize the findings for all elementary or middle schools, and that the district had a rigorous controlled choice process that was carefully managed during the time of this study (Jones-Sanpei).

By using a multilevel approach, the study allowed the researcher to have a more precise understanding when several factors or causes existed. Results of performance were based on the NC EOG tests in reading and math as indicated by scale scores. Contrary to her hypotheses, Jones-Sanpei (2006) discovered that on the reading EOG tests, there was a decrease over time in the racial achievement gap, with White students growing less over time than African-American and Hispanic students (Jones-Sanpei). Also, Jones-Sanpei did not observe that a higher concentration of minority students in a school significantly affected the student achievement growth over time. Subsequently, her report on the analysis of data for math scores showed the same results. While admittedly an achievement gap did exist, the data were not found to demonstrate that a specific racial composition affected the growth in student performance over time, even though the schools were supposedly becoming more segregated (Jones-Sanpei). The analysis could not support the hypothesis that students' learning growth rates vary as a function of the percentage of minority students in a school.

In *After Brown: The Rise and Retreat of School Desegregation*, Charles Clotfelter, a Professor of Economics and Public Policy at Duke University, noted that whether it is due to residential segregation, educational policy, or both, racial segregation

is increasing in the public schools (Clotfelter, 2011). In 2000, more than 70% of African-American and Hispanic students attended predominantly minority schools, which is a higher percentage than in 1970 (Clotfelter, 2011). Studies over the past 20 years have demonstrated that integrated education leads not only to achievement gains in math and reading for African-American and Latino children, but also leads to increased occupational attainment, less involvement with the criminal justice system, and a greater tendency for graduates of integrated schools later in life to live in integrated neighborhoods, have friends from many races and ethnic groups, and to be employed in diverse workplaces (Clotfelter, 2011).

Busing and Integration

While busing had been an acceptable method of achieving racially-balanced schools, the success of the plan was hindered by White parents enrolling their children in private schools, sometimes causing the district to be even more segregated than before the implementation of the busing plan (Cline, 2006). Parents also disliked such policies because their child often had to ride the bus for a long time to a school in an unfamiliar area of the district (Ellinwood, 2011). After busing began to face legal challenges, many large urban districts began to develop and implement controlled choice plans for pupil assignment. A controlled choice plan allows parents the option to select or prioritize their choice of school for their child. Coinciding with The Elementary and Secondary Education Act (ESEA) of 1965, Title I also provided parents the right for a student to attend a different school if that school was not meeting NCLB standards (U.S. Department of Education, 2002). Districts receiving Title I funds are also required to report to parents and the community the achievement levels of their schools so that parents may make an informed decision concerning the school placement of their child.

Racial Disparities and Minority Student Achievement

Socioeconomic status (SES) has been shown to be a contributing factor to student achievement (Jencks & Phillips, 1998). Numerous studies show links to SES level and ethnicity to higher or lower achievement based predominantly on home situations and family background (Ferguson, 2002). Dr. Ronald F. Ferguson is Senior Lecturer in Education and Public Policy at Harvard Kennedy School of Government. He is author of several books and has studied the variables surrounding minority student achievement. In an article titled *What Doesn't Meet the Eye: Understanding and Addressing Racial Disparities in High-Achieving Suburban Schools*, Ferguson (2002) noted that 15 middle and upper-middle income districts in 10 different states formed the Minority Student Achievement Network (MSAN). These districts acknowledged the racial and ethnic achievement disparities in their primary and secondary schools. Joint initiatives among the districts resolved to determine the cause of student achievement discrepancies among students of different racial and ethnic backgrounds. From the 15 districts in MSAN, 95 schools participated in a study during the 2000-2001 school year. Each school completed a survey using the Ed-Excel Assessment of Secondary School Student Culture. Responses were taken from 7,120 African-American, 17,562 Caucasian, 2,491 Hispanic, and 6,955 Asian and mixed-race students in Grades 7-11. Portions of the report indicated that when compared to Caucasian students, African-American, Hispanic and mixed-race students reported themselves to have a lower GPA, as was verified by school officials as well (Ferguson, 2002). Caucasian students also reported a higher number of socioeconomic background advantages when compared to minority students, such as books and computers at home (Ferguson, 2002). Third, African-American students, much more frequently than Caucasian students, responded that teacher encouragement,

not teacher demands, are most important for working hard in school (Ferguson, 2002). This result showed that minority students in a general urban school district placed a great emphasis on relationships with teachers, more so than did Caucasian students and demonstrated the need for positive teacher encouragement for minority students. Finally, Ferguson pointed out that there were differences between minority and majority ethnic groups in behavior and homework completion rates. It was also shown in the survey that Caucasian students tend to place a greater emphasis on completing homework assignments than African Americans (Ferguson, 2002).

The districts involved asked the students three questions that served as achievement indicators. The first question concerned the student's GPA; the second asked the student the percentage of time they understand the teacher's lesson; and the third achievement variable asked the students how much of the material they read for school do they understand very well. All questions are forced-choice, meaning that the students had a select number of options from which to choose. An analysis of family background disparities points out alarming trends in socioeconomic status in the households of the participating districts (Ferguson, 2002). More than half the African-American students reported living in a household with one or neither parent, while half the Hispanic students claimed their mother had 12 or fewer years of schooling (Ferguson, 2002). In contrast, more than half of the Caucasian students interviewed responded that they had two or more computers in the home, over 100 books in the house, and 81% said they had two or fewer siblings. Hispanic students, on the contrary, noted that 40% had three or more siblings, but 30% had no computer at home (Ferguson, 2002). After noting the number of siblings in the households, the inference can be made that Caucasian households have the fewest children and the most computers, giving them a distinct SES

advantage (Ferguson, 2002).

Ferguson (2002) then posed the question of whether SES helps predict racial and ethnic differences in achievement. He also asked if the magnitude of the achievement gap is different for separate SES levels. Several studies show that the answer to both of these questions is that SES does help predict differences in achievement and that the magnitude of the achievement gap is distinct for different SES levels (Ferguson, 2002). Jencks and Phillips (1998) show in their report *The Black-White Test Score Gap* that SES is indeed an indicator of student performance. The study pointed out that parents have a *nature versus nurture* impact on achievement such that parents and families influence their biological as well as adopted children (Jencks & Phillips). Though the impact is much greater on their biological children, adopted children may still be affected due to the number of books available and other factors pertaining to SES level (Jencks & Phillips). Jencks and Phillips also reported that genetics played minimal or no role in academic performance, since African-American children adopted into White families achieved at comparable levels to White students (Jencks & Phillips).

When calculating various factors, Ferguson (2002) noted that the achievement gap among like-SES levels differed from the gap seen in other levels. The gap for Whites in the highest SES level was much smaller when predicting future GPA than the gap for African-American students from a lower SES level (Ferguson, 2002). However, the achievement gap for such groups was not quite as easy to predict or identify using SES factors. The difference in achievement between the highest and lowest SES African-American students was the smallest, which is contrary to the GPA prediction model using race and ethnicity (Jencks & Phillips, 1998). In an effort to address some possible confusion and inaccuracies, the districts in MSAN attempted to learn whether data

existed that indicated African-American and Hispanic students in these districts do not work as hard as Caucasian and Asian students (Jencks & Phillips, 1998). The Ed-Excel answers given by students show that the only report with any outlying statistics is the amount of time spent on homework by Asian students, which is significantly more than other ethnic subgroups (Ferguson, 2002). Whites, when compared to African-American and Hispanic students, reported only an average of 5 minutes more per night. Though this time may seem inconsequential in making a difference in achievement, there is quite a difference in homework completion rates. White students showed a large statistically significant difference in homework completion when compared to African-American and Hispanic students (Ferguson, 2002). The completion of homework and the time spent on homework certainly have a different effect on the achievement level of a student, as they are quite different in the amount of preparation they give toward an exam or understanding of a learning objective (Ferguson, 2002).

MSAN studied student motivation and desire to work hard in school by asking about their reason for such effort. A question requested that students respond to as many reasons as were applicable for their situation when asked which motive is most important when they choose to work hard in school (Ferguson, 2002). Sixteen percent more African-American students than Caucasian students admitted that they are most driven because the teacher encourages them to work hard in school. Demands, on the other hand, from the teacher caused the percentage of all students' responses to be lower, indicating that a more inviting and encouraging environment possibly produced better results and harder work than the teacher just demanding more effort from the students (Ferguson, 2002). However, Caucasian students responded 14% higher than African-American students that the demands of the teacher were reasons for them to work harder.

This result could possibly be linked to the respect for authority and the manner in which teachers attempt to mimic or reflect the family situation for these students (Jencks & Phillips, 1998). Also, this was the same set of students who reported that a significantly larger number of those who were African American came from single parent/no parent homes than did the Caucasian students. For each ethnic subgroup, the most highly rated response for a reason to work hard was the need for grades to get into college (Ferguson, 2002).

Finally, MSAN asked about student GPAs relative to how fair they thought the teacher graded and friends' willingness to ask for help. For each ethnic subgroup, students with a higher GPA were more prone to feel close to teachers, more likely to think that grading is fair, and less likely to think that friends avoid asking for help when they need it (Ferguson, 2002). Caucasian students in the A- to A GPA range were the most likely to say that the teacher grades fairly and their friends are not afraid to ask for help (Ferguson, 2002). Similar to most other data presented by Ferguson (2002), this statistic was not only representative of the aggregate but was reflected in nearly every district associated with MSAN in the Ed-Excel study. Ferguson concluded that it was impossible to discern whether teachers had a higher regard for Caucasian students who perform better and complete more homework based solely on the data provided in the MSAN study (Ferguson, 2002).

In discussion of practice and policy, Ferguson (2002) said that "racial and ethnic disparities in self-reported understanding of lessons and readings call attention to the fact that gaps in standardized test scores and school grades reflect real disparities in academic knowledge and skill" (p. 18). He suggested that schools and teachers target specific issues within each ethnic subgroup and address those accordingly. Ferguson noted that

because African-American and Hispanic students have placed such high worth into teacher encouragement, teachers need to provide such encouragement to students routinely and not intermittently, so as to keep the students who may be performing lower or who comprise these ethnic groups from performing lower than their Caucasian peers (Ferguson, 2002). Finally, Ferguson suggested that schools should make an effort to address the lack of supplemental materials and disadvantages among SES levels. More counselors, books, home visits, and other additional services to help the lower SES students may make a difference in their achievement according to the data analyzed in the Ed-Excel report (Ferguson).

Summary

This review of literature is a compilation of information regarding the history of magnet schools, racial isolation in schools, magnet schools and student achievement, parental involvement, and school size as it relates to student achievement. The research indicates that magnet schools may have a positive impact on student achievement, but a lack of research exists that examines the academic performance of students who attend magnet schools based on their domicile and not by choice. The literature also explains the need for controlling the variables in this study, such as school size and demographics, as these factors could impact student achievement.

Chapter 3: Methodology

Introduction

Based on a national survey conducted by the Pew Research Center for the People and the Press (2004), 62% of the participants placed the need to improve education in the top three priorities for the President and Congress. Large urban districts are more likely to be labeled as districts in need of improvement than other school districts (Center on 2Education Policy, 2005). The questions of what measures are needed for reform and at which schools those interventions should be implemented remain unanswered.

In an economic period when the amount of money spent on education has been reduced, it is important to understand the efficacy and validity of all programs so that limited dollars can support only the most successful programs. The focus of this quantitative study was to examine the relationships between magnet school programs and their effect on academic achievement in reading and math. Since magnet schools can be expensive to operate due to programmatic enhancements and transportation, this study should help stakeholders make informed decisions about financial support in the future. This chapter describes the research questions, methodology, research design, description of the sample, instrumentation, and data collection methods.

Research Questions

1. Do residential minority students attending elementary magnet schools achieve greater academic growth on the NC EOG test in mathematics compared to residential minority students in zone elementary schools in a large urban school district in North Carolina?

2. Do residential minority students attending elementary magnet schools achieve greater academic growth on the NC EOG test in reading compared to residential minority

students in zone elementary schools in a large urban school district in North Carolina?

Design of the Study

This study analyzed quantitative data that reflected student scores on multiple years of standardized tests. The study compared and analyzed z scores, which were converted scale scores from NC EOG standardized tests for targeted third- through fifth-grade students between 2010 and 2012. This study attempted to determine if participation in a magnet program influenced minority residential student performance on the EOG test. The growth between Grades 3 and 4 of residential minority magnet school students who were in third grade in the 2009-2010 school year was compared to the EOG growth made by residential minority zone school students on the EOG from third to fourth grade from 2009 to 2010. The same analysis was repeated as these students matriculated from fourth to fifth grade, i.e., from 2011 to 2012.

The data were analyzed with a mixed, two-factor repeated measures ANOVA. The study was two-factor because the researcher analyzed multiple independent and dependent variables. The between factor was the type of school; this refers to either magnet school or zone school. The within factor accounts for the time period, which for this study was third to fourth and fourth to fifth grades. The multiple dependent variables were the math and reading EOG scale scores for minority students.

Since the state scale changed each year for the NC EOG tests, the researcher used SPSS to convert each student's scale score into a z score in order to determine a significant difference in scores. This conversion was done by using the North Carolina state mean score and standard deviation on reading and math EOG tests beginning with the 2009-2010 school year for third grade. Table 1 shows the scale score means and standard deviations that were used.

Table 1

Mean and Standard Deviation for NC EOG Tests

	Reading	Math
2009-2010 Third-Grade Mean Scale Score	339.7	345.4
2009-2010 Third-Grade Standard Deviation	11.6	9.8
2010-2011 Fourth-Grade Mean Scale Score	346.4	352.2
2010-2011 Fourth-Grade Standard Deviation	9.8	9.4
2011-2012 Fifth-Grade Mean Scale Score	351.5	357.3
2011-2012 Fifth-Grade Standard Deviation	8.9	9.2

Participants

This study took place in a large urban school district with approximately 52,000 students in northwestern North Carolina. For the 2009-2010 school year, the district had 30% African-American, over 17% Hispanic, and more than 44% Caucasian students. In that same year, the district had five elementary magnet schools, two nontraditional elementary schools, and 37 zone elementary schools.

Students included in the study attended one of three magnet elementary schools or attended one of three matched zone elementary schools for third grade in the 2009-2010 school year and completed fifth grade in the 2011-2012 school year. The two nontraditional/alternative/special schools were excluded from this study. During the

course of the data collection for this study, two of the five magnet schools merged together, and both of these schools were excluded from the study. Conversely, one of the traditional zone schools implemented a magnet program during the data collection period and was excluded from the study. Another magnet school was a dedicated magnet and did not have a residential population whereby every student attended that school by lottery; therefore, it was not included in the study either.

As indicated earlier, the zone schools involved were selected to match the magnet schools on the criteria of school size and percent of minority students who attended that school. Parent involvement, such as making a conscious choice about where their child should attend school, has an impact on student achievement (Beverly, 2009). Therefore, only students who attended the magnet school or non-magnet zone school as a residential student were included in the study. Because the goal was to determine if the magnet program had an influence on residential students who did not have to make a conscious choice in order to attend the magnet school, only residential students were used from the sample of zone schools. The purpose of the study was to compare the growth of minority students, and, therefore, students labeled in the master student database as African American or Hispanic were the only races/ethnicities used as participants. Caucasian, multi-racial, and other ethnicities did not represent a large enough population at the schools involved in the study to be included in the study.

Because studies have previously been unable to verify whether school size impacts student achievement, the study used only students from zone schools that had a population similar in size to the magnet schools in the study (Bloom et al., 2010). Since mobility may affect academic achievement, only students who attended the same school for 3 years were included in the study (Jones-Sanpei, 2006). Similarly, no students who

repeated third, fourth, or fifth grade were included.

A possibility existed of six potential zone school matches, two for each of the magnet schools. However, since the main focus was on minority achievement and not classroom size, the percent minority population attending the school was used to narrow the zone schools so there was only one match for each magnet school in the study. The zone schools used in this study had a population of approximately 553 students in the third grade in the 2009-2010 school year. Of the 553, 141 were possible students to be used in the study because the others did not meet the requirements regarding remaining at the school for 3 years and not repeating a grade. Of the 141, 131 were actually used after 10 were removed who took other tests for exceptional children. The magnet schools used for this study had a combined third-grade enrollment of 285 students in the 2009-2010 school year, and 81 met the criteria for inclusion in the study, of which 71 participated who did not receive versions of the test for special education. The three magnet schools involved are identified as M1, M2, and M3, and the three matching zone schools are referred to as Z1, Z2, and Z3 to maintain the anonymity of the actual schools used in the study. Table 2 shows the magnet schools and their zone school matches along with the percent of minority students who attended that school for the 2009-2010 school year:

Table 2

Enrollment in Magnet and Zone Schools

Magnet School	% Minority	Cohort Survival $3^{rd}/4^{th}/5^{th}$	Zone School for Comparison	% Minority	Cohort Survival $3^{rd}/4^{th}/5^{th}$
M1	91	44/32/21	Z1	95	79/69/57
M2	89	66/52/37	Z2	93	73/64/46
M3	60	18/14/13	Z3	62	50/35/28
TOTAL		128/98/71			202/168/131

Overview of the Instruments

Individual student scale scores on the NC EOG tests in reading comprehension and mathematics were taken from the 2009-2010 school year for third-grade students in the study, the 2010-2011 school year for fourth grade, and the 2011-2012 school year for fifth grade. The NC EOG is a test given near the end of each school year for students in a secure testing environment. The difference in growth between magnet school and zone school student scale scores was used in determining if the exposure to a magnet program affects student achievement. Since the study followed a cohort of the same students from Grades 3-5, it was not necessary to perform an analysis of covariance, but rather a repeated measures ANOVA which assisted in determining if the magnet program had any impact on the growth.

The reading and mathematics tests for Grades 3-8 consist of multiple-choice questions that undergo field testing and strategic development process. After field testing is complete and unfair questions are eliminated, the test gets administered as a pilot, where there are no consequences for schools. If consequences do exist, the results must

be delayed until after standardization of the test is complete.

The NC EOG follows industry standards and maintains a reliability coefficient of at least 0.85 on multiple-choice tests (NCPDI, 2009). The test has also been shown to be reliable across gender and ethnic groups. Evidence of validity of the tests is shown across several areas. Validity for content relevance is demonstrated through the alignment with the North Carolina Standard Course of Study, a set of curriculum goals and objectives for the appropriate grade level (NCDPI, 2009).

Consistency in the testing environment also contributes to the validity of the test. The state provides a testing code of ethics outlining what must be done to ensure a test is administered properly. Failure to follow the testing code of ethics may result in a misadministration of the test, and the students involved may be required to retake the test. The tests are stored in a secure, locked environment and administered by a person who has been properly trained as a testing administrator or coordinator. Proctors are required for assistance during the administration of the test.

The SPSS was the program used to import, organize, and analyze the data. SPSS accounts for any variance that may occur from different sample sizes in the independent variable, so the analysis of the groups in the study were comparable and not biased because of one sample size being larger than another.

Data Collection

After obtaining permission from the superintendent and the research department for the school district, the following steps occurred: (1) the researcher requested and collected the race, gender, attending school name, residential school name, and scale scores on the reading and math EOG tests for students who were in Grade 3 from the 2009-2010 school and completed fifth grade during the 2011-2012 school year at the

same school; and (2) the researcher used SPSS to complete the tests on the mixed factors of type of school and school year versus the math scale score and the reading scale score. The researcher also used information from the NCDPI website to retrieve the mean and standard deviation for the state for the given years in the study on the reading and math EOG tests.

Limitations of the Study

While the researcher made efforts to control variations by matching zone schools to magnet schools on the variables of size and minority percentage, the following limitations remain:

1. The study assumed that the magnet programs had been implemented with fidelity. All programs in this study had been in operation for at least 3 years, a length of time that Magnet Schools of America report as being the year when results first become significant (Poppell & Hague, 2001).

2. Student achievement is affected by many variables outside the school, such as single-parent homes, family income, parental involvement, or other factors. This study did not attempt to control these variables.

3. Because of the school choice process for the district used in this study, a student may have attended the magnet or zone school as a residential student, but may have also made a choice to do so. This would indicate a basic level of parental involvement. The researcher was unable to determine if a choice was made, so all students who attended the zone or magnet school from the residential boundary were included.

Summary

The purpose of this study was to determine if a magnet program, operating at least 3 years, had an impact on residential minority student achievement as compared to residential minority students attending a zone elementary school over a 3-year period. The researcher attempted to reduce the effect of bias-inducing variables such as school choice, school size, mobility, and students repeating a grade in an effort to provide the clearest representation of the influence of a magnet program on achievement. A mixed-factor, repeated measures ANOVA was used to examine the data, with a comparison of magnet and zone schools, grade levels reported, and scores on the math and reading comprehension NC EOG tests between 2009-2010 and 2011-2012.

Chapter 4: Results

This research study examined the difference in academic growth on NC EOG reading and math tests for minority residential elementary students attending a magnet school and a matched group of residential students who attended a zone school. Using the SPSS, the researcher began by performing a mixed, two-factor, repeated measures ANOVA, followed by univariate analyses for both reading and math separately. Depending on significance levels in each subject's main analysis, *t* tests and post-hoc comparisons were performed.

Each subject area analysis began with the overall univariate, repeated-measures ANOVA that determined whether a significant interaction occurred between the specified groups over time in that subject area. Depending on the results, the ANOVA is followed by either post-hoc contrasts and between-factor analyses or *t* tests that determined at which grades the significant differences occurred between groups. Then, African-American students are compared between magnet and zone schools, followed by Hispanic student comparison. The next set of tests disaggregates magnet schools by race and then zone schools by race to help determine if race made a difference in the performance of students at magnet schools and zone schools. Male magnet and male zone students are compared to each other, followed by a test analyzing differences between female magnet and female zone students. Finally, magnet and zone schools are each evaluated by gender to determine whether gender was a contributing factor to student success at zone or magnet schools. Figure 1 shows a flow chart which provides a visual representation of the order of tests completed in this study.

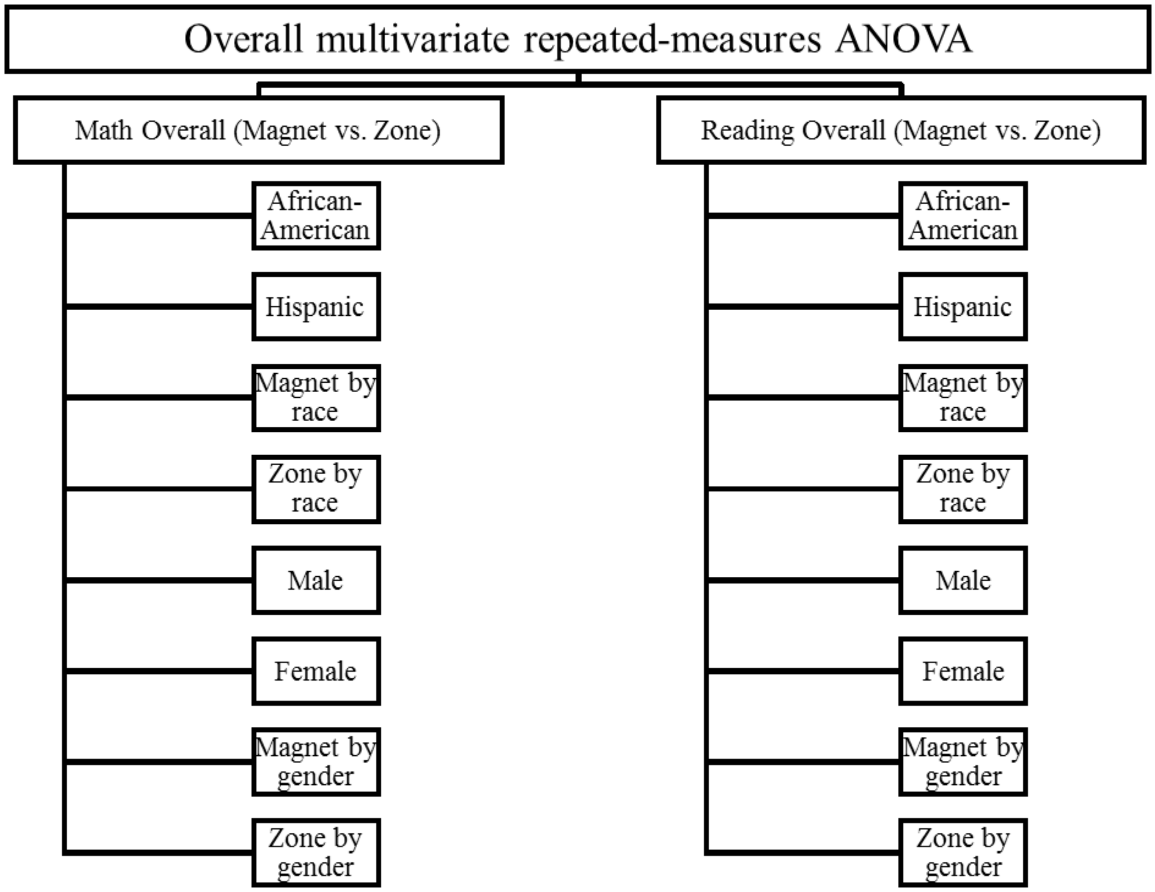


Figure 1. Flow Chart of Tests Run for the Study.

Description of the Sample

The school district used in this study is a large urban district with approximately 52,000 students in northwest North Carolina. The participants in this study consisted of students who were in third grade in the 2009-2010 school year. The students lived in the residential attendance boundary for either the magnet school or the zone school which they attended and remained at that school for third, fourth, and fifth grades. African-American and Hispanic students were the only students involved in the study, since the number of Caucasian students and other races was too small to analyze. A total of 202 students participated in the study. Of the 202, 71 were students at a magnet school, and

131 attended a zone school. Eighty-three students were African American and 119 were Hispanic. Forty-five African-American students were magnet students, and 38 were zone. There were 26 magnet Hispanic students and 93 zone Hispanic students. The study included 88 female participants and 114 male students. Using at least 26 students per subgroup as a guide, the numbers were insufficient to compare male and female African-American students and male and female Hispanic students separately. Table 3 shows the demographic profile of the students involved in the study.

Table 3

Demographic Information for Participants

	Female			Male			Grand Total
	African American	Hispanic	Total	African American	Hispanic	Total	
Magnet	19	16	35	26	10	36	71
Zone	12	41	53	26	52	78	131
Total	31	57	88	52	62	114	202

The researcher obtained data from the district's accountability department that contained scale scores for each student from the NC EOG reading test and the NC EOG math test for the 2009-2012 school years for all participants. To ensure that the data were consistently measured across the groups and time for the study, the scale scores needed to be converted to z scores. Using z scores as the basis for comparison allowed the researcher to determine how far above or below the state mean each group performed on the specific tests at each grade level. The researcher used the mean and standard deviation from the North Carolina state testing results for the coordinating years in the study at each grade level to convert the sample population's scale scores for each student

to z scores. Table 4 shows the means and standard deviations from the state that were used from the NC EOG results for the corresponding years and grades in the study.

Table 4

Means and Standard Deviations from NC EOG Tests in Reading and Math

	Reading	Math
2009-2010 Third-Grade Mean Scale Score	339.7	345.4
2009-2010 Third-Grade Standard Deviation	11.6	9.8
2010-2011 Fourth-Grade Mean Scale Score	346.4	352.2
2010-2011 Fourth-Grade Standard Deviation	9.8	9.4
2011-2012 Fifth-Grade Mean Scale Score	351.5	357.3
2011-2012 Fifth-Grade Standard Deviation	8.9	9.2

Data Conversion

Once the z scores were computed for each student, the researcher used SPSS to run a multivariate, repeated-measures analysis to determine interactions between the group (magnet or zone) over time (Grades 3-5) by subject area (math or reading). The z score allowed the researcher to determine how many standard deviations the sample scale score was below the state mean. The means for each group's z scores are ≤ 0, which signifies that the students in both groups and at all grade levels for both tests, averaged a lower score than the state mean on each test for the given year. The statistical symbol of

$\bar{x}$ refers to the mean of the sample, and *p* represents the statistical level of significance.

Table 5 shows the descriptive statistics that describe the number of subjects (n), mean, and standard deviation for the z scores of magnet and zone students on both math and reading EOG tests. Magnet school students' z scores on third-grade math, where $\bar{x}$=-.0798, decreased on the fourth-grade EOG math test to $\bar{x}$=-.1097, and fell once again in fifth grade where $\bar{x}$=-.2163. Similarly, the mean of the z scores for zone students on third-grade math EOG tests, where $\bar{x}$=-.0362, dropped to -.2113 in fourth grade, and moved even lower in fifth grade where $\bar{x}$=-.3122.

On the reading EOG test, zone and magnet students both began with a negative z score in third grade, where $\bar{x}$=-.1587 for magnet students in the study and $\bar{x}$=-.3788 for zone students. In fourth grade, magnet students' scores grew slightly to $\bar{x}$=-.1256, while the scores for zone students in fourth grade decreased to $\bar{x}$=-.5105. Both groups again performed low in fifth grade, with magnet students at $\bar{x}$=-.3442 and zone students at $\bar{x}$=-.5151.

Table 5

Overall Z Score Descriptive Statistics

	Group	N	Mean Z Sscore	Std. Deviation
Math Third Grade	Magnet	71	-.0798	.83989
	Zone	131	-.0362	.74471
	Total	202	-.0515	.77769
Math Fourth Grade	Magnet	71	-.1097	.83282
	Zone	131	-.2113	.74760
	Total	202	-.1756	.77807
Math Fifth Grade	Magnet	71	-.2163	.92844
	Zone	131	-.3122	.70983
	Total	202	-.2785	.79258
Reading Third Grade	Magnet	71	-.1587	.73904
	Zone	131	-.3788	.77394
	Total	202	-.3015	.76728
Reading Fourth Grade	Magnet	71	-.1256	.76574
	Zone	131	-.5105	.77378
	Total	202	-.3752	.79081
Reading Fifth Grade	Magnet	71	-.3442	.71713
	Zone	131	-.5151	.82509
	Total	202	-.4550	.79125

Multivariate Analysis

Through a mixed, two-factor repeated-measures ANOVA, the researcher examined the interaction between the groups (magnet or zone) over time in reading and math combined. Table 6 shows the results of the SPSS multivariate analysis used to determine if the groups performed similarly over time. *F* represents the F test of equality of variance and is a preliminary step for testing for mean effects.

Table 6

Multivariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.931	3.656	4.000	197.000	.007

A *p* value of .05 or less was used to identify statistically significant relationships. Because the *p* value for the multivariate analysis for the groups over time was shown to be .007, this meant that the two groups interacted significantly over time. The researcher then performed a univariate analysis on both overall math and overall reading separately in order to determine if the interaction between magnet and zone students occurred in the reading or math category or if it occurred in both subjects. Depending on the outcome of the original ANOVA for each subject, decisions were made to conduct further tests to examine relationships between the groups involved. In situations where scores were analyzed within each dependent variable (magnet vs. magnet or zone vs. zone), no post-hoc contrasts were done, as that information was already provided for the entire groups at the beginning of each subject report. Figure 2 shows the way these decisions were made for statistical tests.

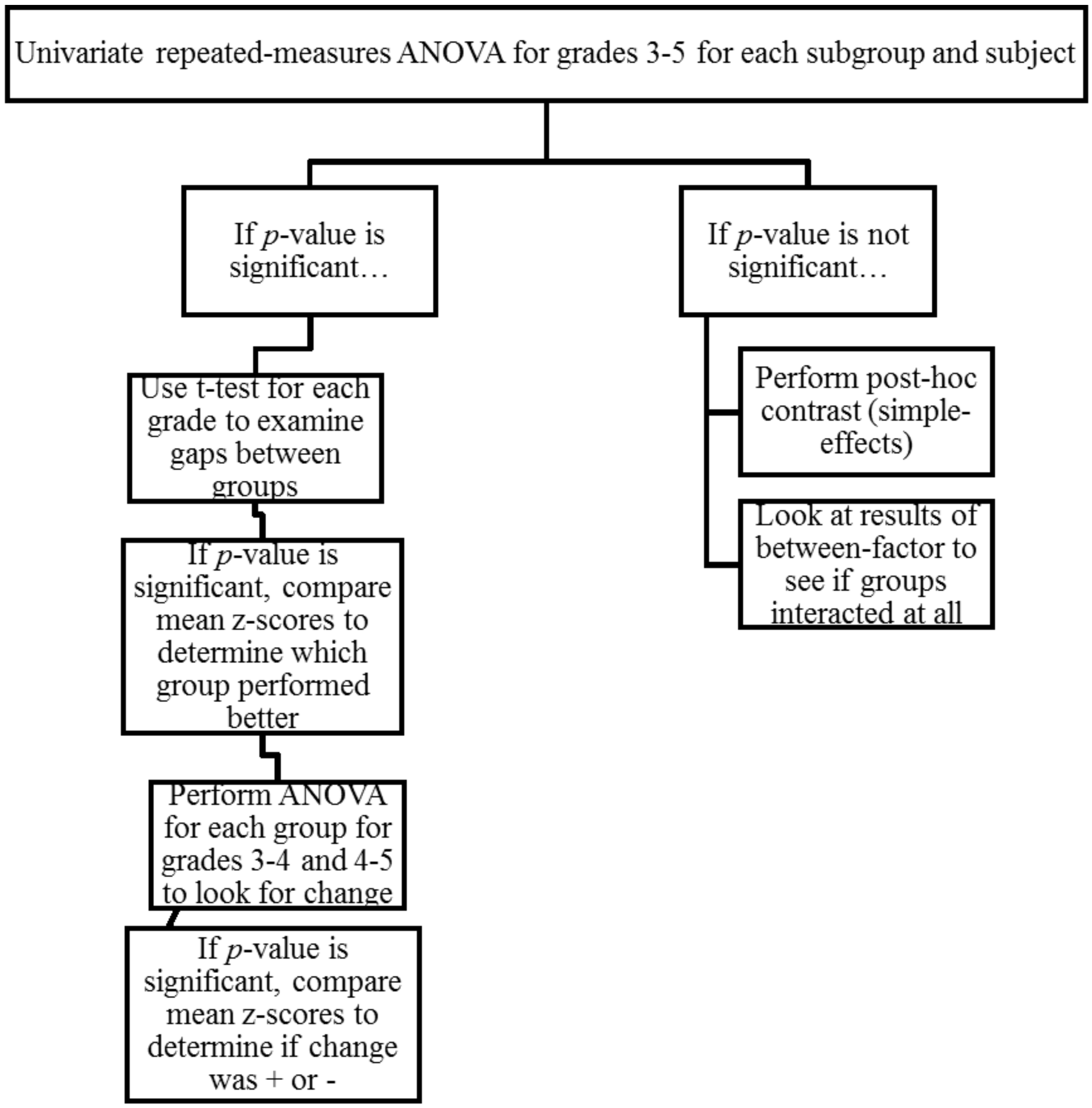


Figure 2. Decision Points.

Research Question 1–Math

Math overall univariate ANOVA. The first research question in the study focused on determining if residential minority students who attended a magnet school performed better on NC EOG tests in math than minority students who attended their residential zone school. Table 7 shows the descriptive statistics for math that include the mean z scores for magnet and zone students, standard deviation, and *N* as the sample size.

Table 7

Mathematics Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Math Third Grade	Magnet	-.0798	.83989	71
	Zone	-.0362	. 74471	131
Math Fourth Grade	Magnet	-.1097	.83282	71
	Zone	-.2113	. 74760	131
Math Fifth Grade	Magnet	-.2163	.92844	71
	Zone	-.3122	. 70983	131

Figure 3 plots the overall z score means for the magnet and zone groups on the mathematics EOG tests from third, fourth, and fifth grades.

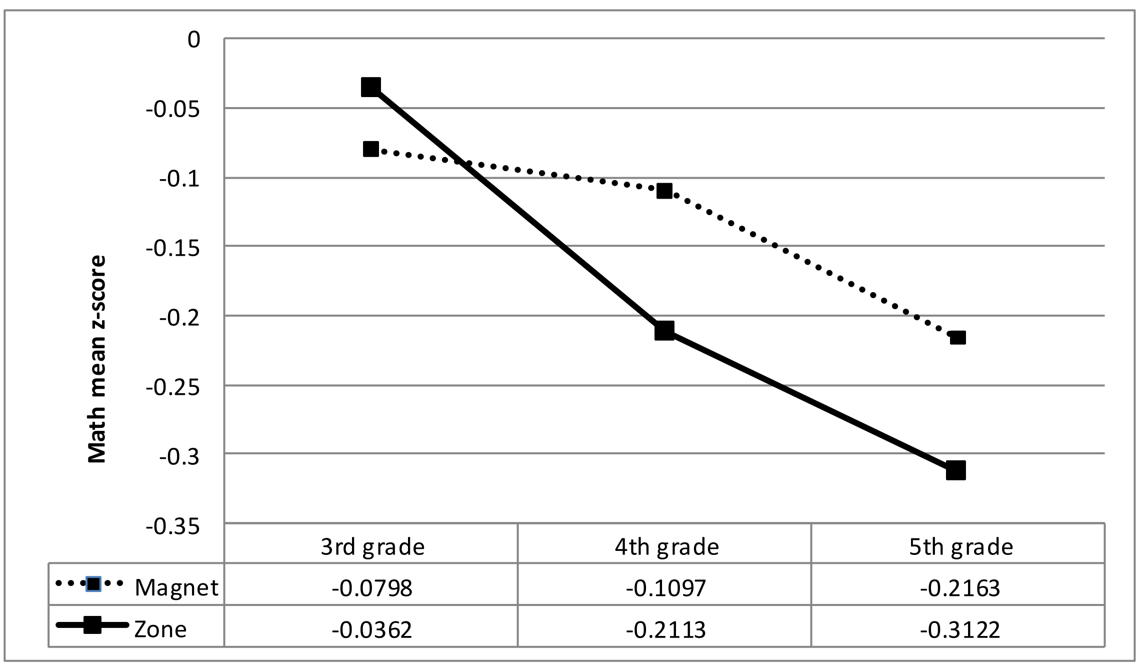


Figure 3. Plot of Mean z Scores for All Students on Mathematics EOG Test.

In order to determine if the math scores were significantly different over time between the groups, the researcher used a repeated-measures ANOVA of the z scores to

determine a significance level. Table 8 displays the results for the ANOVA for math which shows an interaction level of .279. Since the *p* value is greater than .05, the groups did not perform significantly differently over time on the EOG math test.

Table 8

Mathematics Overall Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.987	1.286	2.000	203.000	.279

Because the interaction for all math scores was .279 for the groups over time, the difference in overall performance between groups, as noted in the original multivariate ANOVA that examined math and reading together, was not affected by the scores in math. Therefore, a simple-effects test was needed for both the group and time variables to determine if there was a difference in performance over time or a difference between groups at any point. Table 9 shows the post-hoc contrast for performance over time for math z scores, which revealed a *p* value of .000, indicating that the math scores changed significantly over time. Based on the mean z scores for both groups, the math scores for magnet and zone students combined dropped significantly over time.

Table 9

Post-Hoc Contrast for Time in Mathematics

	Value	F	Hypothesis df	Error df	*p* value
Time	.922	8.606	2	203	.000

However, a test of between-subject effects which evaluates if a significant

difference occurred between the groups in math scores revealed a *p* value of .704, meaning that the type of group did not significantly impact the score.

Math Scores for African-American Students

To help understand if differences occurred between magnet and zone students with regard to ethnicity on math tests, the researcher performed an ANOVA between magnet and zone African-American students to determine if the type of school could be a contributing factor to success for African-American students. Table 10 shows the descriptive statistics including mean, standard deviation, and sample population for African-American students and their performance on the NC EOG math tests.

Table 10

Descriptive Statistics for African-American Students in Math

	Group	Mean	Std. Deviation	N
Z Score math third	Magnet	-.1893	.71863	45
	Zone	-.0698	.65482	38
Z Score math fourth	Magnet	-.2080	.81609	45
	Zone	-.3460	.71931	38
Z Score math fifth	Magnet	-.4287	.67670	45
	Zone	-.2643	.71853	38

Figure 4 shows the mean z scores for African-American magnet and African-American zone students in math. The zone students started higher in third grade but dropped below the magnet students in fourth and then performed better than the magnet students again in fifth grade.

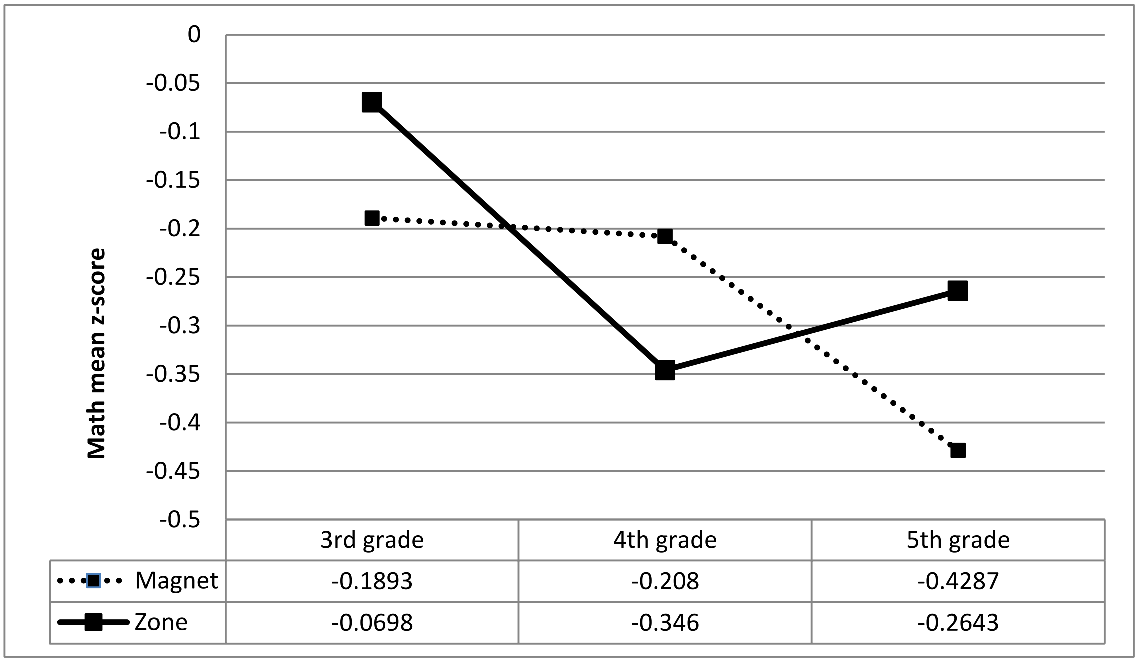


Figure 4. Plot of Mean z Scores for African-American Students on Mathematics EOG Test.

By performing a repeated-measures, univariate analysis, the researcher was able to determine that African-American magnet and African-American zone students performed significantly differently over time, as shown in Table 11, where p=.005.

Table 11

Repeated-Measures ANOVA for African-American Students in Math

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.878	5.573[a]	2.000	80.000	.005

The researcher then performed shorter-interval univariate analyses of math scores to examine differences from third to fourth and fourth to fifth grades for both magnet and zone groups. This particular ANOVA allowed the researcher to determine if math scores changed significantly for African-American students between Grades 3 and 4, and/or

between Grades 4 and 5 at both magnet and zone schools. Table 12 displays the results of the ANOVA for African-American students, where magnet students had a significant drop from fourth to fifth grade where p=.002, and the zone students showed a significant decrease from third to fourth grade, with a p value of .003. The significant drop in mean z scores from third to fourth grade for zone students and the drop from fourth to fifth grade for magnet students identify the points in time where the groups performed significantly differently from 1 year to the next.

Table 12

Repeated-Measures ANOVA for African-American Students in Math

Group	Time	Value	F	Hypothesis df	Error df	p value
Magnet	3 to 4	.998	.087[a]	1.000	44.000	.769
	4 to 5	.803	10.770[a]	1.000	44.000	.002
Zone	3 to 4	.784	10.166[a]	1.000	37.000	.003
	4 to 5	.964	1.386[a]	1.000	37.000	.247

The researcher then used t tests to determine if there were any significant differences between the magnet and zone African-American students on math tests at specific grade levels. The t test revealed that there were no significant differences between performances on the math EOG at any grade level for African-American students at magnet or zone schools. Table 13 shows the results of the t tests for third, fourth, and fifth grade math. This means that although the magnet and zone African-American students performed significantly differently over time, there were no specific grades where one group performed significantly higher than the other.

Table 13

T-Test Results for African-American Students on Math Tests

		Levene's		t test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	.050	.824	-.786	81	.434	-.11953	.15206
	not assumed			-.792	80.507	.431	-.11953	.15087
Z Score Fourth	assumed	.160	.690	.900	81	.371	.13799	.15336
	not assumed			.895	76.903	.374	.13799	.15415
Z Score Fifth	assumed	.564	.455	-.965	81	.337	-.16444	.17039
	not assumed			-.976	80.837	.332	-.16444	.16857

Math Scores for Hispanic Students

Descriptive statistics and repeated-measures analyses were also performed on Hispanic students' scores in math to determine if the type of school possibly impacted the achievement level of Hispanic students. Table 14 shows the descriptive statistics including mean, standard deviation, and sample population for Hispanic students and their performance on the NC EOG math tests, and Figure 5 displays a graph of the mean z scores for math.

Table 14

Descriptive Statistics for Hispanic Students in Math

	Group	Mean z score	Std. Deviation	N
Third-grade math	Magnet	.1099	1.00361	26
	Zone	-.0225	.78138	93
Fourth-grade math	Magnet	.0606	1.04334	26
	Zone	-.1563	.75602	93
Fifth-grade math	Magnet	.1513	1.00977	26
	Zone	-.3318	.70891	93

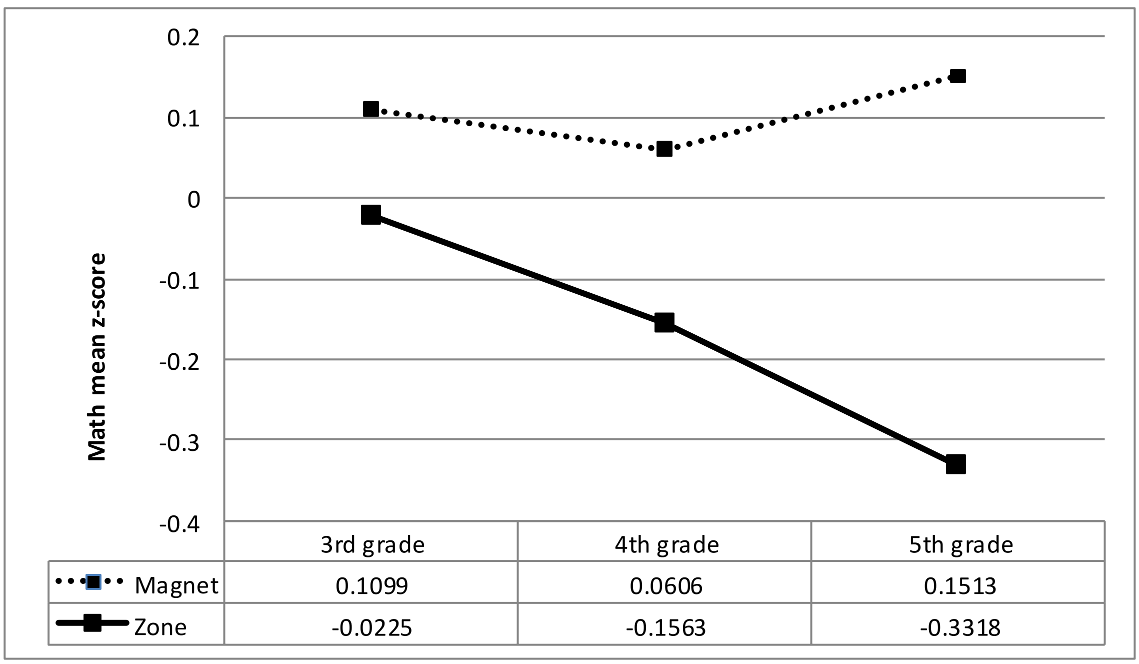


Figure 5. Plot of Mean z Scores for Hispanic Students on Mathematics EOG Test.

In order to determine if the type of school, either magnet or zone, affected academic performance over time for Hispanic students in math, a univariate, repeated-measures ANOVA performed on these students showed that a significant interaction

occurred between the magnet and zone groups over time, as shown in Table 15 where *p*=.016.

Table 15

Repeated-Measures ANOVA for Hispanic Students in Math

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.931	4.295[a]	2.000	116.000	.016

Because there was a significant interaction over time between zone and magnet Hispanic students in math, there was a need to determine at which grade levels such differences occurred. The researcher then used *t* tests to determine if there were any significant differences between the magnet and zone Hispanic students on math tests at each grade level. The *t* test revealed that there was only a significant difference between magnet and zone Hispanic students' performance at the fifth-grade level, where *p*=.029, and the magnet students scored significantly higher than the zone students. Table 16 shows the results of the *t* tests for third, fourth, and fifth grade.

Table 16

T-Test Results for Hispanic Students on Math Tests

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	2.801	.097	.716	117	.476	.13238	.18499
	not assumed			.622	33.927	.538	.13238	.21285
Z Score Fourth	assumed	6.641	.011	1.183	117	.239	.21681	.18321
	not assumed			.989	32.687	.330	.21681	.21912
Z Score Fifth	assumed	3.930	.050	2.782	117	.006	.48315	.17370
	not assumed			2.287	32.198	.029	.48315	.21124

The researcher then performed univariate analyses of math scores to examine differences from third to fourth and fourth to fifth grade for both magnet and zone groups. Table 17 displays the results of the ANOVA for Hispanic students, where magnet students did not have a significant increase or decrease from third to fourth or fourth to fifth grades, but zone students showed a significant decrease from third to fourth and another significant drop from fourth to fifth grade. Because the *t* test showed a significant difference in fifth grade between magnet and zone Hispanic students in math, and the univariate ANOVA showed a significant decrease from fourth to fifth grade for zone students, it was determined that magnet schools likely helped the Hispanic students perform better in math, but most significantly at fifth grade.

Table 17

Repeated-Measures ANOVA for Hispanic Students in Math

Group	Time	Value	F	Hypothesis df	Error df	*p* value
Magnet	4 to 5	.971	.741[a]	1.000	25.000	.398
Zone	4 to 5	.868	14.013[a]	1.000	92.000	.000

Math Scores for the Magnet Students Comparing Ethnicity

In order to further understand the effect that time or group may have on achievement in math, the researcher then conducted tests to determine if differences existed among different racial groups for both magnet and zone populations. Table 18 shows the descriptive statistics for magnet students' z scores in math separated by ethnicity, and Figure 6 displays a graph of the mean z scores.

Table 18

Descriptive Statistics for Magnet Students in Math by Ethnicity

	Group	Mean z score	Std. Deviation	N
Third-grade math	African American	-.1893	.7186	45
	Hispanic	.1099	1.003	26
Fourth-grade math	African American	-.2080	.67670	45
	Hispanic	.0606	1.04334	26
Fifth-grade math	African American	-.4287	.81609	45
	Hispanic	.1513	1.00977	26

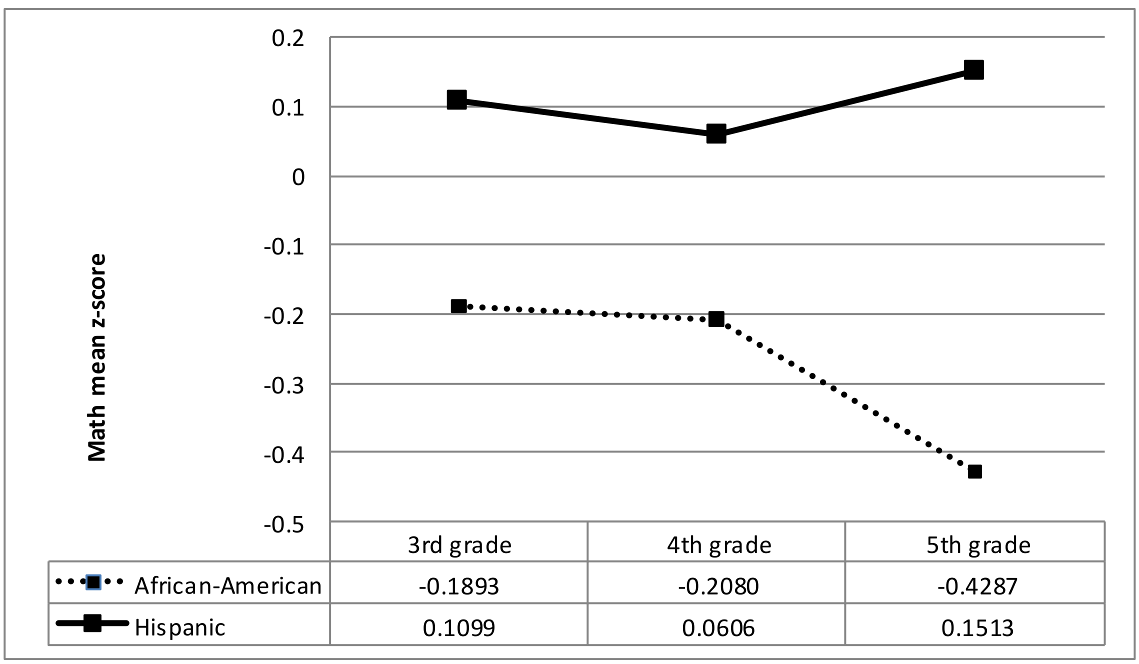


Figure 6. Plot of Math Mean z Scores for Magnet Students by Ethnicity.

To help differentiate between ethnic groups and their performance at magnet schools, the researcher used a repeated-measures, univariate ANOVA to determine if significant interactions occurred between African-American and Hispanic students at

magnet schools over time. Table 19 shows the results of this ANOVA for math z scores of magnet students separated by ethnicity and that there was a significant interaction over time between the African-American and Hispanic students with a *p* value of .032.

Table 19

Repeated-Measures ANOVA for Magnet Students in Math by Ethnicity

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.904	3.624[a]	2.000	68.000	.032

Because the ANOVA showed that African-American and Hispanic magnet students performed significantly differently over time in math, the researcher then performed *t* tests to determine at which specific grades, if any, were there significant differences between the groups' z scores. The *t* tests revealed that a significant difference occurred only at the fifth-grade level, where the Hispanic students performed better than the African-American students. Table 20 shows the results of each *t* test.

Table 20

T Test for Magnet Students in Math by Ethnicity

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	4.445	.039	1.458	69	.149	.29923	.20526
	not assumed			1.335	40.011	.189	.29923	.22409
Z Score Fourth	assumed	8.136	.006	1.316	69	.193	.26859	.20409
	not assumed			1.177	37.375	.246	.26859	.22813
Z Score Fifth	assumed	.999	.321	2.642	69	.010	.58008	.21952
	not assumed			2.496	43.879	.016	.58008	.23241

Because the *p* value for fifth grade is .010, the researcher used SPSS to perform

separate univariate ANOVAs to determine if there was a significant increase or decrease from fourth to fifth grade for either African-American or Hispanic students which could help the researcher understand the difference between the two groups at the fifth-grade level. The Hispanic students did not show a significant increase from fourth to fifth grade, but the African-American students showed a significant decrease, which could explain the gap between the two groups in fifth grade. Magnet schools did not prevent a drop in scores for African-American students in math, but they did not necessarily create it either. Table 21 shows the results of the post-hoc analysis for the fourth and fifth-grade scores for African-American and Hispanic magnet school students in math.

Table 21

Post-Hoc Contrast for Time of Fourth to Fifth Grade in Mathematics for Magnet Students

Group	Value	F	Hypothesis df	Error df	*p* value
African American	.803	10.770[a]	1.000	44.000	.002
Hispanic	.971	.741[a]	1.000	25.000	.398

Math Scores for Zone Students Comparing Ethnicity

An ANOVA for math scores for zone students was disaggregated by ethnicity to determine if the African-American and Hispanic students performed differently over time. Table 22 shows the descriptive statistics including, mean, standard deviation, and sample size for the zone students as separated by ethnicity. Figure 7 shows a line graph of the mean z scores for the two groups for Grades 3, 4, and 5.

Table 22

Descriptive Statistics of Math for Zone Students by Ethnicity

	Group	Mean z Score	Std. Deviation	N
Third-grade math	African American	-.0698	.65482	38
	Hispanic	-.0225	.78138	93
Fourth-grade math	African American	-.3460	.71853	38
	Hispanic	-.1563	.75602	93
Fifth-grade math	African American	-.2643	.71931	38
	Hispanic	-.3318	.70891	93

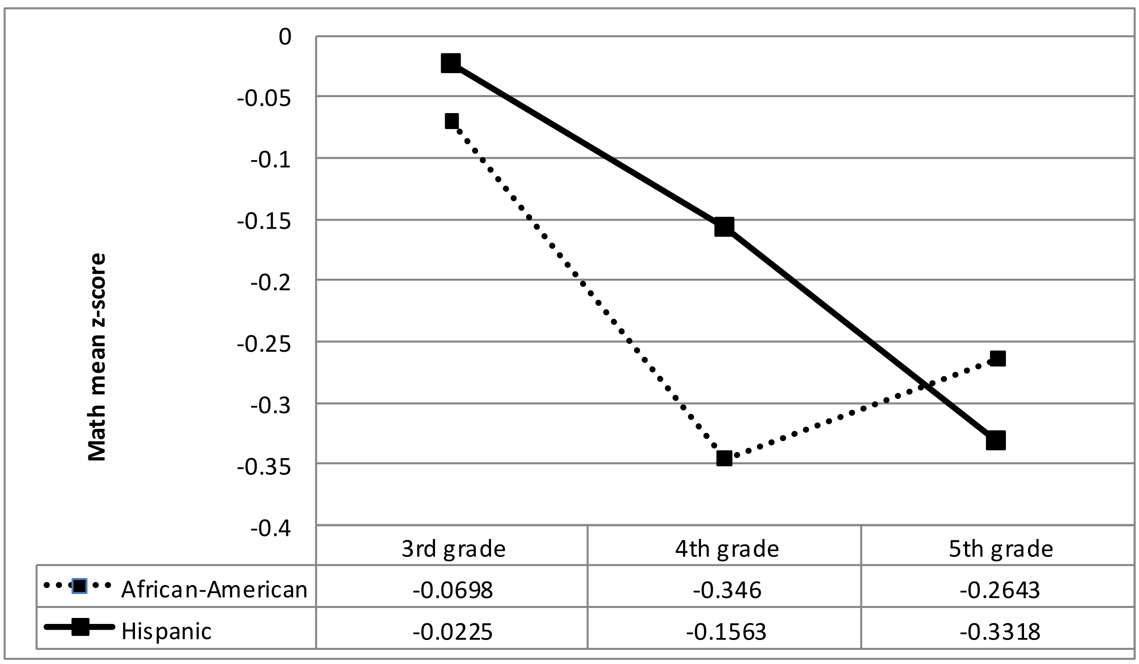


Figure 7. Plot of Mean z Scores in Math for Zone Students by Ethnicity.

Similar to the ANOVA performed on magnet schools by ethnicity, the researcher completed a repeated-measures, univariate ANOVA for zone students to determine whether African-American and Hispanic zone students performed differently over time on the math EOG test. Table 23 shows the results of the ANOVA for math z scores

which show a significant interaction occurred over time between the African-American and Hispanic students.

Table 23

Repeated-Measures ANOVA for Math of Zone Students by Ethnicity

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.933	4.595[a]	2.000	128.000	.012

Because there was an interaction between African-American and Hispanic zone students over time, the researcher then performed *t* tests to determine at which grades, if any, significant differences occurred between the groups' z scores.

Table 24

T Test for Zone Students in Math by Ethnicity

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	1.391	.240	.329	129	.743	.04732	.14388
	not assumed			.354	81.485	.724	.04732	.13360
Z Score Fourth	assumed	.002	.968	1.322	129	.188	.18977	.14352
	not assumed			1.351	72.111	.181	.18977	.14047
Z Score Fifth	assumed	.002	.968	-.493	129	.623	-.06751	.13706
	not assumed			-.490	67.896	.626	-.06751	.13791

None of the *t* tests revealed a significant difference between African-American and Hispanic students at any grade level, but because there was an interaction, the researcher analyzed the interaction of the two groups from fourth to fifth grade, which is where the scores crossed, and for the first time, the African-American students outperformed the Hispanic students. Table 25 shows the results of ANOVA for zone

students in math from Grade 4 to 5.

Table 25

Repeated-Measures from Fourth-Fifth Grade ANOVA for Math of Zone Students by Ethnicity

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.935	9.000[a]	1.000	129.000	.003

The interaction between the groups from fourth to fifth grade was significant with a *p* value of .003, and the researcher used a univariate analysis to determine if the interaction occurred because of a significant increase or decrease from one of the ethnicity groups. Table 26 shows results of the univariate analysis where African-American students reported a *p* value of .247 and Hispanic students had a *p* value of .000, meaning that Hispanic students showed a significant decrease in z scores from fourth to fifth grade. This means that the significant interaction between African-American and Hispanic student scores occurred mostly due to a significant decrease in math scores for Hispanic students attending a zone school.

Table 26

Fourth- to Fifth-Grade ANOVA for Math of Zone Students by Ethnicity

Group	Value	F	Hypothesis df	Error df	*p* value
African American	.964	1.386[a]	1.000	37.000	.247
Hispanic	.868	14.013[a]	1.000	92.000	.000

Math Scores for Male Students

The researcher also examined data related to gender differences in this study. For male students, those attending a magnet school were the only subgroup from the study that had positive mean z scores in third and fourth grade, where $\bar{x}$=.1304 and $\bar{x}$=.1147, respectively. Table 27 displays the descriptive statistics including mean z scores, standard deviation, and sample size for male students on the math EOG tests.

Table 27

Male Student Mathematics Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade math	Magnet	.1304	.83475	36
	Zone	-.0717	.78386	78
Fourth-grade math	Magnet	.1147	.77619	36
	Zone	-.1761	.80961	78
Fifth-grade math	Magnet	-.0447	.94251	36
	Zone	-.3147	.74019	78

Figure 8 shows a plot of the mean z scores for male magnet and male zone students on the math EOG test for Grades 3, 4, and 5.

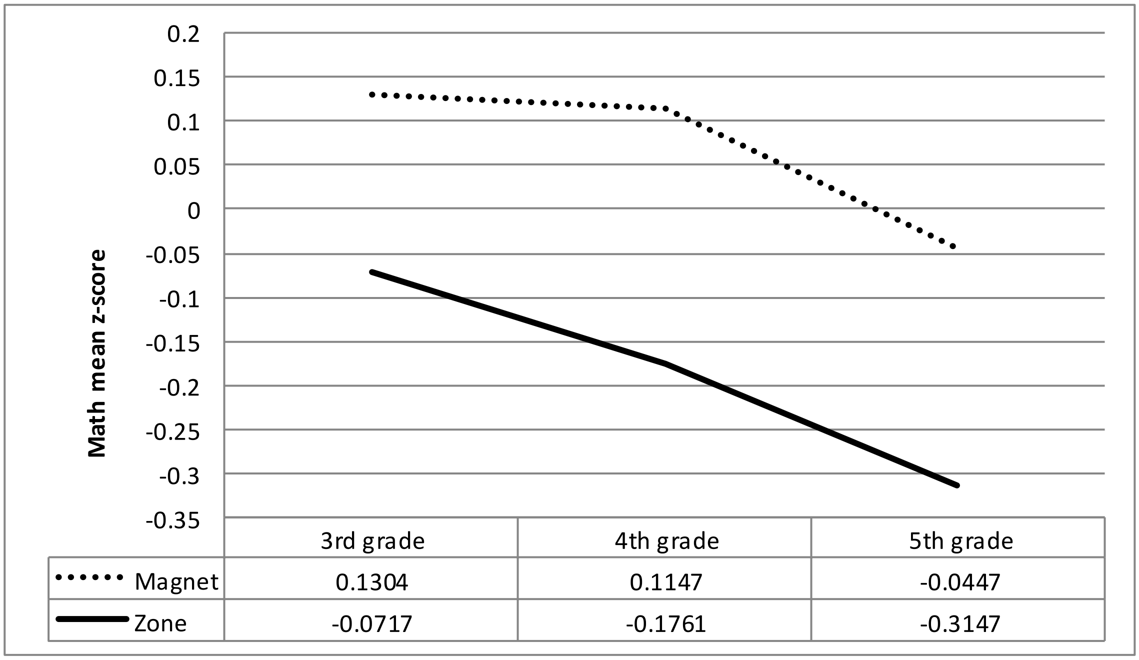


Figure 8. Plot of Mean z Scores for Male Students on Mathematics EOG Test.

The researcher performed a repeated-measures, univariate ANOVA on all scores for magnet and zone male students to determine the interaction between magnet and zone male students on the math EOG test. There was no significant interaction for the groups over time as shown in Table 28, where $p = .715$.

Table 28

Male Student Mathematics Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.994	.337	2.000	112.000	.715

Math Scores for Female Students

Descriptive statistics were also compiled for female magnet and zone students in math. Opposite of the outcome for male magnet students, the female magnet students had a lower mean z score than female zone students in fourth and fifth grade for math.

Table 29 shows the mean z scores, standard deviation, and sample size for female students on the math EOG tests.

Table 29

Female Student Mathematics Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade math	Magnet	-.2959	.80011	35
	Zone	-.0182	.68661	53
Fourth-grade math	Magnet	-.3404	.83647	35
	Zone	-.2321	.66188	53
Fifth-grade math	Magnet	-.3929	.89274	35
	Zone	-.2267	.72892	53

Figure 9 shows the z score means for female students on the mathematics EOG tests which gives a visual representation that the female zone students performed higher on math tests than magnet students at third, fourth, and fifth grade.

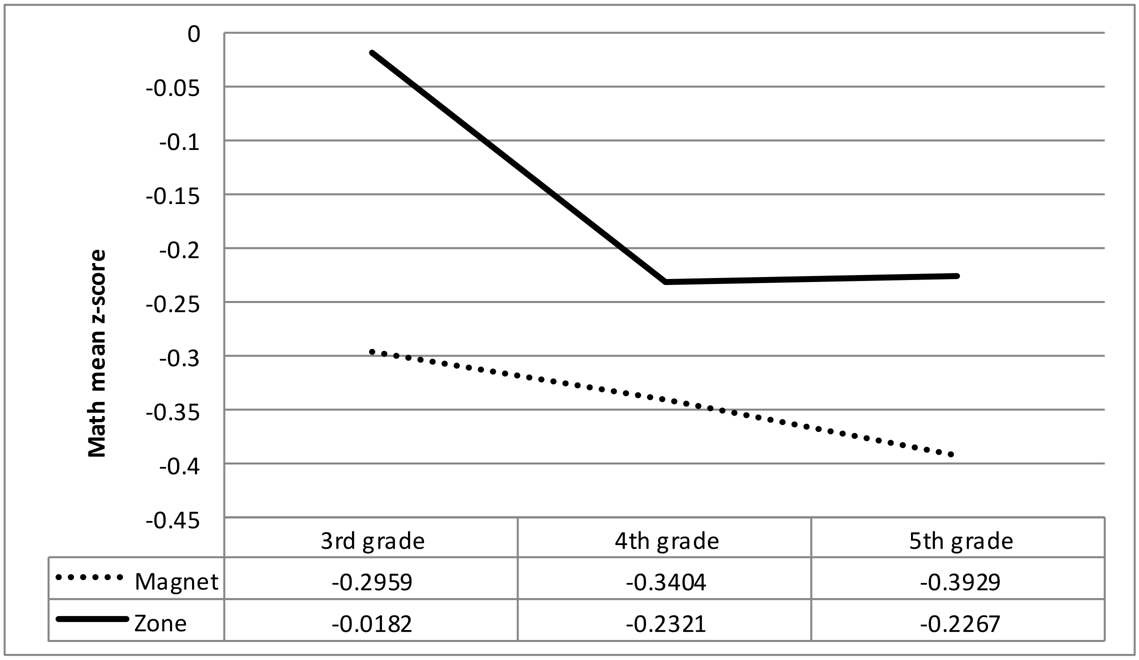


Figure 9. Plot of Mean z Scores for Female Students on Mathematics EOG Test.

A repeated-measures, univariate ANOVA was performed on all math scores for female students to determine if female magnet and female zone students performed differently over time for just mathematics. The ANOVA revealed that female magnet and female zone students performed similarly in math over time, with a *p* value of .258.

Table 30

Female Student Mathematics Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.970	1.378	2.000	88.000	.258

Math Scores for Magnet Students Comparing Gender

Since there were sufficient male and female students in both the magnet and zone groups to create subgroups, another univariate analysis was performed on male and female magnet students to address whether there were differences between the male and

female students at magnet schools over time. Table 31 shows the descriptive statistics for male and female students on third, fourth, and fifth grade math EOG tests which includes mean z scores, standard deviation, and sample size.

Table 31

Descriptive Statistics for Math Scores of Magnet Students by Gender

	Group	Mean z score	Std. Deviation	N
Third-grade math	F	-.2959	.80011	35
	M	.1304	.83475	36
Fourth-grade math	F	-.3404	.83647	35
	M	.1147	.77619	36
Fifth-grade math	F	-.3929	.89274	35
	M	-.0447	.94251	36

Figure 10 shows a graph of the mean z scores in math for male and female magnet school students for third, fourth, and fifth grades for the study.

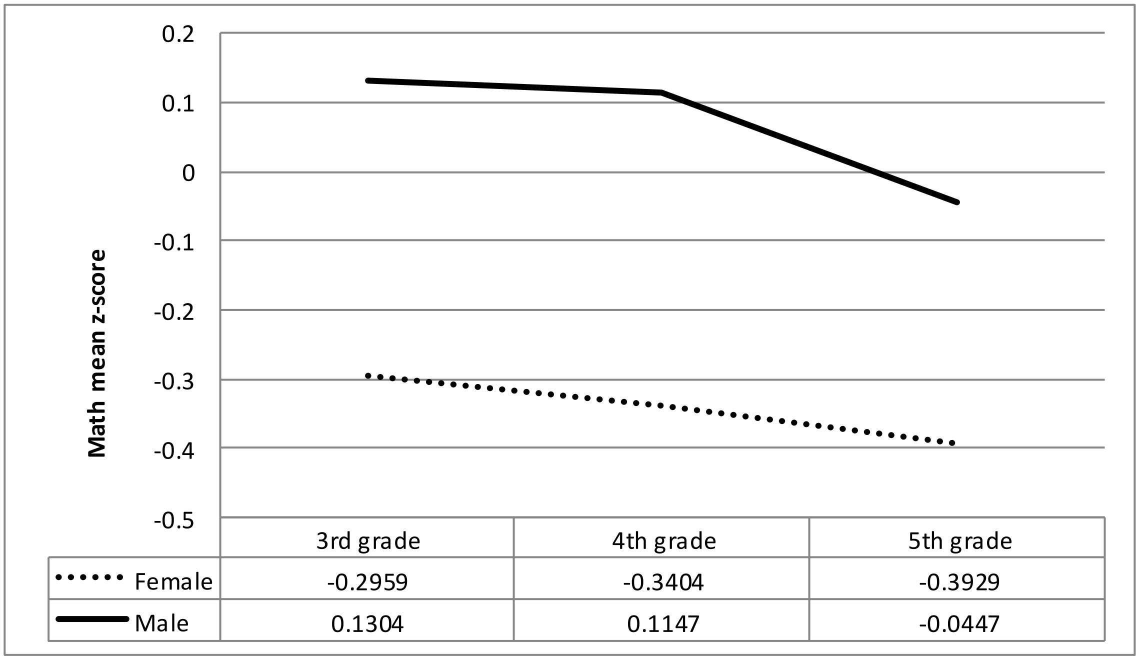


Figure 10. Plot of Mean z Scores for Female and Male Magnet Students on Math EOG Test.

The next analysis compared male and female magnet students in math through a repeated-measures ANOVA. The results are shown in Table 32 and did not reveal a significant interaction between male and female student scores over time.

Table 32

ANOVA of Math Scores for Magnet Students by Gender

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.989	.393[a]	2.000	68.000	.676

Because the *p* value was .676 for the univariate ANOVA in Table 32, a simple effects test helped the researcher examine if there was a difference over time in scores. Table 33 shows that post-hoc analysis which reveals that there was not a significant difference over time for the math scores of magnet students when separated by gender,

and a test of between-subject effects revealed that gender did not influence performance in the magnet schools.

Table 33

Post-hoc Analysis for Magnet Students and Gender Comparison in Math

	Value	F	Hypothesis df	Error df	*p* value
Time	.934	2.402[a]	2.000	68.000	.098

Since the math z scores did not change significantly over time time, a *t* test was used to determine if there were any specific grade levels at which the male and female magnet students performed significantly differently. Table 34 shows that significant differences occurred between male and female magnet students on math in third grade where $p = .031$ and fourth grade $p = .020$. For both years, the male magnet students performed significantly better than the female magnet students as a group.

Table 34

Magnet Student Mathematics Gender t Test

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	.018	.892	2.196	69	.031	.42630	.19414
	not assumed			2.197	68.987	.031	.42630	.19403
Z Score Fourth	assumed	.342	.560	2.377	69	.020	.45508	.19144
	not assumed			2.375	68.274	.020	.45508	.19164
Z Score Fifth	assumed	.160	.691	1.597	69	.115	.34817	.21799
	not assumed			1.598	68.955	.115	.34817	.21782

Math Scores for Zone Students Comparing Gender

Comparing male and female zone students in math helped determine if one group performed better than the other at zone schools. Descriptive statistics were compiled for referencing zone students' performances in math, as separated by gender. These results are shown in Table 35.

Table 35

Zone Students by Gender Mathematics Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade math	F	-.0182	.68661	56
	M	-.0717	.78386	79
Fourth-grade math	F	-.2321	.66188	56
	M	-.1761	.80961	79
Fifth-grade math	F	-.2267	.72892	56
	M	-.3147	.74019	79

Figure 11 shows a graph of the mean z scores in math for male and female magnet school students for third, fourth, and fifth grade for the study.

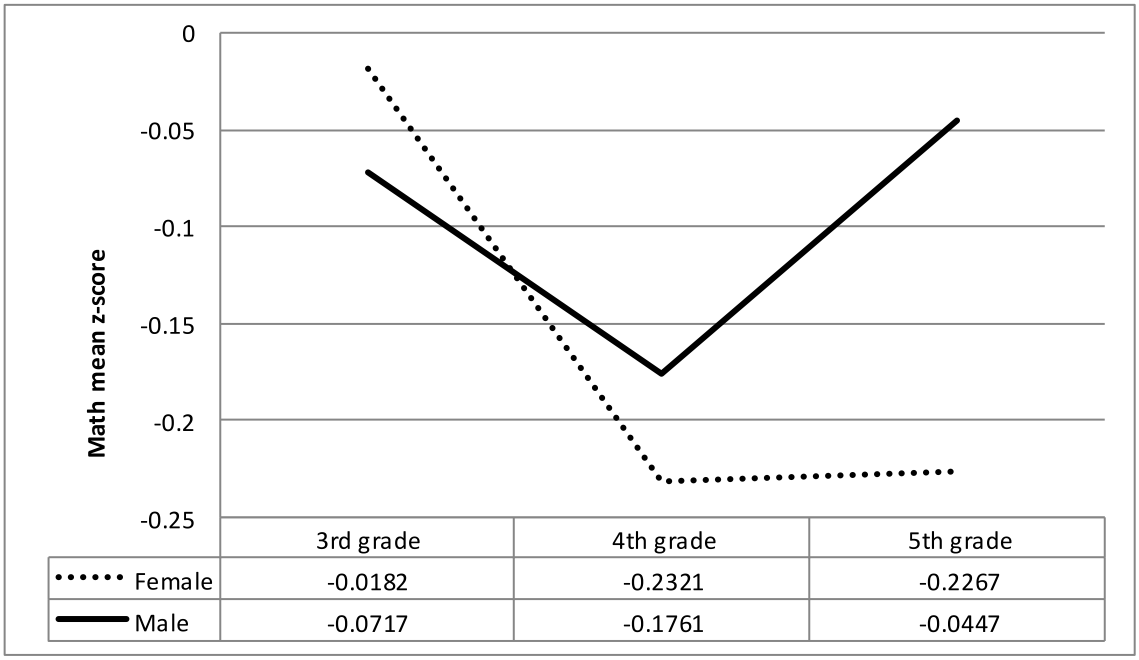


Figure 11. Plot of Mean z Scores for Female and Male Magnet Students on Math EOG Test.

In order to determine if male and female zone students performed differently over time in math, the researcher performed a repeated-measures ANVOA of zone student scores in math, with the groups being compared as male and female zone students. The groups did not exhibit a significant interaction over time for math. The results are shown in Table 36 and reveal an interaction level of .161.

Table 36

ANOVA for Math of Zone Students by Gender

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.973	1.855^a	2.000	132.000	.161

Because there was not an interaction between the groups over time, a simple-effects post-hoc contrast was used to determine if the overall scores changed significantly

over time. This is represented in Table 37, which shows that the combined scores for male and female students attending zone schools changed significantly over time, although the groups performed independent of each other. Because the mean z scores at third grade for these groups is higher than the mean z score at fifth grade, the data suggest that the combined math scores for male zone and female zone students decreased significantly over time. A test of between-subject effects revealed that gender did not influence performance in the magnet schools.

Table 37

Post-hoc Analysis in Math for Magnet Students and Gender Comparison

	Value	F	Hypothesis df	Error df	*p* value
Time	.887	8.415[a]	2.000	132.000	.000

Research Question 2- Reading

Overall repeated-measures ANOVA. The mean for magnet students on the third-grade EOG reading test was -.1587 but grew in fourth grade where $\bar{x}$ = -.1256. However, in fifth grade, the magnet students' scores dropped to where $\bar{x}$ = -.3442. Zone students' scores in third grade were lower than magnet students' scores, where $\bar{x}$ = -3788. They continued to decline in fourth and fifth grade, to $\bar{x}$ = -.5105 and $\bar{x}$ = -.5151, respectively. For all 3 years, the zone students performed lower than the magnet students on the reading EOG test. Table 38 shows the descriptive statistics for the reading z scores, which includes the mean of the z scores, standard deviation, and sample size at each grade level.

Table 38

Reading Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade reading	Magnet	-.1587	.73904	71
	Zone	-.3788	.77394	131
Fourth-grade reading	Magnet	-.1256	.76574	71
	Zone	-.5105	.77378	131
Fifth-grade reading	Magnet	-.3442	.71713	71
	Zone	-.5151	.82509	131

Figure 12 shows an illustrated representation of the mean z scores in reading separated by magnet and zone students.

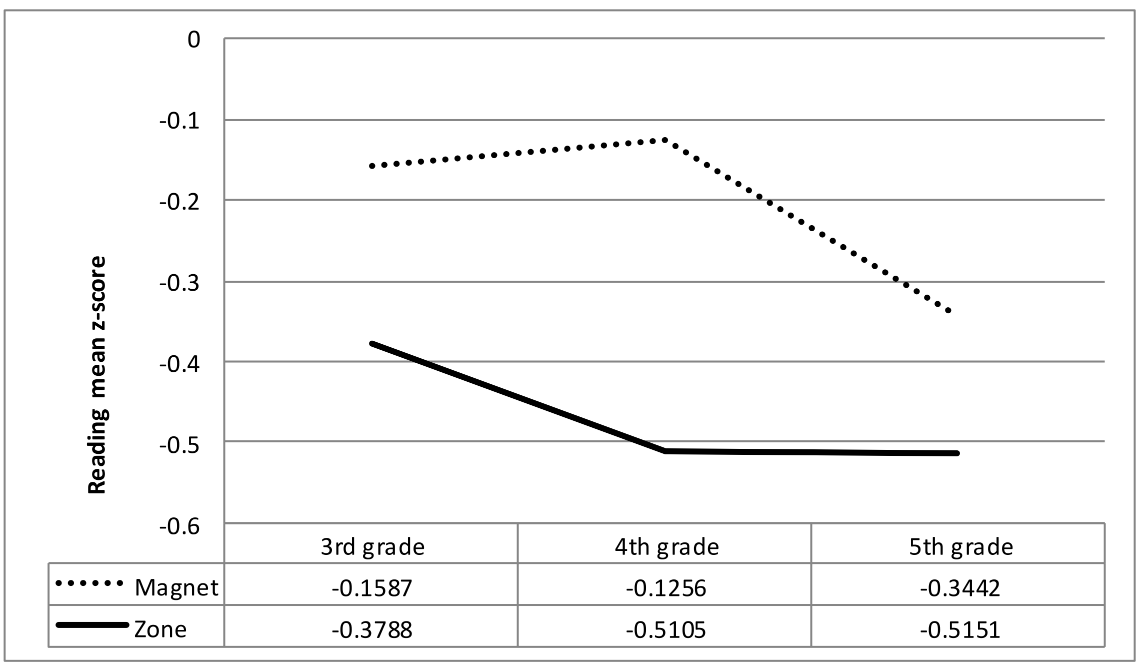


Figure 12. Plot of Mean z Scores for All Students on Reading EOG Test.

The first and most important analysis performed on reading scores was used to determine if a significant interaction occurred over time between magnet and zone

students. The researcher performed a repeated-measures, univariate ANOVA on magnet and zone reading z scores using SPSS. Table 39 displays the results of this univariate analysis for the reading scores of magnet and zone students over time, where $p = .005$, meaning there was a significant interaction between the two groups and that they performed differently over time.

Table 39

Reading Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.949	5.399[a]	2.000	199.000	.005

The researcher then ran *t* tests on the reading scores at each grade level to determine at which grade the significant differences in z scores occurred between magnet and zone students. With regard to the *t* test, where Levene's test for equality of variances results in a significance level of greater then .05, variances are assumed equal and that significance level is used to determine if there was a significant difference between the two groups at that point in time. Table 40 displays the *t* test results. All variances were assumed equal, and the significance level was .051 for third grade, .000 for fourth grade, and .113 for fifth grade. At .051, the third-grade *t* test shows what is considered more of a trend than a statistical significance, meaning that the difference between the groups in third grade was possibly due to the students attending a magnet school but not statistically significant. In fifth grade, where $p = .113$, the data showed that a significant difference did not occur between the magnet and zone students. Therefore, there is no need for further testing for third or fifth grades. The *t* test results for reading show there was a significant difference in z scores between magnet and zone students only at fourth

grade, where p = .000. In order to determine which group performed significantly better at fourth grade, the researcher referred to the means of the fourth-grade z scores. Zone students had a mean z score of -.5105 on the fourth-grade reading EOG test, and magnet students had a mean z score of -.1256.

Table 40

T Test Results for Reading

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	.039	.844	1.961	200	.051	.22016	.11228
	not assumed			1.988	149.503	.049	.22016	.11075
Z Score Fourth	assumed	.008	.931	3.554	204	.000	.40651	.11439
	not assumed			3.585	145.986	.000	.40651	.11338
Z Score Fifth	assumed	1.911	.168	1.593	204	.113	.18389	.11541
	not assumed			1.662	160.127	.098	.18389	.11065

Because the *t* test showed that there was a significant difference between magnet and zone students on the fourth-grade reading EOG, the mean z score is used to determine which group performed better that year. Table 41 shows the means and standard deviation of the z scores for the reading EOG for magnet and zone students. In fourth grade, magnet students reported a mean z score of -.1256, and zone students had a mean z score of -.5321, meaning that magnet students performed significantly better on the fourth-grade reading EOG than zone students.

Table 41

Mean z Scores on Reading EOG for Magnet and Zone Students

	Group	N	Mean z score	Std. Deviation	Std. Error Mean
Third-grade reading	Magnet	71	-.1587	.73904	.08771
	Zone	131	-.3788	.77394	.06762
Fourth-grade reading	Magnet	71	-.1256	.76574	.09088
	Zone	131	-.5321	.78776	.06780
Fifth-grade reading	Magnet	71	-.3442	.71713	.08511
	Zone	131	-.5281	.82153	.07071

The researcher then performed separate repeated-measures univariate analyses on each magnet and zone groups for reading scores from Grades 3-4 and Grades 4-5 in order to determine where significant differences in score changes occurred for each group. Table 42 displays the repeated-measures ANOVA of the differences from one grade to the next for reading z scores of magnet students. For all grade levels of magnet students, the significance level was .000. The significance level for the difference from Grades 3-4 was .592 and Grades 4-5 was .000. The reading score difference between third and fourth grade, where p = .592, was the only occurrence where there was not a significant difference in z scores for magnet students. The significant difference on the reading EOG for magnet students occurred between fourth and fifth grade, where $p = .000$. Since the mean z score decreased from -.1256 in fourth grade to -.3442 in fifth grade, the magnet students performed significantly worse on the fifth-grade reading EOG than they did on the fourth-grade EOG.

Table 42

Univariate Analysis for Magnet Students in Reading Separated by Grade

Time	Value	F	Hypothesis df	Error df	*p* value
3 to 4	.996	.290[a]	1.000	70.000	.592
4 to 5	.813	16.128[a]	1.000	70.000	.000

Table 43 displays the repeated-measures univariate analysis for reading z scores for zone students separated by Grades 3-4 and Grades 4-5. For all grade levels of zone students, the significance level was .001. The significance level for the difference from Grades 3-4 was .001 and Grades 4-5 was .926. This means that there was a significant difference in scores for zone students on the reading EOG between all grades and, more specifically, their scores from third and fourth. Since the mean z score for the fourth-grade reading test is lower than the mean z score for the third-grade reading test for zone students, the data show that the decrease in performance from third to fourth grade was the most significant, where the *p* value = .001.

Table 43

Univariate Analysis for Zone Students in Reading

Time	Value	F	Hypothesis df	Error df	*p* value
3 to 4	.913	12.311	1.000	130.000	.001
4 to 5	1.000	.009	1.000	134.000	.926

Reading Scores for African-American Students

To better understand if differences occurred between magnet and zone students

with regard to ethnicity, the researcher performed a repeated-measures ANOVA on z scores for reading for African-American and Hispanic students to determine if ethnicity could be a contributing factor to success at either magnet or zone schools. Table 44 shows the descriptive statistics for African-American students and their performance on the NC EOG reading tests, and Figure 13 displays a graph of the mean z scores.

Table 44

Descriptive Statistics for African-American Students in Reading

	Group	Mean z score	Std. Deviation	N
Third-grade reading	Magnet	-.1542	.59693	45
	Zone	-.1897	.67902	38
Fourth-grade reading	Magnet	-.1270	.71062	45
	Zone	-.2718	.69600	38
Fifth-grade reading	Magnet	-.3783	.58019	45
	Zone	-.3341	.68357	38

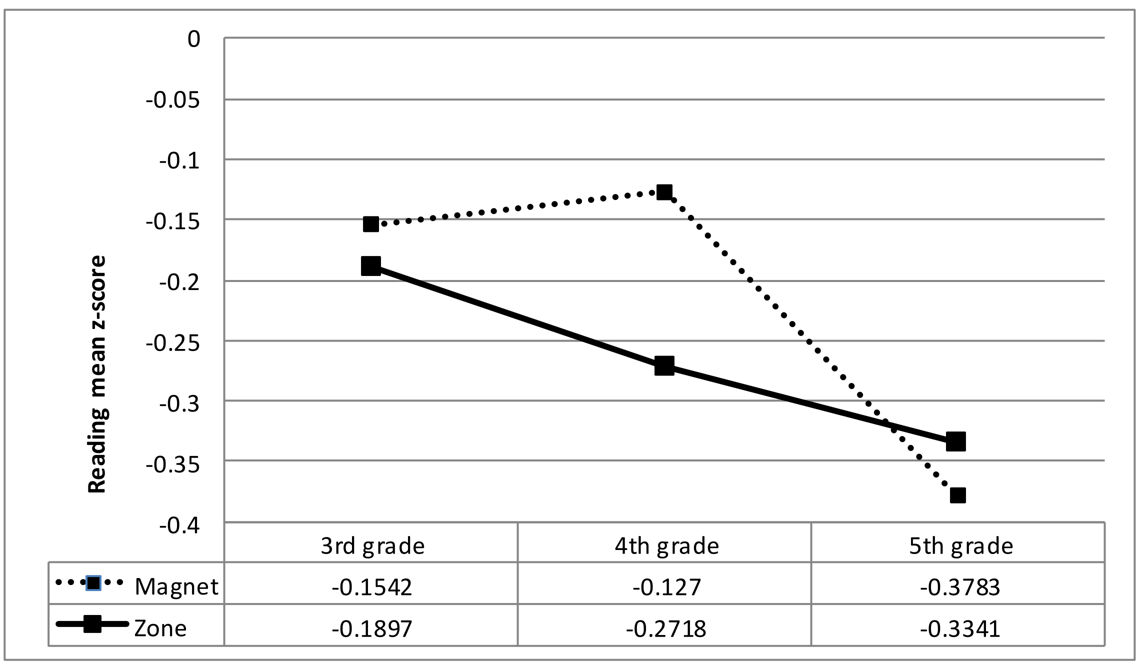


Figure 13. Plot of Mean z Scores for African-American Students on Reading EOG Test.

To help the researcher determine if African-American students performed differently over time in reading at magnet and zone schools, a repeated-measures ANOVA was performed on reading test results for all African-American students which showed that there was not a significant interaction between the groups over time, as shown in Table 45, where p=.192, meaning they performed similarly throughout the study.

Table 45

Repeated-Measures ANOVA for African-American Students in Reading

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.960	1.684[a]	2.000	80.000	.192

Because the p value was greater than .05, the researcher evaluated post-hoc contrasts that showed overall reading scores dropped significantly over time for African-American students in reading, but a test of between-subject effects showed that attending a magnet or zone school likely did not influence the z scores. Table 46 shows the results of the post-hoc analysis.

Table 46

Post-hoc Report of Reading Scores for African-American Students over Time

	Value	F	Hypothesis df	Error df	*p* value
Time	.858	6.625[a]	2.000	80.000	.002

Reading Scores for Hispanic Students

The second ethnicity group involved in the study was Hispanic students. Table 47

shows the descriptive statistics for Hispanic students and their performance on the NC EOG reading tests, and Figure 14 displays a graph of the mean z scores.

Table 47

Descriptive Statistics for Hispanic Students in Reading

	Group	Mean z score	Std. Deviation	N
Third-grade reading	Magnet	-.1664	.94978	26
	Zone	-.4562	.80008	93
Fourth-grade reading	Magnet	-.1232	.86778	26
	Zone	-.6081	.78616	93
Fifth-grade reading	Magnet	-.2852	.91749	26
	Zone	-.5890	.86890	93

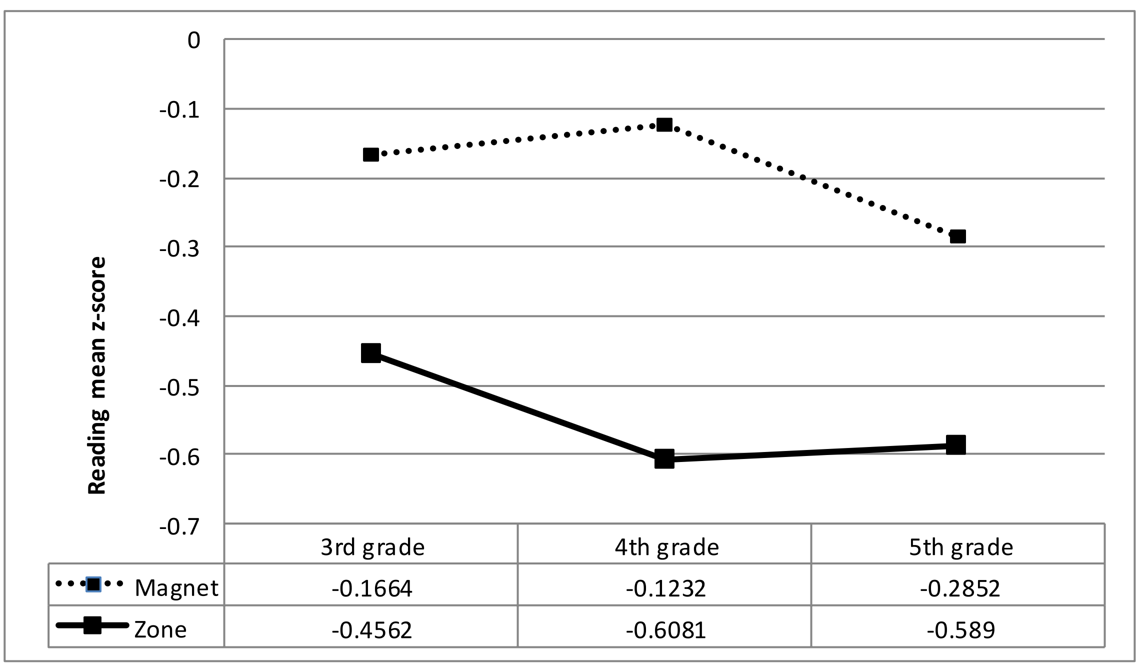


Figure 14. Plot of Mean Scores for Hispanic Students on Reading EOG Test.

A repeat-measures ANOVA for all Hispanic students was used to determine if an

interaction occurred over time between magnet and zone Hispanic students. The results of the ANOVA showed that there was not a significant interaction that occurred between the groups over time, as displayed in Table 48, where p=.063.

Table 48

Repeated-Measures ANOVA for Hispanic Students in Reading

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.953	2.829[a]	2.000	116.000	.063

Because the *p* value was greater than .05, the study required determining whether the group or time influenced Hispanic student achievement in reading. The researcher evaluated a between-subjects effect report that showed the type of school likely influenced scores with a *p* value of .043, but a post-hoc report showed that overall the scores did not change with time for Hispanic students. Table 49 shows the results of the post-hoc analysis.

Table 49

Post-hoc Report of Reading Scores for Hispanic Students

	Value	F	Hypothesis df	Error df	*p* value
Time	.963	2.226[a]	2.000	116.000	.113

The researcher then used *t* tests to determine if there were any significant differences between the magnet and zone Hispanic students on reading tests at specific grade levels. The *t* test revealed that there was only a significant difference between magnet and zone Hispanic students' performance at the fourth-grade level, where p=.008,

and the magnet students scored significantly higher than the zone students. Table 50 shows the results of the *t* tests for third, fourth, and fifth grade.

Table 50

T Test Results for Hispanic Students on Reading Tests

		Levene's		*t* test for Equality of Means				
		F	Sig.	T	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	Assumed	1.571	.213	1.565	117	.120	.28971	.18509
	not assumed			1.421	35.523	.164	.28971	.20391
Z Score Fourth	Assumed	.456	.501	2.717	117	.008	.48484	.17843
	not assumed			2.569	37.256	.014	.48484	.18870
Z Score Fifth	Assumed	.001	.980	1.557	117	.122	.30376	.19511
	not assumed			1.509	38.452	.139	.30376	.20123

The researcher then performed univariate analyses of reading scores to examine differences from third to fourth grade for both magnet and zone groups in order to determine if the difference between magnet and zone students in fourth grade was caused by a significant increase or decrease in one group’s scores. Table 51 displays the results of this ANOVA for Hispanic students, where zone students showed a significant decrease from third to fourth grade, likely causing the significant gap between zone and magnet Hispanic students because magnet students did not have a significant increase or decrease from third to fourth grades.

Table 51

Repeated-Measures ANOVA for Hispanic Students in Reading

Group	Time	Value	F	Hypothesis df	Error df	*p* value
Magnet	3 to 4	.984	.411[a]	1.000	25.000	.527
Zone	3 to 4	.882	12.265[a]	1.000	92.000	.001

Reading Scores for Magnet Students Comparing Ethnicity

Similar to tests done in math, the researcher performed a repeated-measures, univariate ANOVA to further understand the effect that a type of school may have on achievement in reading and if differences existed among different racial groups for both magnet and zone populations. Table 52 shows the descriptive statistics for magnet students' z scores in reading separated by ethnicity, and Figure 15 displays a graph of the mean z scores.

Table 52

Descriptive Statistics for Magnet Students in Reading by Ethnicity

	Group	Mean z score	Std. Deviation	N
Third-grade reading	African American	-.1542	.59693	45
	Hispanic	-.1664	.94978	26
Fourth-grade reading	African American	-.1270	.71062	45
	Hispanic	-.1232	.86778	26
Fifth-grade reading	African American	-.3783	.58019	45
	Hispanic	-.2852	.91749	26

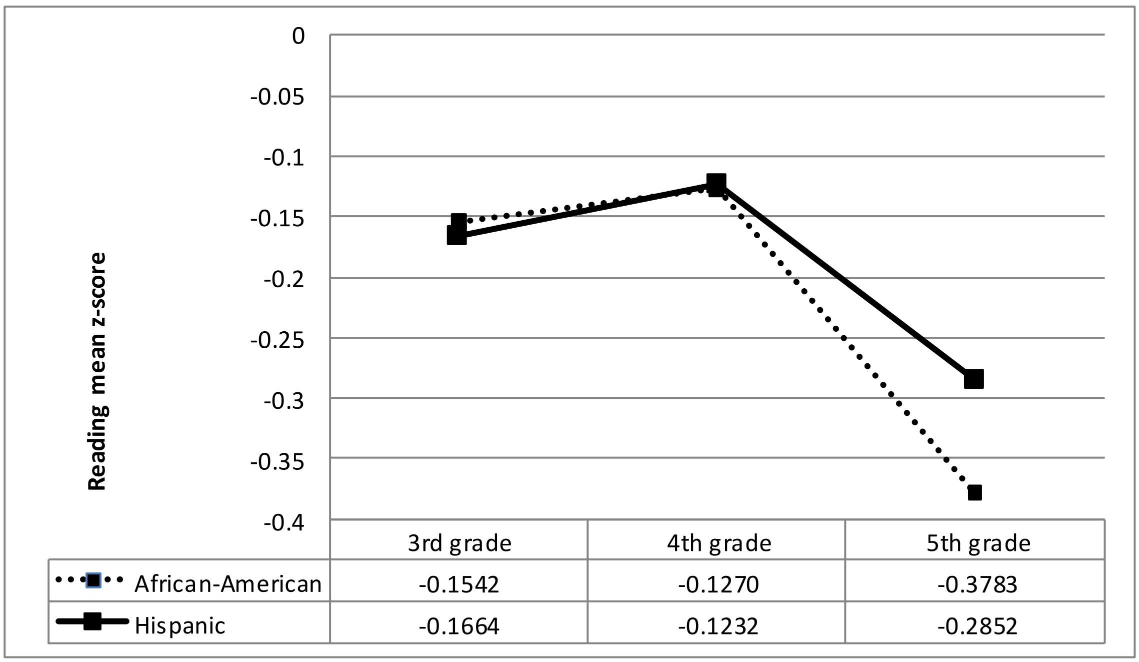


Figure 15. Plot of Mean z Scores in Reading for Magnet Students by Ethnicity.

A repeated-measures ANOVA was necessary to determine if African-American and Hispanic magnet students performed similarly over time. Table 53 shows the results of the analysis for reading z scores of magnet students separated by ethnicity which shows that no significant interaction occurred over time between the African-American

and Hispanic students.

Table 53

Univariate Repeated-Measures ANOVA in Reading for Magnet Students by Ethnicity

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.986	.470[a]	2.000	68.000	.627

In order to understand if there was any difference in overall scores at magnet schools over time or differences between the groups, the researcher examined post-hoc results for the above ANOVA, which showed that overall scores changed significantly over time but that the groups did not necessarily perform differently. Table 54 shows the results of the post-hoc analysis.

Table 54

Post-hoc Report in Reading for Magnet Students and Ethnicity Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time	.819	7.502[a]	2.000	68.000	.001

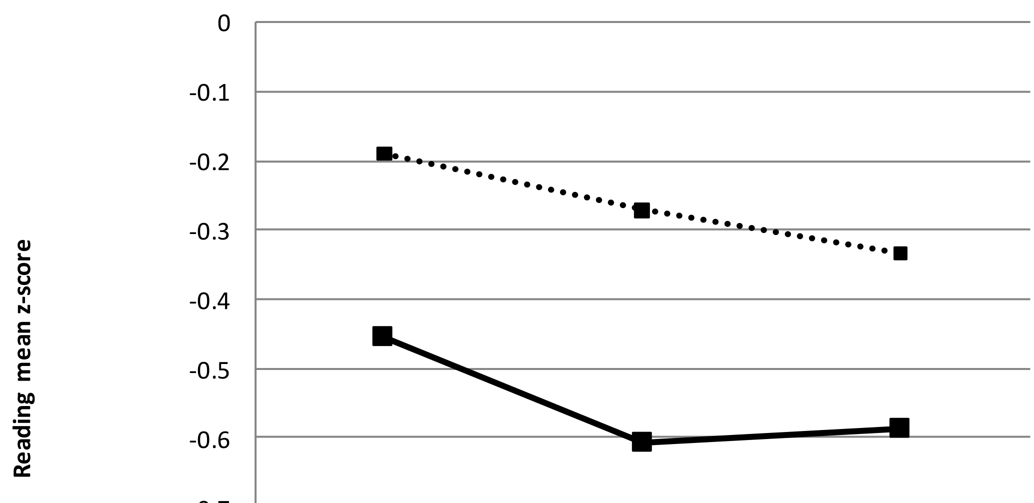
Reading Scores for Zone Students Comparing Ethnicity

An ANOVA for reading scores for zone students was also disaggregated by ethnicity to determine if the African-American and Hispanic students performed differently over the entire course of the study at the zone schools. Table 55 shows the descriptive statistics for the zone students as separated by ethnicity which includes mean z scores, standard deviation, and sample size. Figure 16 shows a line graph of the mean z scores for the two groups for Grades 3, 4, and 5.

Table 55

Descriptive Statistics in Reading for Zone Students by Ethnicity

	Group	Mean z score	Std. Deviation	N
Third-grade reading	African American	-.1897	.67902	38
	Hispanic	-.4562	.80008	93
Fourth-grade reading	African American	-.2718	.69600	38
	Hispanic	-.6081	.78616	93
Fifth-grade reading	African American	-.3341	.68357	38
	Hispanic	-.5890	.86890	93



	3rd grade	4th grade	5th grade
African-American	-0.1897	-0.2718	-0.3341
Hispanic	-0.4562	-0.6081	-0.589

Figure 16. Plot of Mean z Scores in Reading for Zone Students by Ethnicity.

In order to help the researcher understand factors that affect achievement, an ANOVA was performed on the z scores for zone students, separated by ethnicity. Table 56 shows the results of the univariate analysis for reading z scores of zone students separated by ethnicity which shows there was no significant interaction over time

between the African-American and Hispanic students.

Table 56

ANOVA of Reading z Scores for Zone Students by Ethnicity

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.992	.538[a]	2.000	128.000	.585

In order to understand if there was any difference over time or difference between the groups, the researcher examined post-hoc results for the above ANOVA, which showed that overall scores changed significantly over time but that the groups performed similarly according to an examination of between-subject effects. Table 57 shows the results of the post-hoc contrast.

Table 57

Post-hoc Report in Reading for Zone Students and Ethnicity Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time	.929	4.879[a]	2.000	128.000	.009

The researcher then performed *t* tests to determine at which grades, if any, there were significant differences between African-American and Hispanic zone students' reading z scores. The *t* tests revealed that a significant difference occurred between African-American and Hispanic zone students in reading only on the third-grade test, where p=.023, and the African-American students performed significantly better than the Hispanic students. Table 58 shows the results of the *t* test.

Table 58

T Test of Reading Scores for Zone Students by Ethnicity

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	2.485	.117	-1.804	129	.074	-.26650	.14773
	not assumed			-1.933	80.472	.057	-.26650	.13790
Z Score Fourth	assumed	.531	.467	-2.294	129	.023	-.33632	.14659
	not assumed			-2.415	77.196	.018	-.33632	.13926
Z Score Fifth	assumed	4.720	.032	-1.614	129	.109	-.25486	.15788
	not assumed			-1.784	86.770	.078	-.25486	.14288

Because the *t* test for zone students by ethnicity showed a significant difference at fourth grade, a short-term univariate ANOVA was performed for both African-American and Hispanic groups to determine if there was a significant improvement or decline from third to fourth grade. Table 59 shows results of the univariate analysis, where African-American students reported a *p* value of .276, and Hispanic students had a *p* value of .001, meaning that Hispanic students showed a significant decrease in z scores from third to fourth grade. Given that the *t* test showed a significant gap between Hispanic and African-American zone students in fourth-grade reading, the gap is most likely attributed to the statistically significant drop in scores of Hispanic students from third to fourth grade.

Table 59

ANOVA for Reading Scores of Zone Students Change from Third to Fourth Grade by Ethnicity

Group	Value	F	Hypothesis df	Error df	*p* value
African American	.968	1.223[a]	1.000	37.000	.276
Hispanic	.882	12.265[a]	1.000	92.000	.001

Reading Scores for Male Students

As was done with math, z scores in reading for male and female students were examined in the study. The data for both groups of male students exhibited a decline each year in the mean z scores as well. Beginning in third grade, the male magnet students had a mean z score of -.0268, which then dropped to -.0777 in fourth grade, and dropped once again in fifth grade to -.3121. The male students from the zone schools, who in third grade had a mean z score of -.5279, decreased in mean for fourth grade to -.5981, and finally ended where $\bar{x} =$ -.6814 in fifth grade. Mean z scores for both the magnet and zone male students dropped each year on the reading EOG test. Table 60 shows the means and standard deviations of z scores for male magnet and zone school students.

Table 60

Male Student Reading Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade reading	Magnet	-.0268	.67794	36
	Zone	-.5279	.80600	78
Fourth-grade reading	Magnet	-.0777	.75307	36
	Zone	-.5981	.78572	78
Fifth-grade reading	Magnet	-.3121	.64719	36
	Zone	-.6814	.83996	78

Figure 17 illustrates the changes in mean z scores for male students on the reading EOG test.

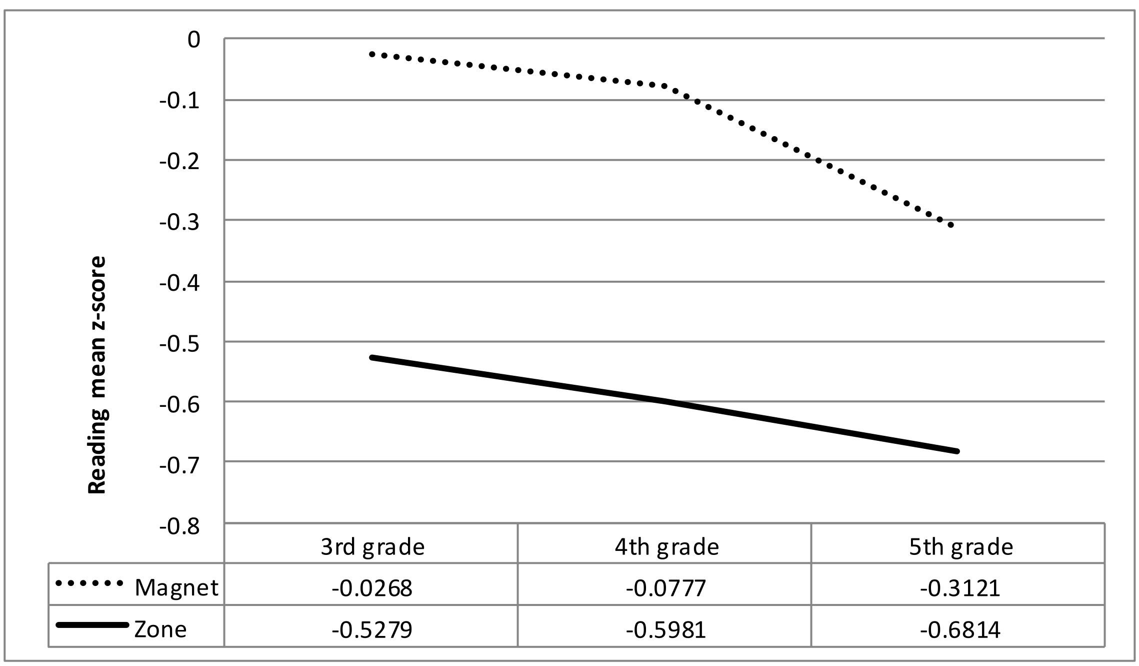


Figure 17. Plot of Mean z Scores for Male Students on Reading EOG Test.

The researcher then performed a repeated-measures, univariate ANOVA on all reading scores for male students to determine if male students performed similarly over

time, whether attending a magnet or zone school. As shown in the univariate analysis report in Table 61, where $p = .358$, there was no interaction that occurred between the male magnet and zone students over time on the reading EOG test.

Table 61

Male Student Reading Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.982	1.036	2.000	111.000	.358

Reading Scores for Female Students

Female students at the magnet schools had a mean z score of -.2943 in third grade, which then grew to -.1749 in fourth, but fell again in fifth grade to -.3772. Female students who attended a zone school followed nearly the opposite. They began with a higher mean z score than the magnet students in third grade, where $\bar{x}$=-.1596. However, unlike the female magnet students who showed growth in fourth grade, the female zone students' z scores decreased to an average z score of -.3816. However, in fifth grade, female students in the zone schools improved to a mean z score of -.2703, which was higher than the female mean z score from the magnet schools.

Table 62

Female Student Reading Descriptive Statistics

	Group	Mean z score	Std. Deviation	N
Third-grade reading	Magnet	-.2943	.78359	35
	Zone	-.1596	.67317	53
Fourth-grade reading	Magnet	-.1749	.78643	35
	Zone	-.3816	.74447	53
Fifth-grade reading	Magnet	-.3772	.79082	35
	Zone	-.2703	.74474	53

Figure 18 illustrates the change in mean z scores over time for the female students, where the groups intersected between years of the study.

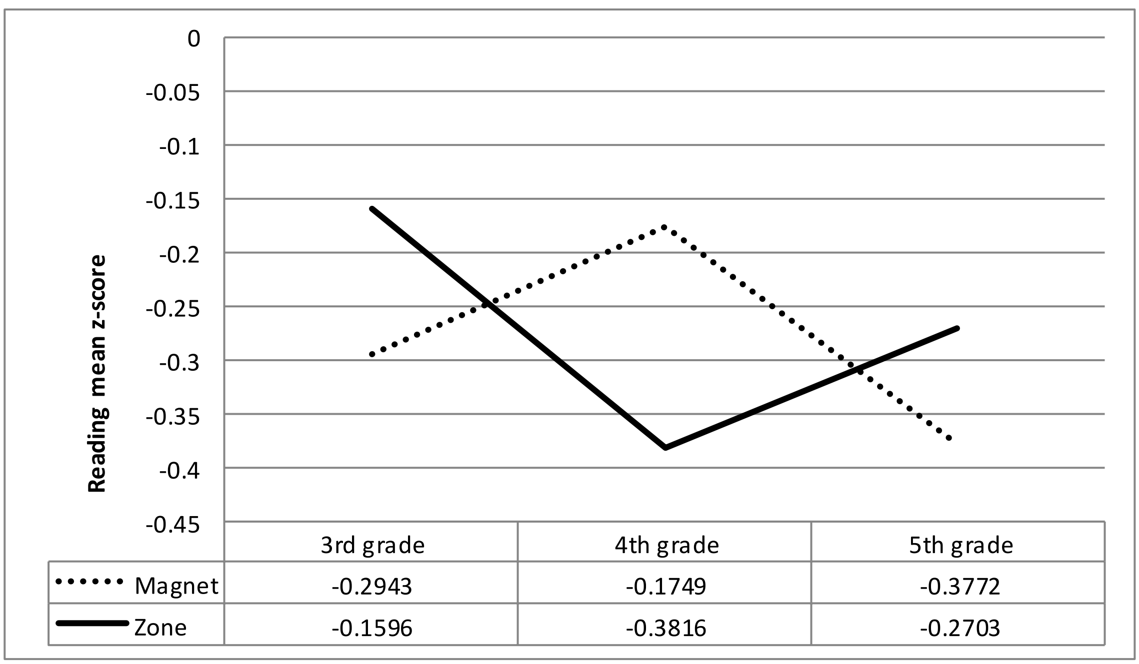


Figure 18. Plot of Mean z Scores for Female Students on Reading EOG.

The researcher wanted to determine if the type of school impacted the performance for female students in reading. A repeated-measures, univariate ANOVA of

the female reading scores helped determine that female magnet and female zone students performed significantly differently over time. This data is displayed in Table 63 which shows a *p* value of .000.

Table 63

Female Student Reading Univariate Analysis

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.810	9.940	2.000	85.000	.000

The researcher then ran *t* tests on the reading scores at each grade level for female students to determine at which grade the significant differences in z scores occurred between magnet and zone students. Where Levene's test for equality of variances results in a significance level of greater then .05, variances are assumed equal, and that significance level is used to determine if there was a significant difference between the two groups at that point in time. Table 64 displays the *t* test results. All variances were assumed equal, and the significance level was .392 for third grade, .157 for fourth grade, and .626 for fifth grade. This means that there were no significant differences between reading scores for female students between the magnet and zone schools at any grade level.

Table 64

Female t Test Results for Reading

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	3.318	.072	-.861	86	.392	-.13477	.15657
	not assumed			-.834	65.106	.407	-.13477	.16153
Z Score Fourth	assumed	.020	.888	1.428	89	.157	.23761	.16645
	not assumed			1.418	70.707	.161	.23761	.16759
Z Score Fifth	assumed	.050	.824	-.489	89	.626	-.08026	.16403
	not assumed			-.482	68.853	.631	-.08026	.16646

Table 65 shows the results of the univariate analysis by grade level for magnet students. The only significant change in performance within the magnet group for females occurred from fourth to fifth grade, where $p = .002$. Since the mean z score for fourth grade is higher than fifth grade, this means that the female magnet students performed significantly lower in fifth grade than they did in fourth grade.

Table 65

Female Student Univariate Analysis for Magnet Schools on Reading Test

Time	Value	F	Hypothesis df	Error df	*p* value
3 to 4	.911	3.329[a]	1.000	34.000	.077
4 to 5	.750	11.309[a]	1.000	34.000	.002

A univariate analysis was also performed on the scores for female students who attended zone schools. Table 66 shows the univariate analysis report for those students. The data show that female students who attended a zone school performed significantly differently in fourth grade than they did in third. Since the mean of the z scores for

fourth grade is less than the mean for third grade for the students, the data exhibit that female students who attended a zone school performed significantly worse in fourth grade on the reading EOG than they did in third grade.

Table 66

Female Student Univariate Analysis for Zone Schools on Reading Test

Time	Value	F	Hypothesis df	Error df	*p* value
3 to 4	.771	15.468[a]	1.000	52.000	.000
4 to 5	.936	3.731[a]	1.000	55.000	.059

Reading Scores for Magnet Students Comparing Gender

A repeated-measures ANOVA performed using the scores for magnet students which examined the interaction between male and female magnet students over time showed that magnet female and male students did not perform differently over time. Table 67 shows the analysis with a *p* value of .213.

Table 67

Univariate Analysis for Magnet Student Reading EOG by Gender

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.956	1.583[a]	2.000	68.000	.213

Reading Scores for Zone Students Comparing Gender

Table 68 shows that female zone students had a mean reading z score of -.0182 in third grade, -.2321 in fourth grade, and -.2267 in fifth grade. Male zone students averaged a higher z score at fourth grade only, where $\bar{x}$=-.1761. The mean reading z score for male zone students was -.0717 in third grade and -.3147 in fifth grade.

Table 68

Descriptive Statistics for Reading for Zone Students by Gender

	Group	Mean z score	Std. Deviation	N
Third-grade reading	F	-.0182	.68661	56
	M	-.0717	.78386	79
Fourth-grade reading	F	-.2321	.66188	56
	M	-.1761	.80961	79
Fifth-grade reading	F	-.2267	.72892	56
	M	-.3147	.74019	79

Figure 19 is a visual representation of the mean z scores of male and female zone students and their performance on the EOG test in reading.

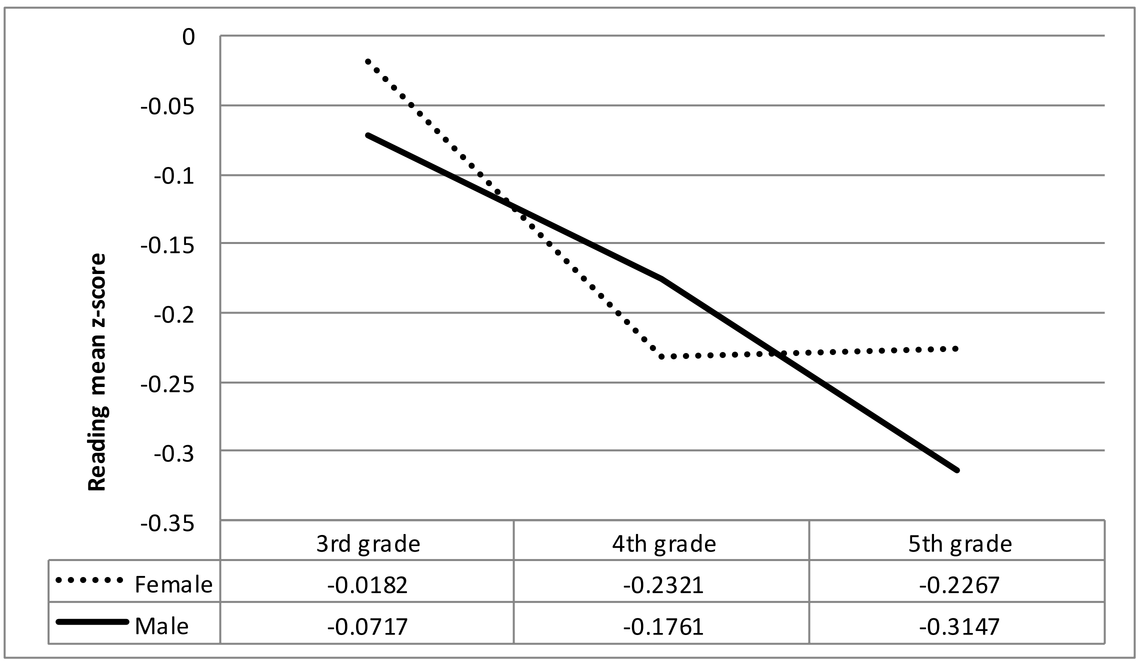


Figure 19. Plot of Mean z Scores in Reading for Zone Students by Gender.

Opposite of magnet students, male and female zone students, as indicated through a repeated-measures ANOVA, performed differently over time on the reading tests.

Table 69 shows the results of this univariate analysis for zone students by gender on the reading EOG tests.

Table 69

Multivariate Analysis for Zone Student Reading EOG by Gender

	Value	F	Hypothesis df	Error df	*p* value
Time * Group	.949	3.430[a]	2.000	128.000	.035

Because there was a significant interaction over time, a *t* test was used to determine at which grade levels the significant differences occurred between male and female zone students in reading. Table 70 shows the results of the *t* tests for the zone students grouped by gender. The *t* tests revealed that a significant difference existed between male and female students at third grade and fifth grade only. Levene's test for equality of variances showed a significance level at .043 in third grade, so the variance is not assumed. However, in fourth and fifth grades, equal variances are assumed because Levene's p value was $\geq .05$. In third grade, the p value was .005, and reference was made that female students performed significantly better than male students at third grade because the mean z score for female students is greater than that of the males. Similarly in fifth grade, the female students performed significantly higher than the male students, where p=-.2267 for female students and p=-.3147 for male students.

Table 70

Reading t Test for Zone Students Comparing Gender

		Levene's		*t* test for Equality of Means				
		F	Sig.	t	df	*p* value (2-tailed)	Mean Difference	Std. Error Difference
Z Score Third	assumed	4.196	.043	-2.739	129	.007	-.36829	.13445
	not assumed			-2.835	123.506	.005	-.36829	.12992
Z Score Fourth	assumed	.014	.906	-1.492	133	.138	-.20436	.13699
	not assumed			-1.503	121.710	.135	-.20436	.13595
Z Score Fifth	assumed	1.007	.318	-2.823	133	.005	-.39499	.13992
	not assumed			-2.883	126.594	.005	-.39499	.13700

Overall Summary

The overall repeated-measures, univariate ANOVA performed on math scores for all subjects in the study showed a significance level of .007, meaning that a strong interaction occurred between magnet and zone groups over time and that magnet and zone students performed significantly differently from each other over time.

Summary-Math

A repeated-measures, univariate analysis of all math scores that examined difference-over-time between all magnet and zone students revealed a *p* value of .279, meaning that the magnet and zone students performed similarly over time in math. The post-hoc contrast for all math scores revealed that scores did decline significantly for zone and magnet students in math over time, where p=.000.

To disaggregate the data by subgroups, the researcher performed a univariate, repeated-measures ANOVA of math scores using only African-American students for the population. The results from this ANOVA showed a significant interaction between African-American magnet and African-American zone students over time, with a *p* value

of .005. *T* tests were then performed to analyze whether African-American magnet and zone students had significant gaps between the groups at each specific grade level, but the *t* tests showed there were no significant differences between the two groups at any specific grade level. A repeated-measures, univariate ANOVA for math scores of Hispanic students was also performed to examine differences over time between Hispanic magnet and zone students, and this test showed that the groups did perform significantly differently over time. *T* tests for Hispanic magnet versus zone students revealed that Hispanic magnet school students scored significantly higher than Hispanic zone students in fifth grade.

To help understand the performance in math within each school setting, the researcher performed a repeated-measures univariate ANOVA that analyzed whether significant differences occurred throughout the entire study between African-American and Hispanic students at magnet schools only. The test revealed a significant interaction between the two ethnic groups over time, with the Hispanic students performing significantly higher on the fifth-grade EOG test, partly because African-American magnet students showed a significant drop from fourth grade. A similar ANOVA performed on the math scores for all zone students related to ethnicity reported a *p* value of .012, interpreted to mean that Hispanic and African-American zone students also performed significantly differently from each other over time in math. *T* tests on zone students by ethnicity showed that no significant gaps occurred at any grade level between the two ethnic groups, but the Hispanic zone students did show a significant drop from fourth to fifth grade in math scores.

In an effort to determine if magnet or zone schools impact student achievement with regard to gender, the researcher used a repeated-measures ANOVA to create a

significance level that showed whether male students performed differently in math if they attended a zone or a magnet school. This ANOVA revealed that male students performed similarly in math regardless of the school they attended during the study. A similar ANOVA using female student scores also showed that the type of school, either magnet or zone, did not significantly affect the performance of female students in math.

Since gender might help explain differences in math at magnet and zone schools, the researcher performed a repeated-measures, univariate ANOVA on math scores for magnet students, using gender as the groups for the test. This ANOVA determined that male and female students performed similarly over time in math at the magnet schools. A similar ANOVA was conducted to examine if male and female zone student scores interacted over time in math, which they did not, meaning male and female students performed similarly at the zone schools.

Summary-Reading

When examining reading scores, the researcher first performed a repeated-measures, univariate ANOVA of all reading scores that compared magnet students versus zone students. This test showed that there was a strong interaction across time for magnet and zone students in reading, where $p = .005$, meaning the groups performed differently throughout the study. This ANOVA was followed by univariate analyses that examined change over time separately for third to fourth and fourth to fifth grades and was divided by magnet and zone students. The analysis for magnet students revealed a significant decrease in reading z scores from fourth to fifth grade, and the analysis for zone students showed a significant decrease from third to fourth grade. A *t* test of reading scores done for each grade level examined whether significant differences occurred at each of the third, fourth, and fifth grades between magnet and zone students.

The results of these *t* tests showed that magnet students scored significantly higher than zone students in reading at fourth grade.

Another repeated-measures ANOVA using only scores from African-American students in reading showed that African-American students performed similarly regardless of whether they attended a magnet or zone school. A post-hoc contrast revealed that overall reading scores, a combination of zone and magnet, for African-American students changed significantly over time. Using similar tests on Hispanic student reading scores, a repeated-measures ANOVA showed that Hispanic students did not perform significantly differently in zone or magnet schools over time in reading.

Of students who attended a magnet school, ethnicity did not appear to affect reading scores, where a univariate, repeated-measures ANOVA reported a *p* value of .627. This test was followed by a post-hoc report which revealed that the combined African-American and Hispanic magnet student scores changed significantly over time. Identical results were seen when comparing the performance of African-American and Hispanic students at zone schools in that the groups did not interact over time, but the combined reading scores changed significantly over time.

Male and female tests were also run for reading to determine if differences existed between the magnet and zone students over time with regard to gender. The male students had a *p* value of .358, where no interaction occurred over time. However, the female students had a *p* value of .000, and therefore displayed a strong interaction between female magnet and female zone students over time in reading. Univariate ANOVA tests performed in reading which examined the change from third to fourth and fourth to fifth grades showed that the female magnet students had a significant increase from fourth to fifth grade, and that the female zone students had a significant decrease

from third to fourth grade. A *t* test in reading for female students, designed to examine differences between the groups at each specific grade, showed that there was no significant difference in female reading scores between zone and magnet students.

Chapter 5: Discussion

Introduction

The purpose of this study was to examine the differences in growth on NC EOG tests in reading and math between students who attend a magnet school and live in the residential area for that school and students who attend a zone school and live in the residential boundary for that school. A review of the literature determined that magnet schools have the potential to help students achieve academic growth more easily than traditional schools, and this difference usually occurs after the magnet school is comprised of a more diverse student population. Some magnet schools are dedicated magnet schools, meaning they only have students who applied to attend that school, with no students attending the school simply by where they live in the school district. This study focused on magnet schools that are not dedicated magnets but instead have a population of students who attend the school because they live in an area of the school district for that school.

The interest in conducting this study came from the knowledge that nationally large amounts of money are spent each year on magnet programs that are designed to improve academic achievement for students attending low-performing schools by attracting interested students to that school. In an economic period when the amount of money spent on education has been reduced, it is important to understand the efficacy and validity of all programs so that limited dollars can support only the most successful programs. This study showed that magnet students, in general, performed better than zone students on fourth- and fifth-grade math EOG tests as well as third-, fourth- and fifth-grade reading EOG tests.

Academic growth was compared between zone and magnet students, African-

American and Hispanic students, and male and female elementary students in Grades 3-5. The data showed that overall there was a significant interaction between the magnet and zone groups over time, meaning that they performed differently throughout the course of the study. After reviewing univariate tests and *t* tests, the data revealed that the students who attended the magnet schools only performed significantly better than the zone students on the fourth-grade reading test. The following questions guided the research in this study.

Research Question 1. Do residential minority students attending elementary magnet schools achieve greater academic growth on the NC EOG test in mathematics compared to residential minority students in zone elementary schools in a large urban school district in North Carolina?

Research Question 2. Do residential minority students attending elementary magnet schools achieve greater academic growth on the NC EOG test in reading compared to residential minority students in zone elementary schools in a large urban school district in North Carolina?

To answer these questions, the study used quantitative data from the NC EOG tests from the 2009-2010, 2010-2011, and 2011-2012 school years. The study took place in a large urban school district with approximately 52,000 students in northwestern North Carolina. For the 2009-2010 school year, the district consisted of 30% African-American, over 17% Hispanic, and more than 44% Caucasian students. In that same year, the district had five elementary magnet schools, two non-traditional elementary schools, and 37 zone elementary schools. Students included in the study attended one of three magnet elementary schools or attended one of three matched zone elementary schools for third grade in the 2009-2010 school year and completed fifth grade in the

2011-2012 school year.

Restatement of the Problem

The United States Department of Education spends nearly $100 million each year on magnet school program funding in an effort to increase diversity and achievement at low-performing schools with a high-minority population (U.S. Department of Education, 2004a). A lack of research exists as to whether a magnet program alone impacts minority achievement. A contributing factor to the success of a magnet school may be the number of children who choose to attend from other parts of the school district. Because parents of these students have to make a choice for their child to attend the school rather than simply live in that area, those students can positively contribute to the school's overall test data. Parental involvement has been shown to have a positive impact on student achievement (Beverly, 2009). For this study, the researcher examined data that did not include any students who chose to leave their residential zone and travel to attend the magnet school.

Magnet programs are most often placed in schools that struggle academically and need to diversify their student population (Ballou et al., 2006). Some schools that have a large percentage of minority students need to improve test scores (Bifulco & Ladd, 2006). Often accompanied by federal grant money, magnet programs have been used for decades to diversify school populations in the hope that the mixed-study body will improve achievement.

Overview of Results

The first test performed in this study was a mixed, two-factor, repeated-measures ANOVA. A multivariate repeated-measures analysis examines multiple variables to see if the groups act similarly over the course of the study. The multivariate analysis resulted

in a *p* value of .007, which means there was a significant interaction between the groups over time and that magnet and zone students overall performed significantly differently. The separate repeated-measures ANOVA tests for math and reading revealed that there was not a significant interaction between the magnet and zone groups over time in math, where p=.279, but magnet and zone students did perform significantly differently throughout the study in reading, based on a *p* value of .005. *T* tests were then performed on reading scores at each grade level to determine if there were significant differences between magnet and zone students at any specific grade in reading. The *t* tests revealed that magnet students performed significantly better in reading at the fourth-grade level only.

However, the significance levels for Grades 3 and 5 were .051 and .113, respectively. While not significant, there was a clear trend that reading scores for magnet students were higher than zone students at all grade levels in reading.

Math Test Results

In order to address each research question and determine whether the differences over time between magnet and zone students occurred in math or reading, a univariate, repeated-measures ANOVA was completed first for math scores. The results from that analysis determined that there was not a significant interaction between the magnet and zone schools over time. However, a post-hoc contrast showed that the combined math scores of magnet and zone students changed significantly over time. Though magnet and zone students did not perform differently over time, the researcher was interested in discovering whether other variables such as race or gender influenced achievement at zone or magnet schools.

A repeated-measures, univariate ANVOA of math scores for African-American

students showed that magnet and zone students performed significantly differently in math over time with a *p* value of .005. *T* tests on African-American students' scores revealed that there was no significant difference at any specific grade level between magnet and zone students in math. The researcher then performed a univariate ANOVA between third- and fourth-grade results and then between fourth- and fifth-grade results, where African-American students at magnet schools showed a significant drop in scores from fourth to fifth grade, while the zone students had significant growth from third to fourth grade.

The results of a repeated-measures, univariate ANOVA that examined performance in math of Hispanic magnet versus Hispanic zone students over all 3 years of the study showed that Hispanic students who attended a magnet school performed significantly differently over time in math when compared to Hispanic zone students. The researcher then performed short-term repeated-measures ANOVA tests to determine if Hispanic magnet or Hispanic zone students showed significant changes between third and fourth grade and then between fourth and fifth grade. While Hispanic magnet students showed no significant changes over time, the Hispanic zone students had significant decreases in performance from third to fourth grade and from fourth to fifth grade on their math tests. One limiting factor in the study that may provide an explanation could be that language infusion at the magnet schools helped the Limited English Proficient Hispanic students improve literacy in English which contributed to math success. Students in zone schools may not have received as much integration of language arts in their math instruction. The researcher performed a *t* test for each grade level to examine gaps in math scores between Hispanic magnet and Hispanic zone students. The fifth-grade *t* test for Hispanic students showed that the magnet students

performed significantly better than the Hispanic zone students.

A repeated-measures, univariate ANOVA, evaluated math scores of magnet students according to ethnicity to determine if African-American and Hispanic students performed differently over time at the magnet schools. The results of this test revealed a *p* value of .032, meaning that there was significant interaction over time between African-American magnet and Hispanic magnet students in math. A *t* test at each grade level to observe differences between African-American magnet and Hispanic magnet students showed significance only in fifth grade, where the Hispanic students scored significantly higher than African-American students on the math test. African-American students demonstrated a significant decrease from fourth to fifth grade, while Hispanic students showed an increase that was not significant.

A univariate ANOVA that examined scores of African-American zone versus Hispanic zone student scores in math revealed that African-American zone and Hispanic zone students interacted over time with a *p* value of .012. While there were no significant differences at each grade according to *t* test results, a closer look at the change in scores from fourth to fifth grade showed that Hispanic students exhibited a significant decrease in scores which caused the groups to have a significant interaction from fourth to fifth grade only.

The researcher then performed a repeated-measures, univariate analysis for all grades to determine if there were significant differences over time in math performance between male and female magnet students. While the *p* value showed that there was no significant interaction between the groups over time, the male magnet students performed significantly higher than female magnet students on the third- and fourth-grade math EOG tests. One of the magnet schools in the study used kinesthetic learning activities in

the math class. Research shows that hands-on learning is more beneficial to male students than female students (Erwin, 2010). Third- and fourth-grade male magnet students who took the math EOG test were the only subgroup in the entire study who reported a positive average z score for the relative year. Reviews of lesson plans and observations show that teachers regularly utilized activities that involved movement to teach math to the students at the magnet schools. With regard to the original univariate analysis that measured whether the magnet and zone students performed differently over time in math, where p=.279, it should be noted that although there was no significant interaction between the groups, the magnet students reported higher average math z scores at each grade level than the zone students.

Reading Test Results

A univariate, repeated-measures ANOVA for all reading test scores showed that the magnet and zone groups interacted significantly over time with regard to reading EOG scores, meaning that it is possible the type of school influenced the student performance. A p value of .005 revealed that this interaction was highly significant for the entire study. This original ANOVA for reading was followed by separate univariate analyses that explored the differences between third- and fourth-grade results and between fourth and fifth grades within each magnet and zone group. By performing this univariate analysis to show change over time, the study revealed that zone students showed significant changes in their performance in reading from third to fourth grade (p=.001). The magnet students, however, showed significant changes in their scores from fourth to fifth grade (p=.000).

A t test was used to determine at which grades a significant difference in reading scores occurred between magnet and zone students. The third-grade difference was not

significant, p=.051. However, a p value so close to .05 clearly demonstrates a positive difference in favor of magnet students. The p value at fourth grade (p=.000) revealed that there was a significant difference between magnet and zone students on the fourth-grade reading EOG tests. Since the mean z score for magnet students was higher than the mean for zone students, it can be stated that the magnet students performed significantly better than the zone students on the fourth-grade reading EOG test. The t test for fifth grade, p=.113, did not show a significant gap between scores for the magnet and zone students, but like the third grade, a p value close to .05 demonstrates a positive difference in favor of magnet students.

However, a repeated-measures ANOVA which examined change in reading scores from fourth to fifth grade showed significant decrease (p=.000) for the magnet students, where the mean z score dropped from -.1256 to -.3442. While the magnet students did not show a significant increase from third to fourth grade, where p=.592, the zone students reported a significant decrease from third to fourth grade, with a p value of .001.

The researcher performed a univariate ANOVA to determine if African-American magnet and zone students performed significantly differently from each other over the entire study in reading, which the ANOVA revealed they performed similarly with a p value of .192. A post-hoc contrast showed that the combined scores changed significantly over the time of the study.

Similarly, Hispanic magnet and zone students performed alike throughout the study, but the combined scores for Hispanic magnet and zone students did not change significantly in the study. A t test of the reading scores comparing differences between Hispanic magnet and zone students at each specific grade level showed that a significant

difference did exist between Hispanic magnet and zone students in fourth grade, where *p*=.008, and the magnet students performed significantly better than the zone students.

The researcher then used a repeated-measures, univariate ANOVA to discover whether African-American and Hispanic students performed similarly at magnet schools throughout the course of the study in reading. A similar ANOVA was completed for zone students, which compared scores for African-American and Hispanic students over the 3-year period. In both of these tests, African-American and Hispanic students performed similar to each other at both magnet and zone schools.

In an attempt to examine data for as many subgroups as possible for this study, the researcher used SPSS to perform a univariate, repeated-measures ANOVA that calculated whether male magnet and male zone students performed differently over time in reading. This ANOVA for reading showed that the two groups did not interact over time, where *p*=.358, but a post-hoc contrast revealed that the combined scores of male magnet and male zone students dropped significantly throughout the study. *T* tests were performed for each grade level to determine if there was a significant difference in reading scores between male magnet and male zone students. These *t* tests showed that there was a significant difference at every grade level between male magnet and male zone students, with magnet students scoring higher than zone students each year.

A repeated-measures, univariate ANOVA that compared all 3 years of z scores for female magnet and female zone students over time showed that the two groups performed significantly differently over time, with a *p* value of .000. The researcher performed univariate ANOVA tests that examined female magnet and female zone students separately, with repeated measures from Grade 3 to 4, and from Grade 4 to 5. The ANOVA for female magnet students showed a significant increase from fourth to

fifth grade, and the ANOVA for female zone students showed a significant decrease from third to fourth grade. The researcher then sought to answer whether these significant changes over time for female magnet and female zone students created any gaps in performance between the two groups at any point in the study. The researcher performed *t* tests at each grade level on z scores of female magnet and female zone students to determine if a significant gap occurred at third, fourth, or fifth grade. The results of the *t* tests showed that there were no significant differences between female magnet and female zone students at any grade level, although the original ANOVA for female magnet and female zone students that compared all their scores showed a significant interaction over time. Essentially, even though the female magnet and zone students performed differently over time, there were no significant differences between the groups at any specific grade level.

Summary of Statistical Tests

This study was conducted to determine if a school's magnet program impacted student achievement for children who attend the school because they live in the residential area in comparison to students from comparable backgrounds who were residential to similar non-magnet zone schools. The findings reflected a significant interaction between the groups over time; and by referencing the mean z scores, it was determined that the magnet students performed significantly better than the zone students on the reading test in fourth grade only and there was no significant difference in math. While most scores decreased over time for zone students in reading, it appeared as though students attending magnet schools maintained similar z scores in consecutive years of the study, indicating that the magnet school had a positive effect in comparison to zone schools on achievement in reading. *T* tests on subgroups revealed that Hispanic

students benefited significantly in math from attending a magnet school in fifth grade and also in fourth grade for reading.

Implications

While there was only one significant difference in math and reading comparisons between magnet and zone students (fourth-grade reading), the data show that the differences between magnet and zone students in Grades 3, 4, and 5 in reading were in favor of magnet students and significance levels were very close to .05. The *t* test for third-grade reading that compared all magnet and zone students revealed a *p* value of .051, and the fifth-grade *t* test had a significance level of .113. Though not statistically significant, the magnet students performed better than the zone students at all three grade levels in reading.

Female students at magnet and zone schools performed significantly differently over time in reading. Though *t* tests between female magnet and female zone students did not reveal any significant differences between the two groups at any grade level, short-term ANOVA tests that examined differences within each group between third- and fourth-grade results and between fourth- and fifth-grade results showed female magnet students may have been a strong contributing factor to the decline in all magnet school reading scores from fourth to fifth grade, where they had a significant drop, p=.002. Similarly, the data showed that male zone students appeared to make a significant contribution to the decline in overall zone scores for reading from fourth to fifth grade.

This study was very unique. By carefully controlling variables that may have impacted student achievement, such as school size and demographics, the researcher was able to gain a better understanding of the impact that a magnet program may have on residential students attending that magnet school. The researcher was unable to find any

other studies that only examined the test results for students who attended a magnet school and were residential to the school. Most research on magnet schools studies the effect of the program on students who select to go to the school or the achievement of all the students at the school. Since the analysis revealed that the magnet students outperformed zone students in reading at Grades 3, 4, and 5, the researcher concluded that the additional money required to operate the magnet schools is a worthwhile investment.

Additional Limitations

1. The sample size was 202 minority students who chose to attend their residential magnet or zone school. This is a relatively small sample of the district's total minority population that chose to attend their residential school and may not necessarily be reflective of the total population. This means that the study is only generalizable to the schools studied.

2. The number of African-American and Hispanic male and female students in magnet and zone schools was too small to create separate subgroups. This prevented further analysis for race and gender together.

3. While no students who received special education services were included in the study, students who received Limited English Proficiency services were included. The performance of these students could have negatively impacted the reading scores in either zone or magnet schools.

4. Other environmental factors such as single-parent homes, family income, or parental involvement at the school were not identified and could influence student performance.

5. While participants in the study remained at the same school for the entirety of

the study, they had different teachers. Therefore, it is possible that there was some *teacher effect* that may have impacted specific grade levels where gaps occurred between zone and magnet students. Also, there was not a record available of the amount of staff turnover at the schools during the 3 years of the study; and, therefore, new teachers may not have been acclimated to the magnet setting.

Recommendations for Further Research

This study examined EOG scores from third to fifth grade for the residential magnet and zone students. The third-grade magnet student scores were much higher in reading and math than the zone student scores. While there may not have been a significant difference between magnet and zone students in third grade, it is still important to understand what occurred at the kindergarten, first-, and second-grade levels at the magnet schools that may have accounted for the higher student success at the third-grade level. An examination of scores on the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) assessment could help determine if there are early successes occurring in reading at the magnet schools that are not occurring at the zone schools. Similarly, a tool such as Early Math Diagnostic Assessment (EMDA) could be used to help determine if there are early successes at either magnet or zone schools in math.

Future research could also examine the impact of different magnet school themes on student achievement. Did the type of magnet, whether arts, science, International Baccalaureate, or other theme, affect the performance of various subgroups of students? This could help educators more narrowly define the needs for different ethnic groups at magnet schools and also determine which magnet programs may enhance learning and achievement for students.

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