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Impact Of Instructional Coaches On Elementary Mathematical Achievement

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IMPACT OF INSTRUCTIONAL COACHES

ON ELEMENTARY MATHEMATIC ACHIEVEMENT

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DEDICATION

In completion of this chapter in my life I would like to dedicate this paper along with the time and energy I have spent completing it to some very important people.

First, I would like to thank my son, Branson, for being my motivation. I began this process before you were ever born, yet you were on my mind the entire time. I hope that the foundation I have worked so hard to lay for you will ensure you have the best life possible and that you can achieve anything you set your mind to. Everything I do is for you, now and forever. I love you.

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ABSTRACT

Since the passage of the Elementary and Secondary Education Act of 1965, school leaders have sought to improve student abilities in both math and reading. Although both subjects have made improvements in both delivery and assessment over the years, mathematics still troubles the nation as students continuously fall short of local, state and federal goals (Darling-Hammond, 1998, 2005; Franke et al., 2005; Johnson & Johnson, 2002).

Instructional coaches have become a norm for many districts across the U. S. as districts seek to draw knowledge and leadership from mastery level teachers as they help improve everyday teaching and student learning. This study evaluates the impact of instructional coaches on student mathematic achievement in an urban mountainous school district in the Western United States. Students in grades first through sixth were administered two interim mathematic assessments during a school year that were created by a district team. Interim Assessment 1 set a baseline score for students as they were divided into classrooms where some teachers worked with a math coach and others did not.

Interim Assessment 2, administered late in the year, was used to measure growth and impact of instructional coaches as scores were compared for all students to the baseline developed earlier in the year. Initial implications indicate that the assessment used was flawed because the majority of students scored lower on the second assessment. The assessment was intentionally created to be harder to represent the expected growth that must take place to score proficiently on state accountability assessments. However, upon a closer inspection of change factors with weighted scores based on teacher ID,

levels of statistical significance did emerge. There were cases that teacher working with an instructional coach did show to have an impact on student achievement that did not occur in the classrooms where teachers did not work with a coach. This data was interpreted with a reflection of how instructional coaches could be assigned to specific classes by principals based on achievement needs.

Ultimately, instructional coaches did have an impact on the achievement of students in the classroom for grades second, third and sixth. Furthermore, additional information was deduced concerning sub-populations in the study and how instructional coaches did impact those groups. The results could influence how and where principals utilize instructional coaches in the mathematics classroom as well as seeing the largest gains in student achievement.

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CHAPTER 1: INTRODUCTION

In 2001, the implementation of the No Child Left Behind Act (NCLB) placed an increased emphasis on student performance and school accountability. Along with a high level of school accountability, instructional focus was placed on student achievement in mathematics and reading. To obtain the desired levels of performance, NCLB required professional development programs to incorporate coaching activities to develop a level of consistency in teaching over time (Kowal & Steiner, 2007).

Before NCLB, coaching was used to reinforce the training teachers received during professional development (Joyce & Showers, 1981). In 1983, the report *A Nation at Risk* highlighted the poor quality in teacher training programs, which in turn gave further confirmation in the need for instructional coaches. Research has attempted to explain the lack of improvement often experienced in teacher instruction and/or student performance citing the poor qualities and training of instructional coaches (Coggins, Stoddard & Cutler, 2003). School districts seeking to hire instructional coaches often pull highly effective teachers from the classroom on the basis that their personal abilities will transfer to teachers they are working with and in turn increase student performance (Knight, 2009).

Highly effective teachers possess an assortment of strategies that are used to obtain the best from every student in their classroom (Kruse & Kern, 2007). Transposing those skills from the setting of teacher-student to teacher-peer can become stressful for many instructional coaches (Taylor, 2008). Developing research identifies content knowledge, curriculum and pedagogy as key areas of expertise instructional coaches must possess, yet Borman and Ferger (2006) feel further research in developed relationships

and interpersonal communications could answer questions about coaching effectiveness. Given this knowledge, the purpose of this study is to identify any relationship between teacher perceptions of instructional coaches and student performance on standards based tests.

This study will be conducted using a selection of schools that do and do not utilize instructional coaches in the classroom. Through these results district personnel can determine the need or use of instructional coaches in mathematics. Districts that currently have active instructional coaches could find answers to how coaches can best benefit students in the district. These solutions may tie into district funding which is a major concern with many schools after facing recent budget cuts.

Instructional coaches invest both time and resources into classroom teachers in order to improve the quality of instruction for students. Wiseman, Allen, & Foster (2013) describe the investor as a person who gives others the ownership for results and invests in their success. It is the job of the investor to guide and nurture those around them, making sure they have the skills and resources needed to succeed. In exchange for their investments, a sense of accountability is given to make all involved a vital part of a successful process. Investors transfer accountability when placing responsibility on others (Wiseman, Allen, & Foster, 2013). The sense of accountability creates a positive environment because people are thought to perform their best when they are given responsibility and have someone counting on them.

Instructional coaches must be efficacious in more than one area in order to produce successful results from teachers (McCrary, 2011). Confidence is important for instructional coaches as they employ effective strategies helping teachers reach their full

potential. As an investor, instructional coaches create a sense of ownership, they will not leave a person to suffer alone or wait for them to fail (Wiseman et al., 2013). They create a relationship of guidance and protection, making sure they have the key elements in order to deliver on personal accountability. Instructional coaches, must not only engage people through delegating, they must be capable of extending the assignment in order to increase the thinking of those around them in pursuit of growth (Wiseman et al., 2013). Being successful as an instructional coach requires investing in others in a way that builds independence. In turn, independence allows teachers to become investors in students creating a cycle of learning and growth (Wiseman et al., 2013).

The financial strain placed on schools from state budget cuts force districts to place high emphasis on the instructional coach. Lack of money to buy new programs or materials requires a creative element to overcome the need to produce more with less. According to Wiseman et al. (2013) instructional challenges can be met by using multiplier logic, that is, the brain power currently existing in our organizations. Instructional coaches as investors must think and approach leadership differently to produce the required results and dramatically enhance student success.

Significance of Study

This study will attempt to find the academic value of instructional coaches. Accountability has forced schools and districts to look at alternative methods to help teachers work with and educate students. One method that has rose in popularity is the concept of instructional coaches. Coaches are usually implemented in math and reading courses and assist teachers in all aspects of learning. Coaches are usually experienced

teachers that can offer a high level of job embedded professional development for struggling schools. Districts and schools that seek to engage instructional coaches into the education structure will need to budget funds to pay for salaries, professional development, meetings, resources and other related expenses. Districts that want to get the most bang for their buck will want to know how well instructional coaches are at impacting school accountability scores. Teachers also need to know how well instructional coaches can impact learning in the classroom and their personal teaching practices. Teachers who seek to develop an optimistic outlook on academic achievement must develop a personal construct that refers to the impact they have on student learning and remove the bounds of self-worth and self-esteem of the individual (Akhavan, 2011). This study will add to existing literature on the value and worth of instructional coaches as seen through the eyes of teachers and the impact coaches have on academic achievement.

Research Question

1. Is there a difference in student achievement between students served by coached and non-coached teachers?

Definition of Terms

Academic Standard(s): Another name for Content Standard(s)

Accountability: The idea that students, teachers, administrators, schools, districts and/or states are held responsible for improving student achievement. This is usually measured through testing students on various individually state developed tests and measuring the success rates of the students to either the state's average score

(norm-referenced) or a score based upon success on the state's standards (criterion-referenced). Rewards and sanctions are then generally detailed in the form of labels to each student, school, and district. Other measures within accountability are, but not necessarily, dropout rates, attendance rates, longitudinal score range, percent tested, and student classroom work (Ravitch, 2007).

Achievement Gap: Persistent differences in achievement among different demographic groups of students as indicated by standardized test score results. The various demographic groups are based upon race, ethnicity, socioeconomic status, English language learners, and students with disabilities (Ravitch, 2007).

America 2000: President George H. W. Bush's educational summit plan for improving schools.

Coaching: Process of an instructional coach working with an individual teacher to improve teacher practice; often employing a cycle of planning, modeling, observing, reflecting and conferencing.

Common Core State Standards: National standards created by a consortium of states in the areas of mathematics and English language arts/literacy.

Criterion-Referenced Test: A test that measures student mastery of skills or concepts from a list of criteria, usually the state's content or performance standards (Ravitch, 2007).

Disaggregated Data: Data broken down into student subgroups such as race, gender or ethnicity (Bernhardt, 2000b; LaFee et al., 2002).

Formative Assessment: An assessment periodically given to gain information on what students have learned to guide future teaching or learning processes. Not usually used as an evaluation of student achievement but as a tool for teachers and administrators (Holcomb, 1999; LaFee et al., 2002).

Goals 2000: President Bill Clinton's education plan for improving schools. The plan came out of the reauthorization of ESEA and renames the Improving America's Schools Act (IASA).

Instructional Coach: Individual that provides professional development in a one-on-one relationship utilizing a cycle of planning, modeling, observing and reflecting.

Longitudinal Data: Data measured consistently over long periods of time to track changes from year to year. Students not contained in the original cohort should not be measured in the longitudinal data (LaFee, et al., 2002).

National Standards: Agreement at the national level about what students are supposed to learn in a given subject area (Ravitch, 2007).

No Child Left Behind Act of 2001: The reauthorization of the Elementary and Secondary Education Act of 2001 signed into law by President George W. Bush. The law stipulates that 100% of students will perform at grade level by 2014. States, districts and schools must take a series of steps toward this goal that focus intensively on challenging academic standards in reading, math and science. Annual testing and the disaggregated regular reporting in these areas are mandated. Districts and schools must account for the performance of every child and guarantee that there is a highly qualified teacher in every classroom (Public Law 107-110, 2002).

Pedagogy: How to teach, the act of educational practice.

Professional Development: The process that a professional group seeks to acquire more of the characteristics concerning their profession, and the improvement in quality of service provided by an individual (Koster, Dengerink, Korthagen, & Lunenberg, 2008).

Qualitative Data: Data not based directly on numbers. Data collected via interviews, focus groups or general observations (LaFee, et al., 2002).

Quantitative Data: Data that is directly based on numbers such as test scores or graduation rates (LaFee, et al., 2002).

Scientifically Based Research: A provision of NCLB mandating "research that involves the application of rigorous, systematic and objective procedures to obtain reliable and valid knowledge relevant to educational activities and programs" (PublicLaw 107-110, 2002, Sec. 9101, 37, (A)).

Self-Efficacy: "Beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1997, p. 2)

Standardized Test: A test designed to be administered and scored in a consistent manner to measure certain standards. The tests are usually multiple choice assessments (Ravitch, 2007).

Summative Assessment: An assessment given at the end of a learning period to determine student performance (LaFee et al., 2002).

Teacher-Efficacy: Teachers belief or conviction that they can influence how well students learn, even those who may be difficult or unmotivated (Cantrell & Hughes, 2008; Guskey & Passaro, 1994).

Limitations

Data collected and used in this study is geographically linked to the Salt Lake City School District for the 2013-2014 school year. Generalizations in this study were made with the following limitations in mind:

1. Teachers participating in this study could have been involved in additional improvement programs that were not identified in this study.
2. Not every coach spent the same amount of time with every teacher.
3. Findings from this study can be generalized only to schools with similar student demographics and a similar history of student achievement scores.
4. The school district chosen for this study works within a state that rolled out their new Common Core during the time of this study, coaches spent 20% of their time at central office creating new pacing guides, new curriculum maps and formative assessment aligned to the new Common Core.

Assumptions

1. All assessments were administered in a uniform method to uphold the fidelity of the test.
2. Scores obtained from student responses were received with an honest effort and are an accurate measurement of achievement.
3. Recording and coding test scores were completed without errors.

Summary

The single most important factor in improving student achievement is the classroom teacher (Cawelti, 1999; Darling-Hammond, 1997; Jordan, Mendro, & Weerasinghe, 1997; Kaplan & Owings, 2002; Sanders & Rivers, 1996; Wright, Horn, &

Sanders 1997). Education has required teachers to obtain ongoing professional development to sharpen their craft and engage students in learning. A long history of ineffective professional development has required a more differentiated approach to growing teacher effectiveness in the classroom. Teachers report they implement practices they learn in partnership four times more than during "sit and get" professional developments they are required to attend (Knight, 2007). Policymakers have adopted the idea of job embedded professional development through instructional coaches as a strategy to improve student achievement (Costa & Garmston, 2002; Gamse, Jacob, Horst, Boulay, & Unlu; 2008; Marsh et al., 2008; Walpole & McKenna, 2004). Many urban school districts have jumped on the instructional coach band wagon and implemented the use of these professionals in core curriculum classrooms. Some research suggests that instructional coaches support teachers and assist in the execution of classroom reform (Joyce & Showers, 1996; Wei et al., 2009). However, limited research offers insight into how classroom instructional coaches have a direct impact on student achievement (Gamse et al., 2008; Marsh et al., 2008). This study will seek to add to the lacking research and determine if the use of instructional coaches in the selected Western Mountainous School District had an impact on student performance and achievement.

CHAPTER 2: REVIEW OF THE LITERATURE

There is little question that coaching, when done effectively, can promote teachers' effective implementation of curriculum reform (Bruce & Ross, 2008; Campbell & Malkus, 2009; Wang, Lin, & Spalding, 2008). Coaches provide educators with guidance on using data to inform practices, these master teachers offer on-site and ongoing instructional support for teachers (Marsh, McCombs, & Martorell, 2010). However, coaching cannot impact student achievement without the buy-in of teachers. What matters most is that teachers transfer their newly learned skills to the classroom (McCrary, 2011).

Truesdale (2003) investigated whether a difference existed in the level at which a peer coached teacher, in comparison to a non-coached teacher, conveyed skills from professional development in the classroom. Findings showed that teachers who received peer coaching had a higher transferability of professional development than their peers (McCrary, 2011). Transferability is a product of teachers putting professional development into practice, receiving feedback from peers and reflecting upon their own performance in the classroom. Cornett and Knight (2008) also found that the transfer of knowledge from teachers was increased by additional support from instructional coaches.

In a study conducted by Marsh et al. (2010) it was concluded that teachers do attribute their coaches as being knowledgeable and helpful when the coach was focused on the individual teacher's needs. Coaches can be utilized to support implementation of particular instructional models, curriculum, or general instructional practices (Marsh, McCombs, & Martorell, 2010). Although instructional coaches implement strategies and practices in the classroom their role is often misunderstood by others. Instructional

coaches are neither teacher nor administrator; this complication in role identity places the instructional coach in isolation from other groups in the school setting (IRA, 2006; Sturtevant, 2003).

A critical component of the effectiveness of professional development is in the ability to collaborate (McCrary, 2011). Researchers found that the level of support teachers received from coaches was critical to the level of sustained improvement in daily instruction. This collaboration is essential because teachers are reluctant to relinquish their beliefs about teaching and learning, formed through their own experiences as a student (Lortie, 1975; Nespor, 1987; Pajares, 1992). It is clear that more research is needed in the area of coaching, research needs to be conducted on the relationship of what instructional coaches do and what teachers change (Vanderburg & Stephens, 2010). Limited research shows only a small amount of what coaches do to impact student achievement, but very little information from a teacher's perspective of what those coaches do that is helpful.

Accountability for All

In 2000, the United States recorded that high school graduation rates were at 69% for a standard four-year diploma (Barton, 2005). Compared to the 77% recorded in 1969 for the same four-year degree makes it easy to see why the United States has plummeted in national rankings. While other countries strived to make advancements in education, the United States had remained stagnant and failed to reform the educational construct. NCLB (2001) has attempted to make changes to the dynamics of academic achievement by introducing an accountability system that pressures both teachers and students to perform at their highest level (Darling-Hammond, 2010).

Accountability can be applied in a wide range of contexts and has numerous different meanings. Wiliam (2010) offers various definitions for accountable, including responsible, liable, answerable and blameworthy. Accountability - meaning "held to account" – would suggest that any person, organization or entity that is considered accountable must answer for their actions or inactions when compared to expectations. Schools are considered accountable to those who pay for the provisions of the services and to those who consume it (Wiliam, 2010). This would mean schools are accountable to taxpayers, parents (that are regarded as being consumers) and to the students they serve. In recent years the question of who are schools held accountable to (Bardach & Lesser, 1996; Wescott, 1972) has been extended to include employers and educational institutions attended by students. When education fails and students are not meeting benchmarks, the social and financial cost are born by the whole of society (Wiliam, 2010). Therefore, the system is held accountable to all of society, because the success or failure of the system has an impact on our civilization. Feinstein, Budge, Vorhaus, & Duckworth (2008) agree that educational success increases the pool of individuals engaging in citizenship and "pro-social" behavior. Whereas failure leads to decreased public spending, broadened social welfare and increased crime rates (Carneiro, Crawford, & Goodman, 2007).

With accountability in place, focus has been placed on the achievement gap between students of minority and white students (Darling-Hammond, 2010). However, this gap has only seen slight fluctuations over the last two decades. Other countries have seen more prominent educational growth and a decrease in gap scores while the United States has lagged behind. Teachers possess the ability to change these outcomes by using

their academic backgrounds and experiences learned through gaining certification to significantly impact student achievement levels (Midgley, Feldlaufer, & Eccles, 1989).

One year with an ineffective teacher can lower a students' academic achievement for years to come (Pajares, 1996). Two ineffective teachers in a row results in a significant deficit in achievement that many students fail to come out of (Darling-Hammond, 2009). Researchers in Tennessee (Sanders & Rivers, 1996) compared growth of fifth grade students over a three-year period and found that those students who had effective teachers scored in the 96th and 84th percentiles on average in state math assessments. Those students sitting under ineffective teachers finished in the 44th and 29th percentiles respectively on the same state math test. Comparatively, students with ineffective teachers three years in a row score an average of 50 points below students that did not have ineffective teachers three years in a row (Peske & Haycock, 2006).

In 2007, Jordan, Mendro, and Weerasinghe confirmed similar research by tracking a group of third grade students based on reading data. Students that had a percentile scale scores of 60 were selected for the study. After three years, findings show that the sixth grade students were several quantiles apart. Students that were assigned to effective teachers over the three years scored around the 70th percentile while those assigned to ineffective teachers three years in a row finished near the 40th percentile.

During a ten-year span from 1987 to 1997, New York City's Community School District #2 sought to increase student achievement through professional development (Elmore & Birney, 1998). District #2 was composed of over 22,000 students, speaking over 100 different languages. 70% of students were of color and the majority were from low-income families. Professional development was job embedded and focused on

improving teachers' ability. Within this timeframe District #2's reading and math achievement rose above state norms and New York City averages.

With the achievement gap remaining relatively unchanged over the last twenty years and research pointing to teacher quality as the answer to student achievement, the United States has set the stage for job embedded professional development for teachers. Pre-service teachers must ensure that their training ranks at the highest quality and that they are the most prepared individuals for today's classrooms. Traditional training for teachers in the United States comes from "sit and get" professional development (Darling-Hammond, 2009, 2010). Compared to other countries that are surpassing the U.S., professional development looks very different. U.S. teachers are forced into meetings that are often not related to the content they teach and trained to receive theoretical information that rarely has follow up sessions to assist in retention of materials. In the majority of top performing countries, such as Japan, teachers work together for an extended amount of time examining a lesson and the student data collected on that single lesson (Darling-Hammond, 2010). This collaborative effort in professional development builds content knowledge for the teachers as well as their efficacy beliefs (Woolfolk, Rosoff, & Hoy, 1990).

Efficacy

Bandura (1977) defines efficacy as the ability of an individual to organize and execute a course of action to achieve a desired outcome. Self-efficacy is a judgment of capability to complete a task or reach a goal. Self-efficacy is not the level of competence a person holds but the perception of competence. An individual could have the ability to

draw, learn a second language or learn to cook but without the desire to do those things accomplishing the task will have no effect on his or her self-esteem (Bandura, 1977).

Bandura (1986) proposed four sources of efficacy expectations: Physiological and emotional states, social persuasion, mastery experiences and vicarious experiences. The most powerful source of efficacy reinforcements is mastery experiences. Perceptions of successful task completion reinforce the amount of effort individuals put forth in a continued cycle. This cycle can be a positive or negative phenomenon. When another person models a skill the result becomes a vicarious experience. A strong connection between the observer and one who models has the greatest impact on efficacy. Social persuasion that accompanies classroom modeling in the form of a pep talk or positive feedback contributes to an increase in self-efficacy (Bandura, 1986, 1997).

For teachers, efficacy becomes the ability to provide instruction within a content area and impact student achievement (Shidler, 2008). Research has shown that a teacher's sense of efficacy indicates the amount of time spent on teaching content and achievement outcomes (Gibson & Dembo, 1984). Efficacy can be composed of three sub-levels: efficacy in student engagement, efficacy in instructional practices and efficacy in classroom management (Tschannen-Moran & Woolfolk-Hoy, 2001). These constructs can be used to identify the overall efficacy a teacher holds and how that relates to student achievement.

No Child Left Behind and Reading First projects have used coaching as a tool to increase teacher efficacy as part of state reform in teacher instruction (Shidler, 2008). Policy makers that have sought to increase teacher performance and student outcomes push to incorporate coaching in teaching methodology. Teachers that hold a high level of

efficacy believe in the ability of students to be successful and in turn devote more time and effort into teaching (Vartuli, 2005). Instruction is clearly given and delivery intensifies to produce better outcomes. Efficacious teachers show a high level of persistence in working with low achievers and an openness to new ideas to meet the needs of the children in their classrooms (Guskey, 1988; Stein & Wang, 1988). They self-reflect and look for the flaws in their own instruction and work to change failed situations. Through believing in themselves they begin to expect more. Conversely teachers that lack high levels of efficacy place blame on student ability, character deficiencies and poor home lives as reasons for failure (Ashton & Webb, 1986).

Guskey (1984) discovered that self confidence in content specific teaching ability was the effect of high levels of teacher efficacy. A positive attitude coupled with the belief that success was attainable increased student achievement rates. Efficacy can be increased through targeted instruction in content specific areas when teacher confidence increases by successful delivery of subject matter. Increasing efficacy in this approach must be organized around common bodies of knowledge as opposed to general abilities for all to be effective (Resnick, 1987).

In 1976, RAND published the results of an investigation where minority student achievement in reading was impacted by teacher efficacy. Armor et al. (1976) found the efficacy beliefs of teachers delivering reading instruction held a strong correlation to student success rates on reading assessments. Additional studies report teacher efficacy holds a significant impact on mathematics assessments results for secondary students (Ashton & Webb, 1986).

Efficacy, self-efficacy and teacher efficacy share common beliefs about the perceived capabilities of the individual (Pajares, 1996). Efficacy beliefs of most pertain to task completion, whereas teacher efficacy relates to perceived belief to impact student learning (Ross & Bruce, 2007). Teacher efficacy studies in Texas by Brophy and Everstion (1977) discovered that teachers that produced the highest gains in student learning also had the highest expectations for their students and held a personal responsibility for student learning. Teachers in the study also viewed student learning disabilities as obstacles to overcome rather than giving up on students because they could not learn.

Research revealed that teacher behavior has a direct link to student outcomes and teachers with the highest levels of self-efficacy produce the greatest results through their teaching methodology (Brophy & Everston, 1977).

Ross (1992) reports that the biggest challenge for professional development teams that seek to increase teacher efficacy is producing change and sustaining that change in personal efficacy belief. Building efficacy in instructional practices can take many forms. Traditional models have been dominated by poor instructional sessions or wasted professional days. Strickland and Riley-Ayers (2007) state that effective professional development occurs on site and in close proximity to the teachers' classroom. Teachers remain engaged in the learning process when training is initiated in school and reinforcement is applied in the classroom. According to adult learning theory, adults must learn through repeated and guided practice while working at their own pace. Unlearning old habits and replacing them with new ones requires self-reflection of existing practices. Instructional coaches can be strategically placed to assist teachers

through this process (Shindler, 2008). Employing a new strategy, trying a new technique or focusing on a content area becomes attainable with support and encouragement from others (Tschannen-Morean et.al., 1998).

A History of Accountability

In 1965, Lyndon Johnson enacted a War on Poverty by passing into law the Elementary and Secondary Education Act (ESEA). To date it became the single largest investment of federal funds in K-12 education and its purpose was to meet the special education needs of educationally deprived children (Tirozzi & Uro, 1997). As with many of the programs enacted during President Johnson's tenure, ESEA sought to help school aged children that were impacted by the effects of poverty. The National Assessment of Educational Progress (NAEP) administered by the U.S. Department of education reports that, low income, minority and black students perform below their peers. In addition to low performance on NAEP, low income and minority students' record lower graduation rates (Kafer, 2004).

With the implementation of ESEA and the use of federal funds to support the act, the federal government required significant reporting and accountability on schools and districts (Tirozzi & Uro, 1997). Creighton (2001) records that ESEA has been reauthorized nine times since the original implementation. Each time schools and districts are offered increased financial supports along with additional regulations brought down by the federal government.

In 1983, the National Commission on Excellence in Education publishes *A Nation at Risk: The Imperative for Education Reform.* The report called for an increase in the federalist role in education as it criticized public education in America. According to the

report “the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and as a people” (National Commission on Excellence in Education, p. 5). Academic proficiency among Black, Hispanic and White students showed an ever widening gap that was unacceptable by any and all standards. School curriculums were considered watered down, science assessment scores were in decline and students were not allowed enough study or homework time to effectively learn content.

In 1989, President George Bush convened with national leaders to develop the six National Educational Goals that became part of a broad legislative package called the America 2000 Act (Crookson, 1995). It was expected for the next president to continue this Act and help American education reach all six goals (Articles of Educational Faith) by the year 2000. In 1994, President William Clinton signed the Goals 2000: Educate America Act which included the Articles of Educational Faith as passed by Bush in 1989 and added two additional articles that America would be expected to reach by the year 2000. These articles are listed below:

By the year 2000:

1. All American children will begin school ready to learn (Public Law 103-227, 1994).
2. The high school graduation rate will increase to at least 90% (Public Law 103-227, 1994).
3. Students leaving grades 4, 8 and 12 will have mastered challenging subject matter in English, math, science, civics and government, geography, economics, arts, history and foreign languages. Every school in America will also ensure that

students can use their minds to be productive in the nation's economy and be responsible citizens (Public Law 103-227, 1994).

4. All teachers will have access to training programs to improve their professional skills to successfully instruct students for the next century (Public Law 103-227, 1994).
5. American students will be first in the world in math and science (Public Law 103-227, 1994).
6. All adult Americans will be literate and able to compete in a global economy and be responsible citizens (Public Law 103-227, 1994).
7. Every school will be free of drugs and violence and offer a disciplined environment (Public Law 103-227, 1994).
8. Every school will strive to increase parental involvement and participation in their children's education to promote academic, social and emotional growth (Crookson, 1995, Public Law 103-227, 1994; Short & Talley, 1997; Tirozzi & Uro, 1997).

Goals 2000 incorporated Title II creating the National Educational Standards and Improvement Council (NESIC) (Public Law 103-227, 1994). States were required to submit academic standards to the NESIC for approval. NESIC was intended to challenge states to develop and implement demanding standards, improve classroom instruction and create assessment that would monitor student and school progress (Public Law 103-227). Congress showed a shift in viewpoints, calling for a change in the ESEA and the Goals 2000: Educate America Act.

Once again President Clinton reauthorized ESEA and titled it the Improving America's School Act (IASA). This 600 plus page document utilized the eight Articles of Educational Faith contained in Goals 2000 and focused on coherent systematic education reform while targeting federal dollars and strictly enforced accountability (Billing, 1997, 1998; Tirozzi & Uro, 1997).

The reauthorization of IASA was significant to the federalist role in education reform because it focused $6.7 billion to the low Socioeconomic Status (SES) population while building academic standards for schools across the United States. IASA utilized President Johnson's implementation of Title I to fund compensatory reading in education. By 1997, 95% of public schools received federal Title I funds based upon free and reduced priced lunches (Billing, 1998; U. S. Department of Education, 1996). Funding offered low SES students, at risk students and students from locations with poor attendance, extended school services, pull-out programs and opportunities for parent/community involvement (Tirozzi & Uro, 1997; Billing, 1997). Although the federal monies were driving local and state reforms in education through IASA, the use of these funds increased the level of reporting and accountability requirements (Billing, 1997; Cohen, 1995; Tirozzi & Uro, 1997).

Education reform was in the spotlight again in 2002 when President George W. Bush reauthorized ESEA with a 1200 plus page document know as No Child Left Behind (NCLB). The premise of NCLB was that by the year 2014, 100% of students being served by public education would be performing on grade level (Public Law 107-110, 2002). President Bush targeted four Basic Education Reform Principles to support the

goals of NCLB. These principles were clustered around increased accountability, improved instruction and better student performance.

Education Reform Principals:

1. Stronger accountability and reporting for results. NCLB redefines the federalist role in K-12 education by requiring all states to set challenging academic standards of achievement, and create a system of reporting and accountability to measure the results, especially in reading and math, and to a lesser degree science (Public Law 103-382, 1994).
2. Greater local control and flexibility. NCLB provides the LEA with powerful tools to provide the best education to every student in their district, especially for the students in the greatest need. The reauthorization attempts to reduce the amount of federal red tape, reduces the number of federal education programs and allows districts to make decisions at the local level by creating larger more flexible programs (Public Law 103-382, 1994).
3. Expanded choice and options for parents. NCLB empowers parents by providing unprecedented support from the federal government that allows at-risk children in low-performing or dangerous schools to transfer to other public schools inside and outside of their district (Public Law 103-382, 1994).
4. Emphasis on proven teaching methods that work. NCLB supports instruction in reading that demonstrates Scientifically Based Research (SBR) methods that attempt to ensure that every child in American public schools reads at or above grade level by the third grade. Additionally, NCLB works to strengthen teacher quality by investing federal dollars to train and retain Highly Qualified

Teachers (Elmore, 2003; Kim & Sunderman, 2004a, 2004b; Lohr, 2003; Mathis, 2003; Public Law 103-382, 1994; Rajala, 2003; Schwartzbeck, 2003; Tyler, 2003).

The NCLB document mentions Scientifically Based Research SBR a total of 110 times (Slavin, 2002) as a criterion for education strategies and how students are grouped for learning. NCLB sought to predict the educational outcomes for students with 95% certainty by minimizing change and developing programs of study that guaranteed student success (Slavin, 2002). Within the paradigms of SBR the collection and analysis of data for educational growth took form and spawned the evolution of Data-Driven Decision Making (Yeagley, 2003).

Data to Drive Change

Every new presidential administration since Lyndon Johnson has reauthorized ESEA to some degree (Tirozzi & Uro 1997). Some changes were minor while other changes held dramatic impacts in educational reform across the United States. It is the use of data collected for ESEA that has been the driving force behind presidential mandates and changes within education (Yeagley, 2003). McIntire (2002), a former Director of Achievement at Edison Schools, has been a huge proponent of Data-Driven Decision Making (D^3M). McIntire developed a four step process that included the implementation of technology that serves as the model for the D^3M process of change.

According to McIntire (2002), the first step of using data to drive change is conducting an information inventory of what the school or district is already doing. A comprehensive list of all indicators should be collected that designates how often data

should be collected, who collects the data and what typed of data it is (McIntire, 2002). Included in this inventory should be all assessment data related to the school or district.

The second step is to develop standards that the collected data can be compared to. Standards should be applied to everyone in the school or district. A universal language with common formats and examples should be introduced to all in the organization (McIntire, 2002). With these standards a level of ownership must be established to determine who is responsible to collect, enter, maintain and access information. Creighton (2001) reminds us that bad data results in bad information. Along these lines McIntire (2002) states that the chain of accountability needs appropriate checks with a degree of quality control to bring value to the process.

Step three in D^3M is to analyze the data. Rallis and MacMullen (2002) agree that the Annenberg Institute for School Reform at Brown University has done an excellent job at creating the Inquiry Circle to assist schools and districts in effectively analyzing data. The Inquiry Cycle aims to increase accountability leading to improved instruction and student achievement. Six activities encompass the Inquiry Cycle: establish outcomes, define essential questions, collect and organize targeted data, make meaning of the data, take action based on the data and asses the actions taken (Rallis & MacMullen, 2000).

Finally, McIntire (2002) says to institute change based upon the outcomes of data analysis from the Inquiry Cycle. New strategies and new technologies should always be considered when instituting change. Bernhardt (2002b) notes that to meet the reporting requirements of NCLB schools can stop after step three, however, without making changes to the system, instruction will never improve, student achievement will not increase and the ultimate aim of accountability will be missed. Bernhardt (2002b)

suggests that district administrators should have three to four data intersection points to build confidence with the need for change. Having evidential proof provided through D^3M can build a convincing argument with stakeholders for needed change that will benefit student achievement. Figure 2.1 below illustrates McIntire's four step process.

Figure 2.1: Implementation Process. Adapted from "The Administrator's Guide to Data-Driven Decision Making," by T. McIntire, 2002, *Technology & Learning,* 22(11), p18.

Common Core and Accountability

During his presidential terms, Ronald Regan produced an educational agenda that set states in the direction of producing standards and implementing mandated assessments to students in order to monitor and report the achievements of learning in the classroom (Hamilton et al., 2008). Every president hereafter has continued in this work of reform and standards-based learning. Standards give a direction of learning for every

classroom to follow but are meaningless without an assessment that measures student performance on those standards (Lashway, 2000).

The key to assessing students in standards is aligning the assessments students take to the standards they are being taught (David, 2011; Farrace, 2003; Holloway & Pearlman, 2001). Criterion-referenced assessment aligns testing materials to state standards that will be administered to students at various points in K-12 (K-12, 2002; Ravitch, 2007). Ravitch (2007) believes that assessment should measure performance against content and performances standards. First, performance on assessment should measure if students are learning the tested materials of the standards and secondly, the results should offer a direction for the individual student for improving learning specific to areas identified by the assessment.

Lashway (2000) feels it is the hidden aspect of testing that pushes the importance of student performance, which is the piece that allows the public to know how well the students at an individual school performed on achieving the standards. Measuring performance against rigorous state standards requires tests that precisely measure student knowledge of content and individual performance of standard mastery (David, 2011). However, the United States has adopted a pattern of multiple choice testing that are designed as a summative report of student mastery of content and performance standards (Black & Wiliam, 2010). Researchers believe formative test like those often found in the classroom setting offer a better reflection on student mastery of standards and directs teacher to those gaps that arise in student learning (Hamilton, et al., 2008). Offering multiple choice test as a method to rank or report on school performance through individual student outcomes gives way to systems where teachers match materials to the

test and then teach to the test. In core classes where analytical and higher order thinking is developed, rigor has been depleted and basic materials focused on students test taking skills has taken over (Black & Wiliam, 2010; David, 2011; Hamilton et al., 2008; Lashway, 2002).

How do we as a country get back to the idea of setting high standards for students and developing a way to assess those standards? The Obama administration, National Governors Association and the Council of Chief State School Officers suggests Common Core State Standards (CCSS) as the way to attain reliable data on student achievement. NCLB (2001) was developed to correct all of the issues with public education and included an accountability system that guaranteed students would get the very best education possible. Fast forward a little over a decade and Common Core has been inserted into the equation to fix the problems NCLB started or could not fix itself (Hess & McShane, 2013). The Common Core State Standards attempts to get every state to adopt one set of common standards across all subject areas and develop common assessments for those standards across all states (BPR, 2011; CCSS, 2011; Conley, 2011; Finn & Petrilli, 2010; Scherer, 2011). This has resulted in numerous companies attempting to develop common assessments that can accurately assess the mastery of CCSS in an effort to obtain federal grants or contracts for national and state level testing.

Common Core has been designed to help move schools beyond test-prep instruction and push the United States into international competition for overall student outcomes (Conley, 2011; David, 2011; Finn & Petrilli, 2010). Assessments in Common Core needs to be developed using twenty-first century learning goals and should be multifaceted to measure students' complete understanding and performance (Carter,

2011). Many researchers offer descriptions of online simulations, performance tasks and project based assessments that can reflect critical thinking skills and creativity of students being assessed (David, 2011; Finn & Petrilli, 2010; Goertz, 2007; Griffith, 2011; Phillips & Wong, 2010). Black and Wiliam (2010) remind us that the assessment needs to be as helpful as possible to the students. The ultimate goal is individual growth through adjusted instruction that promotes learning.

Rothman (2011) points out that proponents of CCSS explain that having common standards will strengthen accountability. Individual school districts will keep local control over design of curriculum and instructional methods because standards are not curriculum. Schools and teachers will be able to collaborate outside their district on a national level about what is working for instruction (Hamilton et al., 2008). In theory this approach will standardize the content and performance standard for all schools and create equity in education throughout the United States (Noddings, 2007).

Critics of Common Core proclaim that national standards lead to national assessments (Goertz, 2007). However, with the diversity that lies within our nation, education cannot be a one size fits all construct. Local communities know more about what is best for their children, not the federal government. Rothman (2011) states that for students to meet the standards, curriculum must define the courses of study along with the scope and sequence of each instructional program. Furthermore, it is the instructional practice within the classroom that most affect student learning and not the written level of performance standards (Daro et al., 2010; Noddings, 2007).

Professional Development and Student Achievement

Professional development must be effective and ongoing if permanent change is to take place in teaching practice. Many schools seek to retain teachers already in the classroom and equip them with the skills to effectively carry out classroom instruction. Common practice is to place experienced and effective teachers with the lowest performing students (Dole, 2004). In theory this practice should produce high results in student performance, yet achievement often fall short due to teachers' inability to connect the content to students. Professional development for all teachers, even those experienced in years, can ensure an assortment of strategies for closing the achievement gap. Cincinnati's Public School District (CPSD) implemented a district wide professional development reform that focused on teacher practice (Supovitz, 2002). CPSD's reform grouped teachers into collaborative teams and focused on gaining new knowledge and teaching skills. A central part of the program was the use of release time allowing teachers to collaborate and plan through professional developments. Results showed the social interaction with peers and sharing of experiences lead to an increase in student achievement.

Peer coaching allows teachers to work together in small groups to share, learn and practice new teaching strategies (Showers & Joyce, 1996). Peer coaching groups offers teachers the ability to analyze both successful and unsuccessful attempts at implementing new activities without feeling threatened or isolated. Peer coaching often takes place in pairs modeled by grade level or subject matter teams (Carnahan, Righeimer, Tarr, Toll, & Voss, 2004). Effective teams are directed by a teacher-leader or coach. A coach assists by observing the teacher and providing feedback during meetings. To master new skills and

permanently change instructional practices teachers require ongoing follow-up and support (Grant, Young & Montbriand, 2001).

Coaching from professional development can come in the form of change coaches or content coaches (Neufield & Roper, 2002). Change coaches assist with planning and facilitating professional development. PD sessions are responsible for leading change in the overall organization of the school. Content Coaches work directly with teachers to improve classroom instruction. A literary coach would be a content coach that provided ongoing in school training to support the criteria for effective professional development (Guiney, 2001).

Coaching in all aspects as a professional development model develops collegial interaction among those involved (Petty, 2007). Relationship developed through coaching interactions provide a setting for improving instructional weaknesses and for introducing and developing new instructional skills (Orelena Hawks Puckett Institute, 2005). Showers and Joyce (1996) concluded that coaching supported teachers in trying new instructional strategies and gave teachers the confidence to introduce new strategies during peer coached team meetings. Coached team meeting allow teachers to share information they receive from professional development outside the school and district (Morris, Chrispeels & Burke, 2003).

Changing Teacher Practice

Smith and Rowley (2005) believe that NCLB has created an atmosphere of accountability and control that negatively impacts teacher outlooks on professional development. Their research shows a zero sum impact of commitment strategies on professional development for teachers. Additionally, developing teacher commitment to professional development does not impact the amount of professional development but it does affect the retention rate of teachers. Schools that work to increase commitment over control hold higher retention rates and boast greater stability in staff.

Belcastro (2009) believes that teacher change can be generated through belief development. Change efforts should be the outcome of professional development programs and focus on changing teacher beliefs. Modifying a belief system requires offering a compelling reason for change (Guskey, 2002) and challenging current beliefs. Change occurs when current beliefs are found lacking to aide student learning. Koster et al. (2008) in a qualitative study, explored teacher change in cognition and behavior through the implementation of professional development. Teacher portfolios revealed professional development activities contributed to the instructional development of teachers. Twenty-five teachers participated in the study and findings suggest that professional development may have an important impact on teacher belief.

Change in belief or practice requires review of current actions and how self-identity effects components of teaching (Amado & Sharpe, 2001). Review is a transitional change that takes place when the teacher and coach debrief a lesson together. Action becomes the hardest part of the change process which requires an accelerated rate to keep up with today's educational field. Action occurs within individuals and organizations yet leaves both with feelings of exposure and vulnerability as they seek greater understanding of best practice (Bridger, 2001).

In order for teachers to improve practice, an increase in collaboration and consultation is needed (Bridger, 2001). Increasing these two components of change will assist others to manage internal and external complexities with greater independence. Collaboration develops independence in application of skills and knowledge. Bridger (2001) states that individuals feel exposed and vulnerable during the change process and often avoid collaborative relationships. When the need for increased collaboration arises

a tendency to fall back on basic competencies and structures assets itself. A resistance to change is a basic solution to this paradox. A deeper understanding of recognizing and relinquishing valued forms of work is required to place greater emphasis on interdependence.

Wohlleb (2015) reviewed the implementation of instructional coaches in a western Kentucky school district. Administrators in the district attest that even with the limited budget due to cuts imposed by the state, instructional coaches offer the biggest return on investment. Coaches working in the district for years developed a sense of trust and rapport with teachers by becoming their eyes and ears, capturing the biggest impact on student learning. Hattie (2008) states that teachers only see about 20% of what is happening in their classrooms. Given that feedback is extremely helpful to students, Hattie (2008) believes the feedback instructional coaches offer teachers influence both teacher and learner in the scope of educational change. By incorporation of Visible Learning with instructional coaching, teachers see through the eyes of their students allowing them to become their own teachers. Instructional coaches are offering job embedded professional development to teachers specific to their work in the classroom. Professional development is ongoing, breaking the concept of one-shot wonders where teachers sit and get information that will rarely be remembered or used in the classroom. Sustainability offered through the use of instructional coaches drives the needed change in classroom pedagogy allowing ongoing growth and development of instructional practice (Wohlleb, 2015).

Change does not always result in a happy ending where teachers and other workers in the school develop a feeling of fulfillment and accomplishment (Ambrose,

2001; Bridger, 2001). Change results in individuals learning a new way to respond to their environments. This is the ultimate goal of instructional coaching, allowing teacher to guide one another through a process of learning new strategies and approaches. Through instructional collaboration and the coaching process student learning is ensured despite the complexities of student abilities and backgrounds.

Instructional Coaching

The use of reading and mathematics coaches as a tool for instructional change has been rooted in research on learning and on effect models of professional development (Campbell & Malkus, 2011). Learners have prior knowledge and if they do not access that knowledge during instruction they fail to learn new materials (Bransford, Brown & Cocking, 2000). Learners that retain information and then use that information hold greater understanding of concepts. Successful learners monitor what they are learning by reflecting on things they do and do not understand. They develop and utilize strategies and ask questions to strengthen their understanding of concepts. Bransford, Brown and Cocking (2000) understood that coaching positioned itself within these constructs described as the core conceptual framework of professional development (Desimone, 2009). This conceptual framework as Desimone describes, consists of five core features: content focus, active learning, coherence, duration and collective participation.

Instructional coaching focuses on content by facilitating activities in which teachers address content and pedagogy in core academic areas as well as how students learn core subjects (Desimone, 2009). A coach is actively involved in learning by modeling instruction and assisting by co-teaching, co-planning, designing assessments, observing and reflecting on pedagogy. Data collected through these activities drives the

instruction of classroom teachers as well as the next steps for instructional coaches. A coach supports teachers' coherence by examining ideas and relationships that connect to prior knowledge and beliefs within learning styles. Coaches assist teachers to correlate teaching efforts with state, district and school policy demands.

Coaching is a task associated with consistency to develop and maintain a strong teaching practice (Campbell & Malkus, 2011). An instructional coach is regularly present throughout the teaching year to provoke reflection upon the teaching practice (Desimone, 2009). A coach facilitates reflection and experimentation within the community of practice and maintains focus on curriculum and instructional approaches while emphasizing student learning. Although there is no single model for instructional coaching, current implementations and past studies offer a variety of approaches. In one district a coach may have a set of regular teaching duties, while in another a coach may spend the majority of their time observing teachers and offering feedback. Other situations may require coaches to provide resources and help teachers analyze student data or just be an extra pair of hands. District personnel often tweak the position of instructional coach to meet the needs of the school or district from year to year.

Joyce and Showers (1980) describe pairs of teachers, known as peer coaching, that provide reciprocal feedback where teachers maintain an effort to strengthen instruction, knowledge and skills. Helping Teachers, as described by Loucks-Horsley et al. (1987), enhance the teaching of others by mentoring through professional dialogue. An instructional coach can be called a specialist, a support teacher or teacher leader within a district; but the intent is to place a highly knowledgeable and effective teacher in a school without the responsibility of instruction for a single classroom that can advance

instruction and programmatic change across the whole school (Loucks-Horsley et al., 1987). It is important that teachers understand the instructional coach is not an evaluator (Wohlleb, 2015). Although the instructional coach may assist with any state or district evaluation system, the purpose is to help teachers become reflective practitioners through questioning and feedback techniques.

Within the small body of research on instructional coach influence of teacher practice, teachers report that their perception of instructional coaches changed instructional behavior frequently in reading and writing content (Ai & Rivera, 2004; Dempsey, 2007; Rodgers & Rodgers, 2007). Additional research characterizes the challenges faced by coaches addressing whole-school reform and the initial experiences they face (Neufeld & Roper, 2003). Poglinco and Bach (2004) suggests instructional coaches struggle transitioning from teacher to coach, setting priorities under unreasonable time constraints, dealing with principals and balancing multiple responsibilities. Instructional coaches must employ a variety of modalities successfully while understanding and negotiating the culture of the school (West & Staub, 2003).

Effects of Coaching on Student Achievement

Effective teachers believe in children's ability to be successful and devote additional time and energy into their efforts (Shidler, 2008). Vartuli (2005) suggests that effective teachers possess a strong and interesting delivery method that is developed through lesson preparation and reflection. Being effective and having a positive impact on student achievement is established through good teaching habits. Identifying a failed situation and reflecting upon their own practice fosters change (Vartuli, 2005). Studies show that educators holding good teaching habits show persistence when working with

students and are open to new ideas to meet the needs of those in their classrooms (Berman et. al., 1977; Guskey, 1988; Stein & Wang, 1988).

Conversely, Vartuli (2005) found that teachers with poor habits and a lack of self-efficacy add to the academic struggles, lack of abilities, insufficient motivation and deficiencies in character of students. These teachers reject the change process and fail to look within themselves when students fail or fall short of instructional goals. Failure is often blamed on student inabilities rather that teacher shortcomings. Midgley et al. (1989) proclaimed that in today's age precedence is not given only to those perceived as capable, but also to those denied because of their struggles to learn.

Instructional coaching is a way to connect with those teachers and students falling short of academic benchmarks. Targeting instruction within specific content areas grows confidence in teacher delivery (Resnick, 1987). As delivery of specific bodies of knowledge becomes less generalized and more defined student achievement increases. Producing change and sustaining that change among teachers proves to be the most challenging of academic endeavors (Ross, 1992). This lofty task is weighed upon the instructional coach along with the stress of shared accountability. Building the effective teacher requires a devotion of time and energy to connect content and increase instructional competencies (Strickland & Riley-Ayers, 2007).

Instructional coaches free up time for classroom teachers by collecting data and completing mundane work that limits time for preparation and reflection (Wohlleb, 2015). Helping to lead professional learning communities (PLC's), running off reports to analyze student mastery and sharing research based instructional practices; streamlines the educational process for student growth and development. Teachers often

fail to see when students reach mastery levels in content and lessons are repeated limiting the valued instructional time needed for growth. Instructional coaches can devote the time needed to editing classroom assessments for student understanding and teacher effectiveness. Developing targeted questions to identify levels of proficiency often take time and resources that teachers have a limited quantity of. With the assistance of an instructional coach, teachers have and extra set of eyes, ears and hands making it harder to lose sight of what's happening in the classroom.

Student Achievement Needs

In recent years, studies have shown that students leaving the elementary classroom are unprepared for middle school (Akhavan, 2008; Slater, 2004). In the same, students leaving middle school headed for the high school classroom are not prepared and a staggering number of those students do not graduate (Munoz & Chang, 2007; Scherff & Hahs-Vaughn, 2008). According to the U.S. Department of Education dropout rates have remained relatively unchanged since 1992, despite school reform efforts.

As educators seek to close the achievement gap, it has become apparent that learning to read well is the core to improving this situation. The National Assessment of Educational Progress (NAEP) tracks reading scores across the nation by testing fourth grade students every couple years. NAEP reported improved reading scores for Black, White and Hispanic students in 2007. Although the gap between Black and White students narrowed between the years of 1992 and 2005, NAEP reports the achievement gap between white student and minority students has remained unchanged since 1992 (National Center for Educational Statistics, 2004).

Goodwin (2000) reports a pattern between students with a poverty background and those from high socioeconomic backgrounds. Those students living in poverty achieve at lower levels than those from a high socioeconomic status background. In recent years, school reform has targeted those schools serving student from low socioeconomic backgrounds with targeted interventions. Regardless of the reform model, level of implementation or type of program being used schools receiving these interventions usually do not reach the same level as schools serving students from high socioeconomic backgrounds (Goodwin, 2002).

Between 1998 and 2005 the U.S. Department of Education focused reform on comprehensive school improvement. Since then, Race to the Top legislation has placed a spotlight on reform at the federal level. NCLB has developed large scale policies to tackle reform in schools at the teacher level. NCLB requires Title I schools to have highly qualified teachers serving students across core curriculum classes. Although controversial, NCLB has focused school reform to measurable and obtainable objectives whereas before NCLB school wide reform appeared to be fragmented and disjointed (Gross, Booker, & Goldhaber, 2009). Reform now targets specific populations, programs, students and teachers to develop achievement.

The need to gain or produce highly qualified teachers has pushed districts across the nation to hire instructional coaches that can implement structured professional development for school reform (Fitzgerald, 2010). Studies of instructional coach practices in urban school districts reveal that coaching practices vary from school to school (Camburn, Kimball & Lowenhaupt, 2008). As coaches believe their professional development is of a high quality, they are more likely to provide direct coaching to

teachers than engage in administrative duties such as paperwork. Furthermore direct coaching will occur when the coaches' feel the expectations of their work is clearly defined (Camburn et al., 2008).

Experts believe the need for instructional coaching developed and increased in popularity due to weak preservice education programs (Taylor, 2008). A majority of teacher professional development programs are underdeveloped and contain no follow-up sessions or monitoring for implementation making the need for strong in-service programs a necessity for teacher development (Garet, Porter, Desimone, Birman, & Yoon, 2001). According to Taylor (2008) coaching impacts professional development by embedding and extending content to individual teacher needs.

The negative effects of an ineffective teachers continue to lower student academic performance (Darling-Hammond, 2010). During the last 20 years' graduation rates have been stagnant, falling below the attainment of other countries. In addition, the achievement gap between minority and White students have not seen a significant change in the last 25 years. Two or three years of ineffective teaching compound the problem resulting in significant academic deficits that students rarely come back from. In a three-year study of students in Tennessee, Sanders and Rivers (1996) reported that those students being taught by effective teachers placed in the 96th and 83rd percentiles on fifth grade math state assessments. Those being taught by ineffective teachers scored in the 44th and 29th percentiles. Another analysis reports that students receiving ineffective instruction multiple years in a row scored at levels 50 points below students getting adequate instruction (Peske & Haycock, 2006).

Summary

The fact that the achievement gap has remained relatively unchanged over the last 25 to 30 years, and that teacher quality holds a significant impact on student achievement, provides a stage for professional learning for teachers and preservice teachers (Elmore & Birney, 1998; Darling-Hammond, 2009, 2010). If the goal is to offer the highest qualified teachers in every classroom across the U.S., professional development need an overhaul to keep up with the worldly trends in education reform. Darling-Hammond (2010) states that the U.S. model of professional differs from that of other countries in that teachers often sit and get information and rarely communicate with others on lesson activities or self-reflection. In many countries, teachers collaborate for extended periods of time, examining a lesson or student learning result based on a single lesson. The overall result of this collaboration can impact teacher capacity in content knowledge and efficacy beliefs.

Literature suggests that teachers who are coached may have increased levels of efficacy and higher academic optimism compared to those not coached (Smith & Rowley, 2005). Teachers that increase these two constructs of educator development report increased levels of student achievement. As federal and state policy makers seek to improve math and reading achievement scores, district look for relief from the overwhelming accountability to produce proficient students. Theories surrounding the idea of coaching as a way to replicate or produce mastery level teachers has yet to prove itself as a sure way to gain student achievement in core related content. Teachers are not always cooperative and coaches are not always at the same level of academic development as the mastery teacher they are attempting to produce. Chapters three

through five will attempt to discover if instructional coaches have the desired impact on academic achievement or if coaching is just another educational fad.

CHAPTER 3: METHODOLOGY

The purpose of this study is to determine if instructional coaches positively impact teacher effectiveness in a selected school district in the Mountainous West of the United States. This research will take a quantitative approach to determine if a strong correlation exist between student achievement and teacher instruction as influenced by instructional coaches. Student achievement in mathematics will be the determining factor of overall effectiveness. The following research questions will be used to guide the research and analysis associated with this study:

1. Is there a difference in student achievement between students served by coached and non-coached teachers?

During the 2011-2012 school year, six hundred and twenty-five teachers interacted with instructional coaches in math and language arts classes in the selected school district. Collectively 21,000 hours were logged between coaches and teachers as they worked in the classroom, during PLC's, faculty meetings and in small group settings. Teachers responded to an anonymous survey during the second semester concerning the effectiveness instructional coaches had on their teaching.

Student achievement data in mathematics for the corresponding academic year was collected through two interim math assessments developed and used by the district. Assessment 1 was administered during the Fall semester and Assessment 2 was given in the Spring. Assessment 2 was developed to be more intense based upon student expected growth. Both assessments were used by the district to evaluate the academic coaching program during 2011.

District Demographics

The school district is located in a large, urban mountainous area in the Western United States. The community has a population of 190,884 ("Population estimates, July 1, 2015, (V2015)," n.d.) and lies within a metropolitan area with a population over 1,175,905. The city itself covers 110 square miles and experienced a population increase of 2.4% between the years of 2010 to 2014. Roughly 22.5% of the population is under the age of 18 and only 9.4% is over the age of 65. The Median household income is $45,833 with a poverty rate at 20.9%. The reported majority ethnic background of the population is White (75.1%). Minority populations include: Blacks (2.7%), American Indian and Alaskan Native (1.2%), Asian (4.4%), Native Hawaiian/Pacific Islander (2%), and Hispanic (22.3%), with some groups reporting two or more races.

In 2012 the school district enrolled 25,023 students in grades Pre-K through 12th. Table 3.1 displays the ethnicity report for the fall 2012 Enrollment. 26% of students are English Language Learners (ELL).

Table 3.1. Ethnicity

Race	Number	Percentage
African American	996	4
Asian	1038	4
Caucasian	10579	42
Hispanic	10197	41
Native American	280	1
Pacific Islander	1057	4
Multiple	876	4

The selected sample group for this study will include teachers and students in the selected school district during the 2011-2012 school year. Teachers are from various curriculum areas, as well as, grade levels. Qualifications for this study requires that the teachers worked with an instructional coach during the 2011-2012 school year and took part in the culminating survey at the end of the school year. Six hundred twenty-five teachers worked with instructional coaches in Math and Language Arts, grades K-6, during the 2011-2012 school year in the School District. Teaching experience for this group range from non-tenured teachers to experienced teachers holding upwards of 30 years' service. Teachers will be organized into the following categories of experience: 0-5 years' experience, 6-11 years' experience, 12-20 years' experience, and 20+ years' experience.

The district host 45 total schools with 30 being elementary schools and 6 middle schools. The district employs 1,154 certified teachers at a ratio of 21.6:1. In 2012 the per-pupil expenditure was $9,927. Elementary teachers served 13,727 students while middle school teachers served 3,169 students.

Target Population

This study targeted the students in the school district that took part in the fall and spring interim math assessments in grades 1st through 6th. This population consisted of students that may or may not have sat under a teacher that interacted with an instructional coach for mathematics. Table 3.2 shows the population distribution for students in the study per grade level, including if their teacher worked with an instructional coach or not.

Table 3.2. Coach Interactions Per Grade Level - Crosstabulation

			Teacher worked with a Math Coach		
			No	Yes	Total
Grade Level	1st	Count	373	841	1214
		% within Grade Level	30.7	69.3	100.0
	2nd	Count	489	810	1299
		% within Grade Level	37.6	62.4	100.0
	3rd	Count	552	1048	1600
		% within Grade Level	34.5	65.5	100.0
	4th	Count	349	832	1181
		% within Grade Level	29.6	70.4	100.0
	5th	Count	409	729	1138
		% within Grade Level	35.9	64.1	100.0
	6th	Count	378	786	1164
		% within Grade Level	32.5	67.5	100.0
Total		Count	2550	5046	7596
		% within Grade Level	33.6	66.4	100.0

The district had a total of 7,596 students in grades 1st through 6th during the time of the study. Tables 3.3 and 3.4 show the gender and race totals for the target population.

Table 3.3. Student Gender

			Teacher worked with a Math Coach		
			No	Yes	Total
Gender	Female	Count	1249	2470	3719
		% within Gender	33.6	66.4	100.0
	Male	Count	1301	2576	3877
		% within Gender	33.6	66.4	100.0
Total		Count	2550	5046	7596
		% within Gender	33.6	66.4	100.0

Table 3.4. Racial Minority

			Teacher worked with a Math Coach		
			No	Yes	Total
Racial Minority	No	Count	1620	1120	2740
		% within Racial Minority	59.1	40.9	100.0
	Yes	Count	930	3926	4856
		% within Racial Minority	19.2	80.8	100.0
Total		Count	2550	5046	7596
		% within Racial Minority	33.6	66.4	100.0

Table 3.5 displays the income level of students participating in the study. Within the population that attended a class with a teacher working with a math coach (N = 5,046), 81.2% qualified as low income.

Table 3.5. Student Income Level

			Teacher worked with a Math Coach		
			No	Yes	Total
Low Income	No	Count	1581	863	2444
		% within Low Income	64.7	35.3	100.0
	Yes	Count	969	4183	5152
		% within Low Income	18.8	81.2	100.0
Total		Count	2550	5046	7596
		% within Low Income	33.6	66.4	100.0

Table 3.6 addresses the special education population of the study group. Within this population, 913 students are identified as having disabilities. There were a total of 618 students with disabilities that attended a class under a math teacher working with a coach.

Table 3.6. Students with Disabilities

			Teacher worked with a Math Coach		
			No	Yes	Total
Special Education	No	Count	2255	4428	6683
		% within Special Education	33.7	66.3	100.0
	Yes	Count	295	618	913
		% within Special Education	32.3	67.7	100.0
Total		Count	2550	5046	7596
		% within Special Education	33.6	66.4	100.0

The given school district has a number of ELL (English Language Learners) students. Table 3.7 shows the percent of the target population with respect to teachers working with a coach that are labeled ELL.

Table 3.7. English Language Proficiency

			Teacher worked with a Math Coach		
			No	Yes	Totals
English Language Learner	No	Count	2070	2323	4393
		% within English Language Learner	47.1	52.9	100.0
	Yes	Count	490	2766	3256
		% within English Language Learner	15.0	85.0	100.0
Total		Count	2560	5089	7649
		% within English Language Learner	33.5	66.5	100.0

Table 3.8 shows the number of teachers working with students in grades 1st through 6th in the school district. 66.5% of those teachers worked with a math coach during the 2012 school year.

Table 3.8. Teacher Involvement

		Frequency	Percent
Valid	No	126	33.5
	Yes	250	66.5
Total		376	100.0

Instrumentation

A hardcopy of the aforementioned survey will be hand delivered to teachers. This survey will be coded in a manner that allows teachers to record responses on a pre-created answer sheet that can later be identified using barcodes. This will allow for student achievement scores to be linked to the survey, however, will not include any personal data referring back to the teacher, coach or principal.

Data Collection

Data collected for this research was part of a program evaluation conducted in a urban mountainous school district in the western United States by Hausman, Shaeffer and Shoemaker (2014). This detailed work evaluated the coaching program by interviewing and surveying everyone that had a direct connection with the instructional coaches in the district. Teachers were given hard copies of the survey containing a barcode at the top that was a district identifier. Teachers had the option of removing this page with barcode if they wanted to increase their anonymity. In addition, student data was analyzed to determine if individual coaches impacted student achievement through working with classroom teachers. Student assessment data collected through this research does not identify any student, teacher, school or administrator. Permission was given to use the data in the pursuit of answering the research questions in this study.

Data Analysis

Data will be placed into IBM's SPSS statistical software for analysis. A correlational analysis will be conducted to determine if there is a relationship between the student achievement results in math and reading as it relates to those teachers working under an instructional coach's influence. R-values will be assessed to determine the level

of significance and conclusions will follow. In addition to analyzing student data, teacher responses to coach ratings will be compared to student achievement in a correlational analysis.

CHAPTER 4: RESULTS

The purpose of this chapter is to present the data collected through the study and subsequently report the findings associated with the analysis as it relates to the research questions. The research has sought to answer questions associated with the impact of instructional coaches on mathematical achievements for students in grades 1st through 6th in the selected school district. Analysis of the data focused on the results of two mathematical assessments administered to students during the fall 2012 and spring 2013 semesters. Assessments were created by the school district and included input form district teacher, district faculty and other stakeholders. The fall assessment gave a baseline score of student achievement without the influence of an instructional coach. Students taking the spring assessment were coded as either having a teacher that did or did not work with a coach during the school year. Both assessments were correlated to state standards and were scored similarly. The spring assessment was more detailed than the fall assessment to reflect content learned and expected growth related to grade level content.

Analysis of Data

A one-way between groups analysis of covariance (ANCOVA) test will be used while utilizing a quasi-experimental pretest-posttest non-equivalent design to examine the hypothesis in this study. The ANCOVA will compare the impact of coach interventions versus the results obtained from the control group at each grade level. The independent variable in the study is the instruction given to students between the fall and spring assessments. The dependent variables are the mean test scores of students in the study. The following five covariates have been identified to monitor significant results based on

subpopulation: Gender, Racial Minority, Low Income, Special Education, and English Language Learner.

Table 4.1 shows the mean scores for all students on Interim Assessment 1 and Interim Assessment 2. Additionally, Table 4.1 shows mean assessment scores for both coached and non-coached groups.

Table 4.1. Mean Assessment Scores

Grade	Interim Assessment 1 % Correct	Interim Assessment 2 % Correct	Interim Assessment 2 % Correct Non-Coached	Interim Assessment 2 % Correct Coached
1	69.0	70.9	71.3	70.7
2	77.5	72.0	72.9	71.4
3	56.8	62.4	61.8	62.7
4	68.8	57.5	61.4	55.9
5	65.4	61.1	62.9	60.0
6	65.7	59.1	60.0	58.6

Data shows a decrease in mean scores from Interim Assessment 1 to Interim Assessment 2 for grades 2, 4, 5 and 6. This could be due to the fact that Interim Assessment 2 increases in difficulty and students failed to reach the moving target of proficiency in the assessment. Other outlying factors such as teacher time spent with a coach, numbers of students exposed to teachers working with a coach, differences in coaches and the five sub-populations adds error in the level of variance for the study. To overcome the issue of non-constant variance, weighted least squares simple regression will be utilities to

ascertain any level of significance in the study. Results at each grade level will be examined using weighted means identified by teacher ID.

First Grade

Table 4.2 shows the mean interim scores based on student characteristic. Positive values under Change_Grade_1 represent increased mean scores for those sub-populations between the two assessments. Female students in the study showed the most progress from assessment one to assessment two (M = 71.82, M = + 3.17). Additionally, racial minority students that attended a class under a teacher working with a coach performed better on the second assessment (M = 70.18, M = + 2.37). The same statement can be made for first grade ELL students (M = 69.97, M = + 2.56).

Table 4.2. First Grade Mean Interim Scores by Student Characteristics

		1st Grade Interim 2 Percent Correct	Change_Grade_1
		Mean	Mean
Gender	Female	71.82	3.17
	Male	70.26	.69
Racial Minority	No	72.72	.86
	Yes	70.18	2.37
Low Income	No	74.92	1.63
	Yes	69.38	1.98
Special Education	No	71.97	1.91
	Yes	59.75	1.42
English Language Learner	No	71.68	1.37
	Yes	69.97	2.56

Tables 4.3 and 4.4 offer descriptive information for first grade populations in the study. The mean values displayed in Table 4.4 are results from the weighted means related to teacher ID's. Positive values represent productive growth on Interim Assessment 2.

Table 4.3. Number of First Grade Teacher that Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	373
	Yes	840

Table 4.4. Weighted Mean Change for First Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	.8516	2103.37082	373
Yes	2.3159	2568.82560	840
Total	1.9754	2435.79670	1213

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.5 shows the results from the ANCOVA test on first grade assessment results and levels of significance among scores for all first grade students and sub-populations of students.

Table 4.5. First Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_1

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	12506287.344	2.120	.049	.010
Intercept	1	27035029.543	4.582	.033	.004
GENDER	1	52684092.765	8.929	.003	.007
Racial_Minority	1	1033940.494	.175	.676	.000
LowIncome	1	1749634.595	.297	.586	.000
SPED	1	1089.439	.000	.989	.000
ELL	1	9599601.749	1.627	.202	.001
Teacher_Coach_Yes_No	1	1901531.610	.322	.570	.000
Error	1206	5900403.148			
Total	1213				
Corrected Total	1212				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .010 (Adjusted R Squared = .006)

Although first grade students did not show a significant difference at the $p = .05$ level ($p = .570$), the sub-population of gender was statically significant ($p = .003$). Reflecting back on Table 4.3 female students in the first grade that attended class under a teacher that worked with a math coach had the highest gains of any sub-population ($M = 71.82$, $M = + 3.17$).

Second Grade

Table 4.6 shows the mean interim scores based on student characteristic for second grade. Negative values in the column titled Change_Grade_2 represent lower scores for that subpopulation. Although all subpopulations show negative change values it is important to remember that the second interim is a harder test focused on measuring growth. Students would need to perform better than originally benchmarked to make similar scores as on the first interim.

		2nd Grade Interim 2 Percent Correct	Change_Grade_2
		Mean	Mean
Gender	Female	72.25	-5.32
	Male	71.89	-5.72
Racial Minority	No	76.99	-4.99
	Yes	69.74	-5.77
Low Income	No	78.91	-4.26
	Yes	69.33	-6.02
Special Education	No	73.04	-5.68
	Yes	62.20	-3.84
English Language Learner	No	74.06	-5.51
	Yes	69.48	-5.54

Table 4.6. Second Grade Mean Interim Scores by Student Characteristics

Table 4.7 shows the number of second grade students in the study and how many worked with at teacher that collaborated with a math coach. Table 4.8 reports the mean score of all students and if those students were in a class with a teacher working with a math coach.

Table 4.7. Second Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	489
	Yes	810

Table 4.8. Second Grade Interim 2 Percent Correct

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	72.8249	2243.54339	489
Yes	71.6897	2657.44594	810
Total	72.0590	2509.71382	1299

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.9 shows the results from the ANCOVA regression on Interim Assessment 2. Racial Minority (p = .015), Low Income (p = .000), Special Education (p = .000) and Teachers working with or without a coach (p = .033) are shown to be statistically significant.

Table 4.9. Second Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: 2nd Grade Interim 2 Percent_Correct

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	104235426.616	17.837	.000	.076
Intercept	1	27968503571.239	4785.973	.000	.787
GENDER	1	67994.289	.012	.914	.000
Racial_Minority	1	34688393.248	5.936	.015	.005
LowIncome	1	242726503.011	41.535	.000	.031
SPED	1	88298067.909	15.110	.000	.012
ELL	1	156310.850	.027	.870	.000
Teacher_Coach_Yes_No	1	26500023.339	4.535	.033	.003
Error	1292	5843848.784			
Total	1299				
Corrected Total	1298				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .076 (Adjusted R Squared = .072)

Table 4.10 shows the estimated marginal means for Interim Assessment 2 percent correct. Means displayed in this table are correcting for the effects of the covariates on assessment scores. The uncorrected means displayed in Table 4.8 report higher means for students not attending class under a teacher that works with a coach (*M* = 72.83) than those students attending a class where the teacher does work with a coach (*M* = 71.68). Corrected means from Table 4.10 reports that students attending class with a teacher that works with a coach (*M* = 72.87) perform better than those students attending class with a teacher that does not work with a coach (*M* = 70.38).

Table 4.10. Estimated Marginal Means Second Grade Interim 2 Percent_Correct

Dependent Variable: 2nd Grade Interim 2 Percent_Correct

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	70.383[b]	.942	68.534	72.232
Yes	72.867[b]	.642	71.607	74.127

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .50, Racial Minority = .69, Low Income = .72, Special Education = .07, English Language Learner = .46.

Table 4.11 shows the number of students in the second grade that did and did not attend class with a teacher that worked with a coach who has a score on the first and second interim assessment for data analysis. Table 4.12 reports that change in mean from Interim Assessment 1 to Interim Assessment 2. Negative values in the data report a decrease in overall performance between the two assessments.

Table 4.11. Second Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	489
	Yes	810

Table 4.12. Weighted Mean Change for Second Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	-3.5390	1887.46457	489
Yes	-5.4689	1900.97879	810
Total	-4.8411	1898.78455	1299

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.13 shows the ANCOVA weighted regression with respect to change in test scores from assessment one to assessment two. At the second grade level Special Education (p = .043) and Teacher_Coach_Yes_No (p = .048) were statistically significant at the p = .05 level.

Table 4.13 Second Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_2

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	8217642.801	2.293	.033	.011
Intercept	1	66869652.328	18.658	.000	.014
GENDER	1	1330402.524	.371	.542	.000
Racial_Minority	1	204259.711	.057	.811	.000
LowIncome	1	7629114.061	2.129	.145	.002
SPED	1	14679015.420	4.096	.043	.003
ELL	1	11880174.567	3.315	.069	.003
Teacher_Coach_Yes_No	1	14047769.959	3.920	.048	.003
Error	1292	3583963.622			
Total	1299				
Corrected Total	1298				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .011 (Adjusted R Squared = .006)

Table 4.14 shows the estimated marginal means of change in test scores, corrected for covariate data. According to the table, covariates did not hold a strong influence on assessment outcomes. Means for teachers working without a coach (*M* = -3.54, *M* = -3.62) and teachers working with a coach (*M* = *-5.47, M* = -5.43) display diminutive change from Table 4.12 to Table 4.14.

Table 4.14. Estimated Marginal Means Change_Grade_2

Dependent Variable: Change_Grade_2

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	-3.621[b]	.738	-5.069	-2.173
Yes	-5.430[b]	.503	-6.417	-4.443

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .50, Racial Minority = .69, Low Income = .72, Special Education = .07, English Language Learner = .46.

Third Grade

Table 4.15 shows the mean interim scores based on student characteristic for third grade. Positive values represent higher scores on Interim Assessment 2 than on Interim Assessment 1 for third grade. ELL students attending class with a teacher working with a coach showed the largest gains (M = 5.49) but still underperformed (M = 59.63) compared to those ELL students attending class under a teacher without a coach (M = 64.48). Students falling in the category of Low Income reported the highest means (M = 69.88). Special Education students attending class under a teacher working with a coach scored the lowest (M = 50.09) and reported the lowest gains of any subgroup (M = 2.40).

Table 4.15 Third Grade Mean Interim Scores by Student Characteristics

		3rd Grade Interim 2 Percent Correct	Change_Grade_3
		Mean	Mean
Gender	Female	63.08	4.78
	Male	61.86	4.53
Racial Minority	No	67.83	3.88
	Yes	59.33	5.09
Low Income	No	69.88	4.17
	Yes	58.85	4.88
Special Education	No	64.17	4.96
	Yes	50.09	2.40
English Language Learner	No	64.48	4.10
	Yes	59.63	5.49

Table 4.16 shows the number of third grade students in the study and how many worked with at teacher that collaborated with a math coach. Table 4.17 reports the mean score of all students and if those students were in a class with a teacher working with a math coach. According to Table 4.17, students attending a third grade class under a teacher working with a math coach scored higher than those attending class under a teacher that did not work with a math coach.

Table 4.16. Third Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	445
	Yes	937

Table 4.17. Third Grade Interim 2 Percent Correct

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	62.5652	1990.80806	445
Yes	63.6960	2933.17339	937
Total	63.4869	2666.21542	1382

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.18 shows the results from the ANCOVA regression on Interim Assessment 2. Racial Minorities (p = .000), Low Income (p = .000), Special Education (p = .000), and Teacher_Coach_Yes_No (p = .000) are shown to be statistically significant at the third grade level for mathematics.

Table 4.18. Third Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_3

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	197521329.593	31.463	.000	.121
Intercept	1	22648364918.553	3607.684	.000	.724
GENDER	1	227077.465	.036	.849	.000
Racial_Minority	1	94813895.955	15.103	.000	.011
LowIncome	1	256450839.104	40.850	.000	.029
SPED	1	433715006.401	69.087	.000	.048
ELL	1	3482745.604	.555	.457	.000
Teacher_Coach_Yes_No	1	184564454.684	29.399	.000	.021
Error	1375	6277813.223			
Total	1382				
Corrected Total	1381				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .121 (Adjusted R Squared = .117)

Table 4.19 shows the estimated marginal means for third grade Interim Assessment 2 percent correct. Means displayed in this table are correcting for the effects of the covariates on assessment scores. Students attending class under non coached teachers did not perform as well as originally calculated ($M = 62.57$). The weighted regression lowers the original mean more than five points ($M = 56.77$). Those students working with a coached teacher scored higher with the corrected means ($M = 65.01$).

Table 4.19. Estimated Marginal Means Third Grade Interim 2 Percent_Correct

Dependent Variable: 3rd Grade Interim 2 Percent_Correct

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	56.770[b]	1.342	54.137	59.403
Yes	65.011[b]	.589	63.857	66.165

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .52, Racial Minority = .71, Low Income = .75, Special Education = .12, English Language Learner = .50.

Table 4.20 shows the number of students in the third grade that did and did not attend class with a teacher that worked with a coach who has a score on the first and second interim assessment for data analysis. Table 4.21 reports the change in means from Interim Assessment 1 to Interim Assessment 2. Positive values in the data report an increase in overall performance between the two assessments. Both groups increased in performance on the second test, however students attending class under coached teachers reported the largest gains ($M = 6.71$).

Table 4.20. Third Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	445
	Yes	937

Table 4.21. Weighted Mean Change for Third Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	1.8385	1574.96458	445
Yes	6.7105	2373.32763	937
Total	5.8094	2162.40781	1382

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.22 displays the ANCOVA weighted regression with respect to change in test scores from assessment one to assessment two. At the third grade level Special Education (p = .044), English Language Learners (p = .017) and Teacher_Coach_Yes_No (p = .005) were statistically significant at the p = .05 level.

Table 4.22. Third Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_3

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	23466223.352	5.108	.000	.022
Intercept	1	61163481.402	13.314	.000	.010
GENDER	1	669407.919	.146	.703	.000
Racial_Minority	1	1677196.080	.365	.546	.000
LowIncome	1	1522435.556	.331	.565	.000
SPED	1	18723087.394	4.076	.044	.003
ELL	1	26455725.594	5.759	.017	.004
Teacher_Coach_Yes_No	1	36834966.658	8.018	.005	.006
Error	1375	4594013.875			
Total	1382				
Corrected Total	1381				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .022 (Adjusted R Squared = .018)

Table 4.23 shows the estimated marginal means of change in test scores, corrected for covariate data. Both groups displayed positive change on Interim Assessment 2 while students working with a coached teacher reporting the largest gains (M = 6.49).

Table 4.23. Estimated Marginal Means Change_Grade_3

Dependent Variable: Change_Grade_3

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	2.809[b]	1.148	.556	5.061
Yes	6.490[b]	.503	5.503	7.478

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .52, Racial Minority = .71, Low Income = .75, Special Education = .12, English Language Learner = .50.

Fourth Grade

Table 4.24 shows the mean interim scores based on student characteristic for fourth grade. Negative values in the column titled Change_Grade_4 represent lower scores for that subpopulation. Special Education students whose teacher worked with a coach displayed the lowest scores (M = 43.76), however they also reported the smallest loss between assessments (M = -9.55). Male students in the study reported the biggest loss from Interim Assessment 1 to Interim Assessment 2 (M = -11.87).

Table 4.24. Fourth Grade Mean Interim Scores by Student Characteristics

		4th Grade Interim 2 Percent Correct	Change_Grade_4
		Mean	Mean
Gender	Female	57.99	-10.56
	Male	57.40	-11.87
Racial Minority	No	63.28	-11.00
	Yes	53.93	-11.36
Low Income	No	65.48	-10.36
	Yes	53.29	-11.69
Special Education	No	60.21	-11.51
	Yes	43.76	-9.55
English Language Learner	No	60.20	-11.17
	Yes	53.93	-11.29

Table 4.25 shows the number of fourth grade students in the study and how many worked with at teacher that collaborated with a math coach. Table 4.26 reports the mean score of all students and if those students were in a class with a teacher working with a math coach. According to Table 4.26, students attending a fourth grade class under a teacher working with a math coach scored lower than those attending class under a teacher that did not work with a math coach.

Table 4.25. Fourth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	349
	Yes	831

Table 4.26. Fourth Grade Interim 2 Percent Correct

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	60.5177	2522.43385	349
Yes	56.2857	3126.65571	831
Total	57.3028	2970.74800	1180

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.27 shows the results from the ANCOVA regression on fourth grade Interim Assessment 2. Racial Minority (p = .000), Low Income (p = .000), Special Education (p = .000) and Teachers working with or without a coach (p = .002) are shown to be statistically significant.

Table 4.27. Fourth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_4

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	243190502.875	31.887	.000	.140
Intercept	1	21907431195.378	2872.524	.000	.710
GENDER	1	253078.724	.033	.855	.000
Racial_Minority	1	100109113.985	13.126	.000	.011
LowIncome	1	313211693.744	41.069	.000	.034
SPED	1	579233732.586	75.950	.000	.061
ELL	1	57162.245	.007	.931	.000
Teacher_Coach_Yes_No	1	70520396.361	9.247	.002	.008
Error	1173	7626544.920			
Total	1180				
Corrected Total	1179				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .140 (Adjusted R Squared = .136)

Table 4.28 shows the estimated marginal means for Interim Assessment 2 percent correct. Means displayed in this table are correcting for the effects of the covariates on assessment scores. The uncorrected means displayed in Table 4.26 report higher means for students not attending class under a teacher that works with a coach ($M = 60.52$) than those students attending a class where the teacher does work with a coach ($M = 56.29$). Corrected means from Table 4.28 reports that students attending class with a teacher that works with a coach ($M = 58.40$) perform better than those students attending class with a teacher that does not work with a coach ($M = 53.52$).

Table 4.28. Estimated Marginal Means Fourth Grade Interim 2 Percent_Correct

Dependent Variable: 4th Grade Interim 2 Percent_Correct

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	53.582[b]	1.350	50.935	56.230
Yes	58.480[b]	.689	57.128	59.831

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .50, Racial Minority = .65, Low Income = .71, Special Education = .15, English Language Learner = .44.

Table 4.29 shows the number of students in the fourth grade that did and did not attend class with a teacher that worked with a coach who has a score on the first and second interim assessment for data analysis. Table 4.30 reports the change in means from Interim Assessment 1 to Interim Assessment 2. Negative values in the data report a decrease in overall performance between the two assessments. Both groups decreased in performance on the second test, however students attending class under coached teachers reported smallest loss of the two groups (M = -11.29).

Table 4.29. Fourth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	349
	Yes	831

Table 4.30. Weighted Mean Change for Fourth Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	-12.2947	1882.47864	349
Yes	-11.2918	2251.88563	831
Total	-11.5328	2149.31411	1180

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.31 displays the ANCOVA weighted regression with respect to change in test scores from assessment one to assessment two. At the fourth grade level Special Education (p = .045) was the only covariant be statistically significant at the p = .05 level. Looking back at Table 4.24 Special Education showed the least loss from Interim Assessment 1 to Interim Assessment 2 (M = -9.55). Despite any factor that may have cause all sub-populations to perform poorly on the second interim, the assistance of an instructional coach allowed for special education students to outperform their peers.

Table 4.31. Fourth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_4

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	5802669.637	1.258	.274	.006
Intercept	1	545430161.157	118.225	.000	.092
GENDER	1	6480117.656	1.405	.236	.001
Racial_Minority	1	47396.678	.010	.919	.000
LowIncome	1	8424645.005	1.826	.177	.002
SPED	1	18611001.653	4.034	.045	.003
ELL	1	1355228.018	.294	.588	.000
Teacher_Coach_Yes_No	1	6258497.219	1.357	.244	.001
Error	1173	4613499.371			
Total	1180				
Corrected Total	1179				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .006 (Adjusted R Squared = .001)

Table 4.32 shows the estimated marginal means of change in test scores, corrected for covariate data. Both groups displayed negative change on Interim Assessment 2, however students working with a coached teacher outperformed those students working with teachers that were not coached.

Table 4.32. Estimated Marginal Means Change_Grade_4

Dependent Variable: Change_Grade_4

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	-12.641[b]	1.050	-14.701	-10.582
Yes	-11.182[b]	.536	-12.233	-10.131

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .50, Racial Minority = .65, Low Income = .71, Special Education = .15, English Language Learner = .44.

Fifth Grade

Table 4.33 shows the mean interim scores based on student characteristic for fifth grade. Negative values represent decreased scores on Interim Assessment 2 compared to Interim Assessment 1 for fifth grade. Low Income students attending class with a teacher not working with a coach showed the largest loss (*M* = -6.51) but outperformed all other subpopulations in the study at the fifth grade level (*M* = 68.06). Special Education students working with a coached teacher reported the lowest means (M = 48.42).

Table 4.33. Fifth Grade Mean Interim Scores by Student Characteristics

		5th Grade Interim 2 Percent Correct	Change_Grade_5
		Mean	Mean
Gender	Female	60.48	-4.37
	Male	61.81	-4.24
Racial Minority	No	65.91	-5.35
	Yes	58.31	-3.68
Low Income	No	68.06	-6.51
	Yes	57.70	-3.19
Special Education	No	63.00	-4.71
	Yes	48.42	-1.51
English Language Learner	No	62.40	-5.61
	Yes	59.30	-2.58

Table 4.34 shows the number of fifth grade students in the study and how many worked with at teacher that collaborated with a math coach. Table 4.35 reports the mean score of all students and if those students were in a class with a teacher working with a math coach. According to Table 4.35, students attending a fifth grade class under a teacher working with a math coach scored lower than those attending class under a teacher that did not work with a math coach.

Table 4.34. Fifth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	409
	Yes	729

Table 4.35. Fifth Grade Interim 2 Percent Correct

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	63.7070	3042.89917	409
Yes	60.8594	2878.94190	729
Total	61.8594	2944.14373	1138

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.36 shows the results from the ANCOVA regression on Interim Assessment 2. Gender (p = .025), Racial Minorities (p = .003), Low Income (p = .000), Special Education (p = .000), and Teacher_Coach_Yes_No (p = .010) are shown to be statistically significant at the fifth grade level for mathematics.

Table 4.36. Fifth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_5

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	175405761.199	22.536	.000	.107
Intercept	1	23006956421.646	2955.889	.000	.723
GENDER	1	38948924.370	5.004	.025	.004
Racial_Minority	1	68084740.524	8.747	.003	.008
LowIncome	1	249122777.118	32.007	.000	.028
SPED	1	396242430.819	50.908	.000	.043
ELL	1	15192508.291	1.952	.163	.002
Teacher_Coach_Yes_No	1	51491938.942	6.616	.010	.006
Error	1131	7783431.735			
Total	1138				
Corrected Total	1137				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .107 (Adjusted R Squared = .102)

Table 4.37 shows the estimated marginal means for fifth grade Interim Assessment 2 percent correct. Means displayed in this table are correcting for the effects of the covariates on assessment scores. The weighted regression results show that students working with coached teachers out performed ($M = 63.21$) students working with non-coached teachers ($M = 59.37$).

Table 4.37. Estimated Marginal Means Fifth Grade Interim 2 Percent_Correct

Dependent Variable: 5th Grade Interim 2 Percent_Correct

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	59.370[b]	1.125	57.164	61.577
Yes	63.207[b]	.776	61.684	64.730

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .51, Racial Minority = .65, Low Income = .68, Special Education = .11, English Language Learner = .45.

Table 4.38 shows the number of students in the third grade that did and did not attend class with a teacher that worked with a coach who has a score on the first and second interim assessment for data analysis. Table 4.39 reports the change in means from Interim Assessment 1 to Interim Assessment 2. Negative values in the data report a decrease in overall performance between the two assessments. Both groups decreased in performance on the second test, however students attending class under non-coached teachers reported the largest loss (M = -5.28).

Table 4.38. Fifth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	409
	Yes	728

Table 4.39. Weighted Mean Change for Fifth Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	-5.2775	2570.62334	409
Yes	-4.5829	2549.22226	728
Total	-4.8271	2556.25908	1137

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.40 displays the ANCOVA weighted regression with respect to change in test scores from assessment one to assessment two. At the fifth grade level Low Income (p = .008) and Special Educartion (p = .034) were statistically significant at the p = .05 level.

Table 4.40. Fifth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_5

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	22896576.564	3.551	.002	.019
Intercept	1	321715305.478	49.897	.000	.042
GENDER	1	2685.781	.000	.984	.000
Racial_Minority	1	775308.920	.120	.729	.000
LowIncome	1	44949774.558	6.972	.008	.006
SPED	1	29092536.161	4.512	.034	.004
ELL	1	18371967.908	2.849	.092	.003
Teacher_Coach_Yes_No	1	15858556.213	2.460	.117	.002
Error	1130	6447581.972			
Total	1137				
Corrected Total	1136				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .019 (Adjusted R Squared = .013)

Table 4.41 shows the estimated marginal means of change in test scores, corrected for covariate data. Both groups displayed negative change on Interim Assessment 2 while students working with a coached teacher reporting the largest loss (*M* = -5.58).

Table 4.41. Estimated Marginal Means Change_Grade_5

Dependent Variable: Change_Grade_5

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	-3.447[b]	1.023	-5.454	-1.439
Yes	-5.576[b]	.707	-6.963	-4.188

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .51, Racial Minority = .65, Low Income = .68, Special Education = .11, English Language Learner = .45.

Sixth Grade

Table 4.42 shows the mean interim scores based on student characteristic for sixth grade. Negative values represent lower scores on Interim Assessment 2 than on Interim Assessment 1 for sixth grade. Low Income students working with an non-coached teachers had the largest mean score of all subpopulations (M = 66.21) but also has double digit loss (*M* = -10.48). Racial Minorities had the largest loss from the first assessment to the second (*M* = -10.72). Special Education had the lowest recorded means (*M* = 43.76), but also had the smallest amount of loss between test (*M* = -2.72).

Table 4.42. Sixth Grade Mean Interim Scores by Student Characteristics

		6th Grade Interim 2 Percent Correct	Change_Grade_6
		Mean	Mean
Gender	Female	59.68	-5.66
	Male	58.57	-7.74
Racial Minority	No	63.80	-10.72
	Yes	56.58	-4.56
Low Income	No	66.21	-10.46
	Yes	55.63	-4.89
Special Education	No	61.74	-7.41
	Yes	43.76	-2.72
English Language Learner	No	61.17	-8.99
	Yes	56.73	-4.10

Table 4.43 shows the number of sixth grade students in the study and how many worked with at teacher that collaborated with a math coach. Table 4.44 reports the mean score of all students and if those students were in a class with a teacher working with a math coach. According to Table 4.44, students attending a sixth grade class under a teacher working with a math coach scored slightly higher than those attending class under a teacher that did not work with a math coach.

Table 4.43. Sixth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	378
	Yes	786

Table 4.44. Sixth Grade Interim 2 Percent Correct

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	59.3704	2414.45303	378
Yes	59.6841	3012.70187	786
Total	59.6104	2831.32605	1164

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.45 shows the results from the ANCOVA regression on Interim Assessment 2. Racial Minorities (p = .026), Low Income (p = .000), Special Education (p = .000), and Teacher_Coach_Yes_No (p = .002) are shown to be statistically significant at the sixth grade level for mathematics.

Table 4.45. Sixth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_6

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	164825395.037	22.882	.000	.106
Intercept	1	16385625270.489	2274.763	.000	.663
GENDER	1	9336542.770	1.296	.255	.001
Racial_Minority	1	35817516.235	4.972	.026	.004
LowIncome	1	162276591.890	22.528	.000	.019
SPED	1	601003279.334	83.435	.000	.067
ELL	1	17103228.561	2.374	.124	.002
Teacher_Coach_Yes_No	1	67645078.056	9.391	.002	.008
Error	1157	7203223.185			
Total	1164				
Corrected Total	1163				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .106 (Adjusted R Squared = .101)

Table 4.46 shows the estimated marginal means for sixth grade Interim Assessment 2 percent correct. Means displayed in this table are correcting for the effects of the covariates on assessment scores. The weighted regression results show that students working with coached teachers out performed ($M = 60.73$) students working with non-coached teachers ($M = 55.97$).

Table 4.46. Estimated Marginal Means Sixth Grade Interim 2 Percent_Correct

Dependent Variable: 6th Grade Interim 2 Percent_Correct

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	55.971[b]	1.322	53.377	58.566
Yes	60.727[b]	.686	59.380	62.074

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .51, Racial Minority = .74, Low Income = .77, Special Education = .15, English Language Learner = .55.

Table 4.47 shows the number of students in the sixth grade that did and did not attend class with a teacher that worked with a coach who has a score on the first and second interim assessment for data analysis. Table 4.48 reports the change in means from Interim Assessment 1 to Interim Assessment 2. Negative values in the data report a decrease in overall performance between the two assessments. Both groups decreased in performance on the second test, however students attending class under non-coached teachers reported the largest loss (M = -7.54).

Table 4.47. Sixth Grade: Teacher Worked with a Math Coach

	Value Label	N
Teacher worked with a Math Coach	No	377
	Yes	786

Table 4.48. Weighted Mean Change for Sixth Grade

Teacher worked with a Math Coach	Mean	Std. Deviation	N
No	-7.5410	1849.02208	377
Yes	-4.1049	2255.92350	786
Total	-4.9082	2140.79975	1163

a. Weighted Least Squares Regression - Weighted by Teacher ID

Table 4.49 displays the ANCOVA weighted regression with respect to change in test scores from assessment one to assessment two. At the sixth grade level Gender (p = .011), Low Income (p = .001) and Special Educartion (p = .008) were statistically significant at the p = .05 level.

Table 4.49. Sixth Grade ANCOVA Weighted Regression by Teacher ID

Dependent Variable: Change_Grade_6

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6	42310216.333	9.644	.000	.048
Intercept	1	334518541.646	76.249	.000	.062
GENDER	1	28423717.441	6.479	.011	.006
Racial_Minority	1	47605398.273	10.851	.001	.009
LowIncome	1	10411111.245	2.373	.124	.002
SPED	1	31406922.544	7.159	.008	.006
ELL	1	3134341.878	.714	.398	.001
Teacher_Coach_Yes_No	1	437580.986	.100	.752	.000
Error	1156	4387207.696			
Total	1163				
Corrected Total	1162				

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. R Squared = .048 (Adjusted R Squared = .043)

Table 4.50 shows the estimated marginal means of change in test scores, corrected for covariate data. Both groups displayed negative change on Interim Assessment 2 while students working with a non-coached teacher reporting the largest loss (M = -5.20).

Table 4.50. Estimated Marginal Means Change_Grade_6

Dependent Variable: Change_Grade_6

Teacher worked with a Math Coach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
No	-5.202[b]	1.036	-7.236	-3.169
Yes	-4.818[b]	.536	-5.870	-3.767

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Covariates appearing in the model are evaluated at the following values: Gender = .50, Racial Minority = .74, Low Income = .77, Special Education = .15, English Language Learner = .55.

Question Results

This study sought to answer the question: "Is there a difference in student achievement between students served by coached and non-coached teachers?" Table 4.51 displays the level of significance for grades 1-6 on both Interim Assessment 1 and Interim Assessment 2. Each test has been validated at the p = .05 level for statistical significance.

Table 4.51. Interim Assessments 1 and 2. Teacher_Coach_Yes_No

Grade	Sig.	Significant at $p = .05$
1st – Spring	.564	No
1st – Change	.570	No
2nd – Spring	.033	Yes
2nd – Change	.048	Yes
3rd – Spring	.000	Yes
3rd – Change	.005	Yes
4th – Spring	.002	Yes
4th – Change	.244	No
5th – Spring	.010	Yes
5th – Change	.117	No
6th – Spring	.004	Yes
6th – Change	.002	Yes

a. Weighted Least Squares Regression - Weighted by Teacher ID

Students in first grade showed no statistical significance for either interim assessment. Reflecting back on covariate data from Table 4.2, students in each subpopulation increased in performance from interim one to interim two, but there was not enough variance in the data to determine if having a math coach with a teacher held any greater impact on student performance at the first grade level. Similarly, Interim Assessment 2 for fourth and fifth grade held not statistical significance. Unlike first grade both groups decreased their scores on assessment two. Tables 4.24 and 4.33 report academic loss for all covariates in the subpopulations. Students did not show a response

that signified coached teachers could impact student outcomes in mathematics for fourth or fifth grade.

Second, third and sixth grades all shown statistically significant results. Second and sixth grades reported academic loss between assessments but still held a statistically significant result as to the impact of instructional coaches on mathematical performance. Third grade was the only grade to boast positive academic gain from assessment one to assessment two and show a statistical significance in instructional coach impact. Covariates in the subpopulation of third grade students from Table 4.15 show that Racial Minority, Low Income and English Language Learners working with coached teachers made greater improvements than students working with non-coached teachers.

Z-Score Data

Appendix D displays the difference in standardized test percentages for both coached and non-coached groups for each grade level. Table 4.52 contains z-scores for students taught by a teacher working with an instructional coach. This table reports positive differences for grades 1, 3, 5 and 6. Positive values represent better performance on the second interim assessment for students in this population. According to Table 4.53 grades 1 and 3 performed better on interim assessment 2 within the population of students taught by a teacher not working with an instructional coach. Recall that the second interim assessment was created harder by district personnel to measure expected growth. This fact increases the value of instructional coaches in the math classroom given that a majority of students learning under a coached teacher performed better on the second interim assessment compared to the first.

CHAPTER5: DISCUSSION OF RESULTS

Introduction

Traditional teacher development practices often teach new methodologies and updated curriculum by forcing teachers to sit through numerous days of in-service workshops that focus on topics unrelated to the everyday lives of teachers (Fuhrman, 1993). At the end of these days of training, teachers are left alone to interpret the loads of information they are given and expected to place this new found knowledge into practice. Research has shown that this application of training does nothing to change instructional practice and has no impact on student performance or their academic success (Cuban, 1990; Darling-Hammond & McLaughlin, 1995). Change occurs when professional development becomes ongoing, sustained, site-based and offers an avenue of communication with a highly qualified, trained professional (Bryk & Schneider, 2003**).** According to Mizell (2006) instructional coaches are a dynamic, positive and concrete way to create the conduit for change by offering adult learning during the course of the school day.

The purpose of this study was to ascertain the value of instructional coaches on student achievement in mathematics. Specifically, the study assessed the impact of instructional coaches on elementary students, grades first through six, in a selected school district in the Mountainous West of the United States. The study was designed to determine overall influence of instructional coached at each grade level but also provide insight on subpopulations within the study group at each grade level. The results demonstrated that instructional math coaches have a statistical impact on many students

in the study and provided awareness of subpopulation or covariate relationships between math instructional coaches and student performance.

Summary of Assessment Results

This study utilized two math assessments developed by a school district in the Mountainous West United States. Interim Assessments 1 and 2 were created with each grade level in mind and took into account expected growth for mathematical understanding throughout a school year. Both assessments were administered to 7,596 students in grades first through sixth. Between the first and second assessment 5,046 students attended classes with a teacher selected to work with a mathematics instructional coach. The remaining 2550 students attended class with a teacher working without a math instructional coach.

The data collected was divided into additional subpopulations based upon Gender, Racial Minority, Low Income, Special Education and English Language Learners. Each subpopulation has been identified as having an impact on educational assessment outcomes throughout the country. Results show that math coaches did have an impact on some student populations in the study. Those populations are both grade level specific and many are associated with subpopulations within grade level categories.

Findings

The data from this study revealed that teachers working with an academic coach did see statistically significant results in student achievement. Coaching is viewed as a collaborative and successful professional development model (Joyce & Showers, 1995; Denton & Hasbrouck, 2009; Feltz et al., 1999; Garet,et al., 2001; Hopkins-Thompson, 2000). Research reports teachers experience greater differentiation of instruction,

additional collaboration among school faculties and improved identification of students' learning needs when working with instructional coaches (Marsh et al., 2007). Instructional coaching is an avenue that provides teachers with job embedded professional development on data driven decision making. Teachers working with instructional coaches are exposed to 1-on-1 activities that incorporate instruction with student centered needs based on data. Vaughn et al. (1996) suggest that individuals learn best when provided opportunities to observe modeling, discuss and reflect with others, practice applications of new ideas and receive feedback from an expert in the field. The change model of one-shot workshops to actual instructional change and increased students learning is extremely limited in today's educational construct (Garet et al., 2001).

The research question for this study asked, Is there a difference in student achievement between students served by coached and non-coached teachers? Data revealed that instructional coaches had a statistically significant impact on students in grades second, third and sixth. Grades first, fourth and fifth showed no statistical change in scores from assessment one to assessment two. A majority of grade levels reported substantial academic loss from assessment one to assessment two. This could be a result of the difficulty associated with assessment two. The district design of the assessments was to represent expected growth throughout the course of a school year. When looking closely at the date range between the two assessments, a period of four months had passed. This may not be in the same timeframe as originally planned by district parties. Additionally, the second test was matched to academic standards that may have not been

covered or failed to reach the level of detail in the classroom needed for student success within the given timeframe.

Although there was recorded loss in achievement the impact of instructional coaches was still present by viewing a distribution of change means gathered from Interim Assessment 2. Table 4.52 values the absolute change in mean scores for grades second, third and sixth. This table identifies the subpopulation that instructional math coaches has the biggest impact on. Larger values represent the least impact while smaller totals represent greater impact.

Table 5.1. Sum of Change in Means Change_Grade_2

		Grade			
		Second	Third	Sixth	$\sum M$
GENDER	Female	-5.32	4.78	-5.66	15.76
	Male	-5.72	4.53	-7.74	17.99
Racial Minority		-5.77	5.09	-4.56	15.42
Low Income		-6.02	4.88	-4.89	15.79
SPED		-3.84	2.04	-2.72	8.60
ELL		-5.54	5.49	-4.10	15.13

a. Weighted Least Squares Regression - Weighted by Teacher ID

b. Sum uses absolute value of means.

According to the table instructional coaches working with classroom teachers had the largest impact on students in the special education population. A small sum represents little negative change and valuable positive change across significant grade levels. A

total of 618 special education students worked with coached teachers across all grade levels. Although it is impossible to know how many were in each grade and how much time was spent with each student, it is plausible to assume that addition time was awarded to many of these students as a result of their individual education plans.

Table 5.2 reports the weighted significance for each subpopulation of covariates on percent change between assessment one and assessment two. Excluding first grade, special education shown to be statistically significant at all other grade levels at the p = .05 level.

Table 5.2. All Grades ANCOVA Weighted Regression Change_Grade_2

	Sig.					
	1st	2nd	3rd	4th	5th	6th
GENDER	.003	.542	.703	.236	.984	.011
Racial Minority	.676	.811	.546	.919	.729	.001
Low Income	.586	.145	.565	.177	.008	.124
SPED	.989	.043	.044	.045	.034	.008
ELL	.202	.069	.017	.588	.092	.398

a. Weighted Least Squares Regression - Weighted by Teacher ID

One reason this may be happening is taking into account who assigns the duties of instructional coaches and how much time is spent with each teacher. Principals often assign coaches, interventions and other assistance to those classes with the most need or the lowest scores. Classes consisting of multiple special education students would stand out as needing additional assistances. This could skew the data and make it appear that

instructional coaches have the most impact on special education students. This has not been confirmed or denied by this study.

Practical Implications

This study continues to support the work of instructional coaches in the field of elementary mathematics education. Instructional coaches continue to help teachers make needed changes to current practices in order to impact student achievement. On-site development with mathematic content specialists is critical for improving learning outcomes. Knight (2007) identifies instructional coaches as on-site professional developers that work in collaboration with teachers. Coaches empower teachers to incorporate research-based instruction into their classrooms. According to Knight (2007), coaches employ seven basic practices for instructional development. These practices build the coach teacher relationship and strengthen the daily instruction students are exposed to.

- **Enrolls the teacher** - they conduct one-to-one interviews with each teacher prior to the experience.
- **Engages in collaborative planning** - The coach meets with the collaborating teacher to discuss how a new teaching practice can be implemented effectively.
- **Models the lesson** - The coach must model the lesson in the collaborating teacher's classroom while the teacher observes.
- **Teacher-directed post conference** - Both parties must meet to discuss what the teacher observed the coach doing while modeling the lesson.
- **Coach observes the lesson** - It's the teacher's turn to teach the lesson.

- **Exploring data together** - The coach and teacher discuss the data gathered during mutual observations.
- **Providing continued support** - This is a continuous relationship that needs to be fostered over the year.

Educators are faced with increased expectations, less funding, daily pressure and little to no encouragement. Coaches can provide incredible services, such as listening, empathizing and encouraging teachers in a respectful, non-judging way. Knight (2007) views coaches as trusted friends to teachers that provide the needed support to cultivate instructional growth. According to Knight, quality coaches are grounded in seven fundamental principles that build their effectiveness.

- **Equality** - Instructional coaches and teachers are equal partners.
- **Choice** - Teachers should have a choice regarding what and how they learn.
- **Voice** - Professional learning should empower and respect the voices of teachers.
- **Dialogue** - Professional learning should enable authentic dialogue.
- **Reflection** - Reflection is an integral part of professional learning.
- **Praxis** - Teachers should apply their learning to their real-life practice as they are learning.
- **Reciprocity** - Instructional coaches should expect to get as much as they give.

Future Research

One assumption that continuously reoccurs during discussion of the coaching model is that by improving instructional practice student achievement will show positive change. Many districts adopt the coaching model because they believe in the premise that coaches help teachers develop. Other district do not adopt the model because there is

a lack of quantitative evidence to show measurable growth on student achievement by incorporating an instructional coach in the educational construct. This increases the need for additional studies on the subject matter. Research is this study was limited to a select school district, grade level and bound by assessments created by others outside the research project. Other factors outside the control of this study included the time spent and teacher assignment, both of which were in the hands of the building principals. Future research needs to develop a model where more randomness of student and teacher assignments are in place. The time a coach spends with a teacher should be monitored to be equal amongst all parties. In addition, the data instrument used for student accountability should be universally accepted and have more than two data points in order to track achievement.

Acceptable research in coaching may need to occur over a period of three or more years to fully understand the impact of coaching on mathematics achievement. This type of research could determine if coaching is a continuously needed model or if there is a point in a teacher's career where they no longer need a coach. In addition, what impact do coaches have on high achieving mathematics students? Are there components of coaching that prove to be most beneficial for improved instruction? Can the qualities of coaching that are best for improved instruction be fulfilled in other ways, such as collaboration, to save money and resources for financially depleted districted? These questions will require further research and should be extended across all core subjects and grade levels.

Conclusion

This chapter outlined a summary of the study and provided discussion of findings and areas of future research. As with any study there were limitations reviewed along the way that could have had an impact on the findings. Although the research cannot be generalized to other studies, the data found within this study may help future studies to develop methodologies for sound research in instructional coaching for mathematics.

The statistical significance shown by the data in this study is of limited value but still supports instructional coaching in mathematics at some level. Realistically, it is hard to argue having an expert in the field work with a classroom teacher to improve instruction and develop the best delivery of content to students on a daily basis. Issues arise when the coach in question does not possess the mastery level of content knowledge to communicate efficiently with the classroom teacher. In the end each district must do what is best for students. This sentiment should be connected to educational practice and hiring procedures. Adopting this attitude is the first step to building better schools and helping students become the district leaders and teachers of tomorrow.

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APPENDIX A

COACHING APPLICATION

[redacted] School District Coaching Classroom embedded, School-Based Professional Development 2013-14

Goal: Provide authentic professional development within the school/classroom context and to better assess instructional needs, support teacher practice, develop teacher capacity, and increase student learning.

Objective I. Increase student achievement

Objective II. Build the capacity

Objective III. Support School Improvement Plans

Assurance 3: Recruiting, developing, rewarding and retaining effective teachers and principals, especially where they are needed most.

SLCSD has a competitive salary schedule compared to neighboring, more suburban districts, which has enhanced the recruitment of highly qualified applicants who have received degrees from excellent schools such as [redacted]. For the past two years, improvements to the spring hiring calendar have been implemented to achieve a balance between honoring career teachers' desire to fill an open position and recruiting promising teachers who are new to the district. SLCSD has supported the placement of elementary assistant principals and interns to both support the needs of schools and develop a cadre of qualified and experienced school leaders to fill future administrative openings. While the state has not made teacher professional development a priority, and has eliminated virtually all contract-time professional development, SLCSD has committed a significant amount of resources to job-embedded professional development for all teachers through the academic coaching program, which includes the equivalent of 1 FTE coach for each Title I elementary. These academic coaches receive extensive and ongoing training to support teachers on content, pedagogy and equity issues

APPENDIX B

NUMBER OF HOURS LOGGED

Many teachers have been worked with academic coaches in their buildings this fall. Over 21,000 hours have been logged with coaches as they work with groups of teachers, faculties, PLCs, endorsement classes, and individual work with teachers in the classroom. Six hundred and twenty-five teachers have interacted with coaches from August through December of 2013.

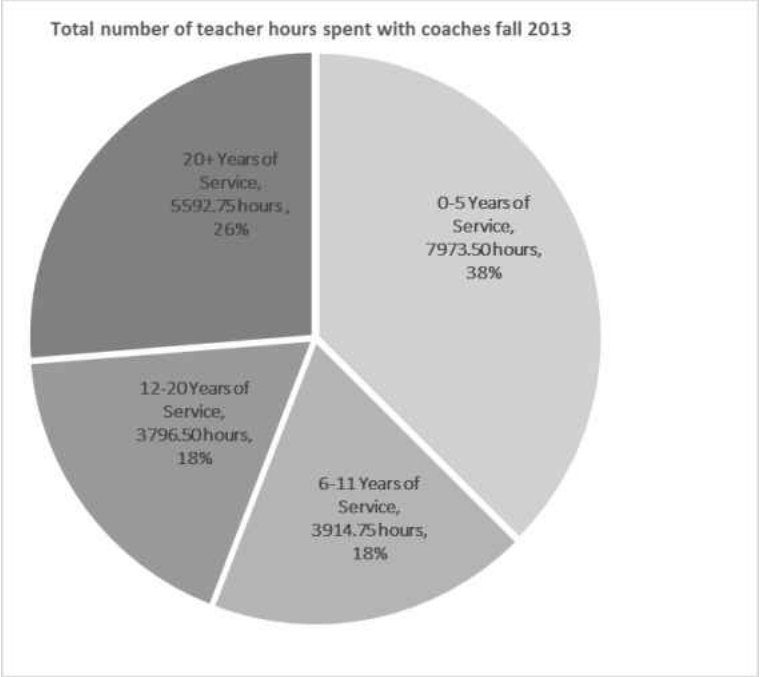
All teachers time with Coaches	Total Teacher Hours	Total Number of Teachers
Total Teacher Time	21277.50	625

Coaches are assigned at least .5 to Title 1 schools and in some cases full time. Twice as many teachers at Title 1 schools came in contact with coaches accounting for over 75% of the time.

Teacher time with coachers by Title 1	Sum	N	% of Total Sum
Non Title 1	5235.00	221	24.6%
Title 1	16042.50	404	75.4%
Total Teacher Time	21277.50	625	100.0%

New teaches (0-5 years of service) made up 37.5% of the total number of contact hours. While experienced teachers made up 26% of the total number of contact hours.

Teacher time with coaches by years of service	N	Total number of contact hours	% of Total Sum of hours	% teachers by years of service
0-5 Years of Service	200	7973.50	37.5%	32.0%
6-11 Years of Service	120	3914.75	18.4%	19.2%
12-20 Years of Service	149	3796.50	17.8%	23.8%
20+ Years of Service	156	5592.75	26.3%	25.0%
Total	625	21277.50	100.0%	100.0%



Distribution of teacher contact time was spread evenly with the exception of 6th grade. The greatest number of teachers being in the first and second grade with class sizes deliberately kept lower there are more teachers in those grade levels.

Total teacher time with Coaches by Grade Level (August-December 2013)	Total number of hours	Number of teachers	% of Total Sum of hours
Kindergarten	2470.50	74	11.6%
First Grade	2580.25	86	12.1%
Second Grade	2494.50	81	11.7%
Third Grade	2839.25	78	13.3%
Fourth Grade	2864.75	68	13.5%
Fifth Grade	2398.25	69	11.3%
Sixth Grade	1544.50	53	7.3%
Seventh/Eighth Grade	2787.50	58	13.1%
ADMIN	483.25	17	2.3%
SEC MATH	259.00	9	1.2%
SPED	550.75	32	2.6%
Total	21277.50	625	100.0%

Representation of teachers in Title 1 Schools:

Teacher time with coaches by years of service	TITLE_1	N	% of Total Sum	Minimum	Maximum	Sum
0-5 Years of Service	Non Title 1	47	6.0%	3.50	127.75	1277.00
	Title 1	153	31.5%	1.00	175.50	6696.50
6-11 Years of Service	Non Title 2	44	3.9%	3.50	110.00	824.25
	Title 2	76	14.5%	2.00	184.00	3090.50
12-20 Years of Service	Non Title 3	59	5.2%	.75	117.00	1104.00
	Title 3	90	12.7%	1.00	135.75	2692.50
20+ Years of Service	Non Title 4	71	9.5%	.50	160.00	2029.75
	Title 4	85	16.7%	2.50	184.00	3563.00
Total	.00	221	24.6%	.50	160.00	5235.00
	1.00	404	75.4%	1.00	184.00	16042.50
	Total	625	100.0%	.50	184.00	21277.50

All teachers time with Coaches	LA Coaches	Math Coaches
N	437	395
Sum	9930.25	11347.25

APPENDIX C

COPY OF IRB APPROVAL LETTER

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NOTICE OF IRB EXEMPTION STATUS
Protocol Number: 16-233
Institutional Review Board IRB00002836, DHHS FWA00003332

Principal Investigator: **Kayla M. Hibbard** Faculty Advisor: **Dr. Charles Hausman**

Project Title: **Impact of Instructional Coaches on Student Achievement**

Exemption Date: **5/31/16**

Approved by: **Dr. Ida Slusher, IRB Chair**

This document confirms that the Institutional Review Board (IRB) has granted exempt status for the above referenced research project as outlined in the application submitted for IRB review with an immediate effective date. Exempt status means that your research is exempt from further review for a period of three years from the original notification date if no changes are made to the original protocol. If you plan to continue the project beyond three years, you are required to reapply for exemption.

Principal Investigator Responsibilities: It is the responsibility of the principal investigator to ensure that all investigators and staff associated with this study meet the training requirements for conducting research involving human subjects and follow the approved protocol.

Adverse Events: Any adverse or unexpected events that occur in conjunction with this study must be reported to the IRB within ten calendar days of the occurrence.

Changes to Approved Research Protocol: If changes to the approved research protocol become necessary, a description of those changes must be submitted for IRB review and approval prior to implementation. If the changes result in a change in your project's exempt status, you will be required to submit an application for expedited or full IRB review. Changes include, but are not limited to, those involving study personnel, subjects, and procedures.

Other Provisions of Approval, if applicable: None

Please contact Sponsored Programs at 859-622-3636 or send email to tiffany.hamblin@eku.edu or lisa.royalty@eku.edu with questions.

APPENDIX D

Z-SCORES

Table 4.52: Z-Scores Coached Yes

Grade	Mean Zscore INT1	Mean Zscore INT2	Difference
1	-.0492937	-.0101283	.0391654
2	-.0153136	-.0298344	-.0145208
3	-.0384253	.0148457	.0532710
4	-.0618357	-.0773462	-.0155105
5	-.0752868	-.0506969	.0245899
6	-.0522592	-.0214579	.0308013

Table 4.53: Z-Scores Coached No

Grade	Mean Zscore INT1	Mean Zscore INT2	Difference
1	.1113722	.0228834	-.0884888
2	.0254811	.0496430	.0241619
3	.0727628	-.0313224	-.1040852
4	.1472783	.1842205	.0369422
5	.1351113	.0909818	-.0441295
6	.1085067	.0445534	-.0639533