A MIXED METHOD ANALYSIS OF THE OHIO STATE UNIVERSITY
MATHEMATICS COACHING PROGRAM SITE VISITS

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The purpose of this mixed-method case study was to uncover the common experiences of 69 first and second year mathematics coaches, bound by their participation in the Mathematics Coaching Program (MCP). Evidence supporting MCP implementation and the evolution of instructional practices were also investigated and reported. Interview, document, and observation data were collected and analyzed for common themes. These themes included (a) establishing identity, (b) planning for coaching, (c) the coaching process, (d) instructional approaches consistent with the MCP, (e) greatest coaching accomplishments, (f) greatest challenges, and (g) professional development support. These findings provide a voice to MCP coaches, add to current research on the impact of coaching, and highlight the need for supportive structures to promote success.
Tell me and I’ll forget.
Show me and I may not remember.
Involve me and I’ll understand.

Native American Proverb
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I would first like to thank The Ohio State University Mathematics Coaching Program (MCP) for the experiences and knowledge gained as a result of working with the program. The program continues to speak for itself, and I am proud to be a part of it. It is my hope that such professional development endeavors will continue to permeate our school systems and reform traditional instruction, as we know it.

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Thank you to my family and friends who were always there to provide a listening ear, and offer encouragement and prayers throughout this lengthy journey. Thank you to my parents, for instilling within me, a continual love for education, and both a sense of hard work and commitment. Thank you for always believing in me, and when times were tough, helping me see a light at the end of the tunnel.
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CHAPTER I

This mixed method dissertation seeks to uncover common themes and experiences related to first and second year coaches affiliated with the Ohio State University Mathematics Coaching Program (MCP). The first chapter provides the foundation and relevancy for the conducted study. It is comprised of an introduction and related background information. The problem statement and significance of the investigation are reported, in addition to an overview of the methodology, and definitions of terms pertinent to the study.

Introduction

Mrs. Jones has been teaching fourth grade mathematics for 25 years. She loves her job and has developed a wonderful rapport with students, parents and peers. She takes pride in each and every lesson taught, and today is no different than any other. She starts by guiding students in checking over the previous day’s homework. Mrs. Jones reinforces the lesson learned through reviewing related concepts. After assuring student understanding, she then proceeds to a new venture, “The three angles of any given triangle total 180 degrees.” Carefully modeling her work, Mrs. Jones insures all students are paying attention. She draws triangles on the board and she labels the measures of two angles within each.

Mrs. Jones proceeds to explain the method used to obtain the unknown degrees of the third angle, “Simply add the two given angles together and then subtract from 180 degrees. It is that simple, just add and subtract.” She draws examples on the board to
emphasize her teachings. She invites several students to the board for practice. Johnny scratches his head and looks bewildered. “What is the first thing you have to do?” Mrs. Jones asks. Johnny proceeds to add the degrees of the two angles. “Okay, now that you have added the two given angles, what is the next thing you need to do?” Johnny hesitates, but proceeds to subtract the sum of the two angles from 180 degrees. “That is correct. You can see boys and girls how simple it is to find the degrees of the hidden angle. Simply add and subtract.”

Mrs. Jones provides them similar problems to perform within their workbooks. She walks up and down each aisle, assisting and instructing as needed. Feeling good about her teaching, she gives them 20 similar problems to complete as homework. This will reinforce her instruction and insure understanding of the procedures involved in this very valuable and relevant math lesson.

Seemingly, Mrs. Jones did everything right. She diligently prepared for the day and used curriculum materials to guide instruction. Her lesson could be likened to a well-orchestrated dance, complete with an ebb and flow of lecture. She modeled and provided both guided and individual practice opportunities to support the learning of all students. Mrs. Jones genuinely cared about each of her students. She wanted them to become proficient and excel in demonstrating the topic at hand.

As adults, we still have a “Mrs. Jones” within our past that will always remain dear to our hearts. In reflecting upon my own experiences, I loved every one of my teachers. I was the stellar student and actually performed well with traditional teaching methods, similar to those exhibited by Mrs. Jones. As an A+ honor roll student, I cried at
the thought of receiving an A-. I quickly learned to apply the knowledge from one problem to a series of 20-25 strikingly similar problems. I had become proficient in replicating and regurgitating information.

During homework endeavors, my mother often invaded my workspace and began to question my reasoning. Time after time, I became increasingly irritable, as I wanted nothing more than to get the correct answer. In no way did I want her love of logic and reasoning rubbing off onto me. I could never understand why she was so infatuated in determining who was “first, second and third in line.” I simply wanted to follow a routine formula, producing an acceptable answer, worthy of a good grade.

It wasn’t until a certain unnamed grade level that I truly struggled and grappled with mathematics, in a way in which I had never experienced. Very quickly, expectations changed and my grade status dropped overnight. I became an average student, struggling to get by. It was no longer acceptable to provide the correct answer to lower level, basic procedural tasks. I was now given those dreaded logic and word problems my mother tried to introduce to me, years earlier. I was expected to reason, make connections, and communicate the evidence of my understanding.

Increasingly, throughout the year, I became more accustomed to this method of learning, and grew to appreciate the challenges set before me. But I had many years of schooling ahead of me, the rest of grade school, high school and then college, most of which was through the more traditional teaching methods previously experienced.

Years later, upon graduating from college, I was grateful for the opportunity of obtaining a job as teacher. I was not, however, thrilled with becoming a teacher of
mathematics. How could I feel comfortable in teaching something I did not feel comfortable with myself? I had only participated in two college classes related to teaching mathematics. I felt like a fish being thrown into unknown waters.

During my first year as a teacher, I was provided a mentor to assist me in my work, an English/Language Arts teacher. The biggest share of support provided was discipline or protocol related.

To make a long story short, I overcame the odds. I remembered and reverted back to the teachings that made me aware of logic and reasoning. Though far from perfect, I received more than stellar evaluation reports and produced high achievement test results. I sometimes, however, found myself reverting to basic, traditional textbook methods of teaching. I wonder if a “Mrs. Jones” exists within each and every one of us?

Ball, Hill, and Bass (2005) said that

Many U.S. teachers lack sound mathematical understanding and skill. This is to be expected because most teachers—like most other adults in this country—are graduates of the very system that we seek to improve. Their own opportunities to learn mathematics have been uneven, and often inadequate, just like those of their non-teaching peers. (p. 1)

The fact is, traditional teaching methods have become “numbingly predictable” as they are repeatedly comprised of reviewing, modeling, drilling, practicing, checking over work and assigning homework (Bruce & Glenn, 2001, p. 20). These methods are glaringly inconsistent with practices shown by our more successful international counterparts (Hiebert et al., 2003). The simple analysis of international, national, and
state level student performance data intensifies concerns with our methods of teaching (Fleischman, Hopstock, Pelczar, & Shelley, 2010; USDE, 1983).

How can we break the continuous cycles of traditional teaching, when far too often, teachers are thrown into a position, with little to no content area support other than a textbook as their guiding authority? Research suggests teachers can overcome the odds. The impact of the teacher is profound (Cahen & Davis, 1987; Hattie, 1992; Haycock, 1998; Marzano, 2003, 2006; Mortimore & Sammons, 1987; Wright, Horn & Sanders, 1997) even when examining the possibilities of overcoming the many seemingly limiting barriers associated with students of minority, disability and/or impoverished statuses (Reeves, 2006).

We must consider and embrace the significant role teachers play and provide them with professional learning opportunities that build upon their comfort and confidence surrounding content and pedagogy (NCSM, 2007). This requires the reformation of traditional professional learning opportunities as we know them.

Research suggests the amount of time spent engaged in professional learning opportunities is limited (NASDTEC, 2004; Parsad et al., 1999;). Many times, these opportunities do not contribute to teacher comfort and confidence (Parsad et al., 1999). And, at their core, such experiences lack consistency with research on the characteristics of effective professional development (ODE, 2007).

For example, research contends professional development endeavors should be data driven, ongoing, job embedded, and collaborative (Hattie, 2009; McNulty & Besser, 2010; ODE, 2007). Professional development should be responsive to individual and/or
group needs, while ultimately aimed at enhancing content knowledge and pedagogy (ODE, 2007). However, this is inconsistent with reality. Too often, professional development efforts address new fads in education (Dufour, 2001) and operate from an episodic (Darling-Hammond, 2010; Parsad et al., 1999), non-collaborative, workshop mode (Darling-Hammond, 2010; Dufour, 2001; Lieberman & Miller, 1984; Sarason, 1971). Too often, teachers are exposed to new learning endeavors and sent back to their classrooms with high hopes for implementation and results (McNulty & Besser, 2010; Pfeffer & Sutton, 2000).

It is important to consider a job-embedded approach that addresses characteristics of effective professional development as it relates to research. Research suggests this can be accomplished through coaching. In fact, coaching far exceeds studying a theory, demonstrating a skill, and/or practicing implementation, in terms of the increase of knowledge, skills, and transfer to practice (Joyce & Showers, 2002). Coached teachers are provided individualized support through pre-conferencing, modeling, observing, co-teaching, and debriefing (Hansen, 2009; ODE, 2007; West & Staub, 2003).

Teachers engaging in this method of professional development provide increased opportunities for students to engage in higher-level mathematics (McGatha, n.d.; Race, Ho, & Bower 2002). They become more comfortable taking risks, more likely to implement their learning, and more apt to sustain their efforts overtime (Baker & Showers, 1984; Joyce, Showers, & Bennett, 1987). Such collaborative efforts result in increased student achievement (Staub, 1999; Staub, West, & Miller, 1998). These outcomes may be challenging. Coaches may encounter a sense of ill preparedness and
lack the structure and support to promote success. Other concerns may include areas of content knowledge, pedagogy, and coaching related skills (Chval et al., 2010). Coaches must be provided the structure and professional learning to build upon their content knowledge and pedagogy, while simultaneously preparing them for such challenges (Chval, et al., 2010; Feger, Wolec & Hickman, 2004; Knight, 2009).

**The Ohio State University Mathematics Coaching Program**

One program that was developed to provide structured coaching was The Ohio State University Mathematics Coaching Program (MCP). Founded in 2005, this program provides professional development support to both coaches and teachers in an effort to enhance content knowledge, pedagogy, and commitments to equity, with the ultimate goal of increasing student achievement (MCP, n.d.a; n.d.c). MCP directors Brosnan and Erchick used existing research to provide the foundation when developing the support and structure for their innovative program (Brosnan & Erchick, 2010). Coaches have acquired statewide and regional support through professional development. They have used their newfound learning to provide job-embedded professional development to teachers within their buildings.

To determine the impact of the program, many forms of data have been collected and analyzed. These data have been beneficial in identifying gains in content knowledge, pedagogy, equity, and ultimately student achievement.

My role, as site visitor for the MCP, was to collect, analyze, and report findings from onsite visits. These visits have been conducted to better determine the functionality
of the program at the building and classroom level. Experiences and challenges of the coach have been recorded and reported to the program directors and facilitators.

This dissertation was aimed at providing summative, emergent themes from site visit data of first and second year coaches. The research study was guided by the constructivist paradigm, as the researcher worked on-site with participants, collecting, analyzing, and making sense of the data. This was done in an effort to better understand and report the realities and experiences of coaches (Hatch 2002). Careful analysis of these data may assist in understanding and thoroughly communicating common experiences and possible connections between program and implementation efforts.

**Purpose of the Study**

The goal of the MCP is to increase student performance data, often in low performing districts, through providing job-embedded professional development to enhance both coach and teacher content knowledge and pedagogy (MCP, n.d.a; Brosnan & Erchick, 2010). The MCP structural model allows for professional development to be provided to coaches, who ultimately provide onsite job embedded professional development to teachers, in their classrooms.

This program evaluation case study was conducted to better understand the following research question: What are the common themes and experiences of first and second year MCP coaches? Both qualitative and quantitative site visit data were collected and analyzed to investigate onsite implementation and delivery, as well as common, emergent trends and themes.
Importance of the Study

This study is important, as it not only adds to the global body of research surrounding mathematics coaching, but more specifically adds to the research within the MCP. The MCP collects and analyzes numerous formative and summative data sources in an effort to determine the impact of their efforts and structure their decisions accordingly.

Currently, site visits serve as a formative evaluation. Data are collected, analyzed, and informally reported to program directors and facilitators to best meet the individualized needs of each coach. This dissertation seeks to formally analyze site visit data, in a summative manner, to better understand program implementation, as well as common themes and experiences among first and second year MCP coaches. This information will be beneficial for obtaining an in-depth look into the program.

The collected and reported data has the potential to benefit the program in several ways. These data may be valuable for complying with funding mandates and assisting both directors and facilitators in determining areas within the program needing to be supported and/or modified. Second, a stronger understanding of common experiences may assist the program in communicating with external stakeholders. Third, outcomes of this study may spark the need for additional research, and/or onsite visits. Finally, this study may benefit other coaching programs desiring to conduct similar studies and/or make program comparisons and modifications.
Overview of Methodology

This mixed method case study was designed to investigate common themes and experiences of first and second year MCP site visit data. Site visits were conducted in participating MCP coach schools and included both rural and urban settings. A total of 43 first year and 26 second year visits were conducted from November 2008 to May 2010.

During these visits, two site visitors, myself included, collected data in the form of interviews, documents, and observations for the purpose of analysis. Data collection and analysis efforts were primarily qualitative in nature, with quantitative measures used to simply provide additional support, using a Likert rating system.

Interview participants were coaches, with comments from principals and teachers used solely for triangulation purposes. Therefore, commonalities between what was seen and heard further strengthened the findings. Documents included schedules and sources identified by the participant, such as the following: Lesson plans, professional development agendas, resources, and correlating data and/or program research. Site visitors conducted observations as nonparticipant observers to unobtrusively collect data. If additional information was desired, site visitors operated from the participant observer role. This enabled the opportunity of asking clarifying questions of the teacher, coach and/or students. Validity and reliability were established through triangulating data sources, conducting joint visits with inter-rater comparisons, using a common protocol/data collection tool, member checking, and frequent common analysis of data.
Definitions of Key Terms

The following terms, processes and organizations are listed and defined in effort to promote a basis for understanding information presented in subsequent sections:

1. **Cognitive Guided Instruction (CGI):** Teachers use information from student knowledge and learning, coupled with goals to inform instructional decision-making (Carpenter, Fennema, Peterson, Chiang, & Loef, 1989).

2. **Content Focused Coaching:** Content-Focused Coaching aims to increase student achievement results through coaches working directly with teachers to improve upon instructional efforts (Staub 1999; Staub, West, & Miller 1998).

3. **Evaluation:** According to Killion (2002), “Evaluation is a systemic, purposeful process of studying, reviewing, and analyzing data gathered from multiple sources in order to make informed decisions about a program” (p. 42).

4. **High Quality Professional Development (HQPD):** The standards “delineate the essential characteristics of quality professional development. These are not minimal expectations. Schools that successfully implement all of these standards should expect to see higher quality teaching and increased student achievement” (ODE, 2007, p. 61).

5. **Mathematics Coaching Program (MCP):** This program, funded through the Ohio Department of Education, is aimed at increasing both coach and teacher content area knowledge and pedagogy, while ultimately increasing student achievement results (MCP, n.d.a).
6. National Assessment of Educational Progress (NAEP): The NAEP test assesses U.S. students to gain an understanding of their knowledge and performance abilities in different subject areas. Participants include a nationally representative population, including fourth, eighth, and twelfth grade students. Data are reported for the nation and participating states and disaggregated by student subgroup data (U.S. Department of Education, 2010a).

7. National Council of Teachers of Mathematics (NCTM): The NCTM organization is committed to ensuring high quality mathematics instruction and learning opportunities for all students (NCTM, n.d.a).

8. National Staff Development Council (NSDC): The NSDC promotes ongoing professional learning among educators, ultimately resulting in the increase of student achievement data (NSDC, 2011).

9. Organization for Economic Cooperation and Development (OECD): The OECD is a group of 30 countries bound by their dedication to establish policies that increase economic growth, expansion and world trade, to further develop the world economy (PISA, n.d.a).

10. Process Standards: These standards were designed to provide a lens for all prekindergarten through twelfth grade mathematics instruction and are ultimately aimed at enhancing student learning (NCTM, n.d.b).

11. Program for International Student Assessment (PISA): PISA is an international standardized assessment given to 15-year-old students in over 70
countries, including all OECD countries. This assessment allows countries to evaluate their educational systems and track progress overtime. It assesses student abilities to apply knowledge and skills to problem solving situations, and their preparation for transitioning to adult life situations. This information may be used to inform research and public policy issues (PISA, n.d.b).

12. *State Report Card*: The state report card provides a detailed, overall composite of the states’ achievement scores and levels of proficiency. It documents improvements and deficits in trend data and data associated with the performance of student subgroups. The report card also provides information on student attendance and graduation rates (ODE, 2010).

13. *Third International Mathematics & Science Study (TIMSS)*: This study examines U.S. fourth and eighth grade student performance in the areas of mathematics and science, and compares their performance to that of other countries (NCES, n.d.).

**Organization of the Dissertation**

This dissertation is organized into five chapters, complete with corresponding references and appendices. Chapter I presents the introduction and relevant background information, while identifying the problem statement for the study. Additionally, the methodology and definitions of relevant, key terms are provided. Chapter II provides an overview of literature related to the study. This includes the areas of student performance, teaching, professional development, coaching, the MCP, and program evaluation.
Chapter III provides the methodology associated with the study, including descriptions of the research context, procedures, data collection methods, research participants, and data analysis. Chapter IV provides research results, and Chapter V is dedicated to the summary of findings, conclusions, and corresponding implications and recommendations.
CHAPTER II

This chapter explores the need for reform in the area of mathematics and the importance of linking appropriate professional development to support instructional efforts. The Ohio State Mathematics Coaching Program will be explored in-depth, as a means of providing High Quality Professional Development (HQPD). This program focuses on increasing teacher content knowledge and pedagogy, with ultimate aims of increasing student achievement. Furthermore, the need for formative and summative evaluations will be shown as a means to assess program quality and make necessary improvements.

A Crisis in Mathematics Education

So let there be no doubt: The future belongs to the nation that best educates its citizens— and my fellow Americans, we have everything we need to be that nation. We have the best universities, the most renowned scholars. We have innovative principals and passionate teachers and gifted students, and we have parents whose only priority is their child’s education. We have a legacy of excellence, and an unwavering belief that our children should climb higher than we did. And yet, despite resources that are unmatched anywhere in the world, we’ve let our grades slip, our schools crumble, our teacher quality fall short, and other nations outpace us. (Obama, 2009, p. 2)
These paradoxes are not exclusive to the governance of President Obama, as they have been shown for decades. International, national, and state level statistics overwhelmingly evidence our shortfalls, particularly in the area of mathematics.

Since the implementation of the Program for International Student Assessment (PISA) in 2000, on average, our mathematics scores have persistently been inferior to that of other Organization for Economic Cooperation and Development (OECD) countries (Fleischman et al., 2010). While demonstrating similar levels of basic mathematical content knowledge to other OECD countries, we continually lag behind in higher levels of proficiency. In 2009, the PISA showed only 27% of U.S. students scoring at or above proficiency levels that require higher-level thinking and reasoning skills in solving problems from unfamiliar contexts. Alarmingly, sixteen OECD and six non-OECD countries outperformed the U.S. in these areas of proficiency (Fleischman et al., 2010).

The publishing of *A Nation at Risk* further highlighted our ill preparedness in using higher order thinking skills (U.S. Dept. of Education, 1983). The report suggested only 40% of 17 year olds were able to draw inferences, while a mere 33% were able to solve multi-step problems. In fact, there was an overwhelming concern for student inability to apply mathematical knowledge outside the classroom (Boaler, 1998).

Though our nation falls short at the international level, the 2009 National Assessment of Educational Progress (NAEP) painted an increasingly pleasant portrait for the State of Ohio. Fourth and eighth grade Ohio students scored at significantly higher levels than the national public averages. However, a closer analysis of the data indicates
only 46% of Ohio fourth graders and 36% of Ohio eighth graders met or exceeded proficiency levels (U.S. Department of Education, National Center for Educational Statistics, 2009). These statistics lead to the following questions: Should Ohioans take pride in having 54% of fourth graders and 64% of eighth graders scoring at basic and limited levels? And, if unsatisfied with those results, what does it suggest about states performing behind the seemingly “advanced” state of Ohio?

The 2009-2010 State Report Card, detailing Ohio student achievement results, offered similar, disappointing trends (Ohio Department of Education [ODE], 2010). Five out of eight grade levels met or marginally exceeded state identified benchmarks, with only three grade levels making marginal improvements from the previous year. Additionally, over 50% of Ohio schools neglected to meet Adequate Yearly Progress (AYP) targets with students, thus suggesting the gaps are not closing for our minority, low socio-economic and student with disability populations. These statistics are rather discouraging, considering our cut scores are set at 60% for grade three, 34% for grade seven and 35% for grade eight (ODE, 2005).

Scores can be deceiving. High performing districts often compare their scores with those of other districts and assume they are in good standing (Schmoker, 2001). They are in good standing, but with what students? A closer look reveals their scores could have been greater, had they attended to the needs of disadvantaged and minority students. These students often exhibit below proficient achievement levels and must not be neglected. There can also be concern for high performing students, as they are not pushed to attain increased levels of performance. Schmoker suggested, “As they say in
baseball, being born on third base doesn’t mean you’ve hit a triple” (p. 9). Many schools often take credit for success of students. But was it a result of what was learned in the classroom, or the environment in which they were born? Districts must not be too quick to celebrate their perceived success. There can be success as a whole, but failures within.

Data speak at the international, national, state and local levels. A plethora of data assists in better understanding the dismal state of our educational systems. However, as suggested by Dufour, Dufour and Eaker (2005), educational systems too often suffer from “DRIP syndrome,” whereas they are “Data Rich/Information Poor” (p. 40). As Reeves (2004) said, “We are in a test driven world where student test scores are carefully measured and displayed in headlines, but we too seldom give the same systematic attention to the actions of teachers, school leaders, and policy makers” (p.2.). As Schmoker (2006) suggested, similar results in the medical field would create frenzy and call for immediate, urgent action.

How can we use accumulated data to create a sense of urgency in education? How do we make sense of it and use it in reforming and refining practices? How do we close, what Pfeffer and Sutton (2000), referred to as the “knowing/doing gap,” where knowledge lacks implementation? (p. 5). How do we move beyond our knowledge of national, state and local data, and create strategic plans that truly impact student performance? We must consider addressing these looming, unchanging statistics, in an effort to alleviate stress from failures and the stagnancy of student achievement. After all, “The relative decline of American education is untenable for our economy, it’s
unsustainable for our democracy, it’s unacceptable for our children—and we can’t afford to let it continue” (Obama, 2009, p. 2).

The Role of the Teacher in Increasing Student Achievement

*It’s that most American of ideas, that with the right education, a child of any race, any faith, any station, can overcome whatever barriers stand in their way and fulfill their God-given potential. Of course, we’ve heard all this year after year after year after year—and far too little has changed . . . . It’s not changing not because we’re lacking sound ideas or sensible plans—in pockets of excellence across this country, we’re seeing what children from all walks of life can and will achieve when we set high standards and have high expectations, when we do a good job of preparing them.* (Obama, 2009, p. 2)

In 1966, the Coleman Report offered a bleak outlook on the power of our educational system in increasing student achievement outcomes. The report suggested schools, as well as teachers, had no impact on student performance. Instead, it highlighted family backgrounds, and both racial and socio-economic status levels, as inevitable precursors to student performance. We were doomed to failure. These findings led many educators to question the significance of their work, especially considering that many pursued the field of education with the noble intentions of making a difference.

Like Coleman, Marzano’s (2003) meta-analytic research suggested student achievement to be connected to student backgrounds. According to this research, 80% of student achievement variances were linked to home environment, background
knowledge, motivational aspects, and other student related factors. This leaves 20% of student achievement variances, linked to factors associated with the school and teacher. Though this impact may seem minimal, it is not.

Haycock (1998) suggested students who were taught by the most effective teachers had achievement gains of approximately 52 percentile points, while students taught by least effective teachers, made minimal gains of 14 percentile points. This was particularly concerning, considering life experiences outside of school, constituted a growth of approximately six percentile points (Cahen & Davis, 1987; Hattie, 1992; Marzano, 2006). Sadly, we conclude that ineffective teachers had an actual gain of only eight percentile points, as compared to six percentile points outside of school. This led to Marzano’s horrific conclusion, “the ineffective teacher adds little more than life experience” (Marzano, 2006, p. 2).

These findings led many researchers to pinpoint school and classroom environments to be critical factors in determining student achievement. In fact, according to Marzano (2006), research suggested effective teaching to be the number one contributor to student achievement (Schmoker, 2001; Wright et al., 1997), having 6 to 10 times the impact of all other factors combined (Mortimore & Sammons, 1987).

 Paramount to supporting such ideologies was a four-year study conducted by the Center for Performance Assessment, analyzing data from 130,000 students in 228 schools. This study uncovered surprising statistics of what Reeves (2006) referred to as “90 90 90” schools (p. 80). These schools were comprised of 90% of students eligible for free or reduced lunches and 90% of students being of minority background.
Astonishingly, 90% of these students met or exceeded district and state standards. But it didn’t stop there. Outperforming these statistics, Reeves suggested we are now seeing: ‘100 100 100’ schools in which 100 percent of students are eligible for free or reduced-priced lunches, 100 percent are members of ethnic minorities, and 100 percent score proficient or higher not only in state reading tests but also in assessments of math, science, and social studies. (p. 80)

These studies showed the invaluable roles both schools and teachers played in increasing student performance and closing achievement gaps. Upon closer analysis of the data, several common practices emerged, shedding light on effective teaching. Within these effective schools, an increased amount of time was dedicated to core areas of mathematics and reading. Non-fiction writing was incorporated into all subject areas, in an effort to further enhance student “thinking, reasoning and analysis” (Reeves, 2006, p. 84). Student needs became the central focus in building wide efforts, including aspects of scheduling and instructional decision-making. These schools embraced a sense of holistic accountability, as comfort with data became second nature. Displayed throughout the building, data served as a means to highlight and reflect upon effective practices. The use of common, formative assessments and collaborative scoring and feedback, was valued as a professional learning opportunity and set as a priority for implementation and decision-making (Reeves, 2006).

Effective teaching provided reason for excitement about school systems. However, effective teaching was significantly different from instructional practices in most classrooms (Odden & Kelly, 2002). Schmoker (2006) further expounded upon
studies of classroom instructional practices and suggested them to be “mediocre or worse” (p. 2), even in high performing schools (Schmoker, 2001).

So, what is the problem with traditional methods of teaching? Schools are comprised of accomplished, passionate teachers, devoted to ensuring students master the content. Must we redefine our traditional concept of effective teaching practices, altogether?

**Teaching Mathematics**

*It’s not that their kids are any smarter than ours—it’s that they are being smarter about how they educate their children. They’re spending less time teaching things that don’t matter, and more time teaching things that do. They’re preparing their students not only for high school or college, but for a career. We are not. Our curriculum for 8th graders is two full years behind top performing countries. That’s a prescription for economic decline. And I refuse to accept that America’s children cannot rise to this challenge. They can, and they must, and they will meet higher standards in our time”* (Obama, 2009, p. 3)

Prevalent in U.S. schools today is the commonly held notion that there “isn’t enough time in the day” to fulfill the aspects of achieving higher standards, with all students. However, research suggests teachers in the U.S. spend significantly more time teaching than our OECD counterparts, and despite our time and efforts, we are continually outperformed (Darling-Hammond, 2010).

Naturally, this leads to scrutiny of current instructional practices and how they differ from our more successful, international counterparts. Many factors may contribute
to the discrepancies of achievement outcomes in U.S. schools today. A video study, from the Third International Mathematics and Science Study (TIMSS), sheds insight into how teaching of mathematics stacks up with other, more successful countries (Hiebert et al., 2003). To highlight the magnitude of such differences, comparisons will be made between the United States and the most successful OECD country, Japan. These data will furthermore be supplemented with related research on student learning in mathematics.

When considering the use of instructional time, the portrait of most traditional U.S. classrooms reveals a very bleak state of affairs. Typical lessons include significant portions of time dedicated to checking homework and engaging in practice and review. In fact, research from the TIMSS International Video Study (Hiebert et al., 2003), suggested U.S. teachers dedicated 78% of their lessons, and some entirely, to reviewing and practicing previously taught content material. In comparison, Japan dedicated only 40% of lesson time to such purposes.

Research suggests traditional methods of routinely reviewing and practicing procedures to be superficial (Hiebert et al., 1997). Unfortunately, mathematics research studies reveal:

Wars between ‘new math’ --- aimed at mathematical reasoning, communication, and problem solving—and a ‘back to the basics’ approach-favoring the use of memorization and algorithms for computation—political forces have repeatedly pushed most mathematics teaching in the United States back to drill-and-practice methods at odds with what research shows are the most effective strategies for
developing high levels of mathematical competence. (Darling-Hammond, 2010, p.12)

This skill-based focus is shown when examining the intentions of teachers in planning their lessons. Hiebert and Stigler (1999) conducted a study in which teachers were asked to identify lesson objectives. In response, 61% of U.S. teachers answered by describing specific skills they would like their students to attain. When asked the same question, 73% of Japanese teachers responded by suggesting they wanted students to view the concepts differently, or unearth new relationships among concepts and procedures.

Data suggests the majority of questioning methods to be of low complexity, as they include conventional procedures and four or less decisions for solving (Hiebert et al., 2003). In fact, of questions presented by U.S. mathematics teachers, 67% were of low complexity (e.g., “Solve the equation: 2x + 7 = 2”) (p. 71), 27% of moderate complexity (e.g., “Solve the set of equations for x and y: 2y = 3x - 4; 2x + y = 5”) (p.71), and 6% of high complexity (e.g., “Graph the following linear inequalities and find the area of the intersection y ≤ x + 4; y ≤ 2; y ≥ -1”) (p. 71). Traditional classroom assessments follow suit, as they were typically comprised of low-level complexity problems, and taken directly from skill-based textbooks. Questions presented to students, left little room for higher-order thinking and connection making, as they mirrored the format of those presented in class lessons and reviews (Balka, Miles, & Hull, 2009). Teachers in Japan, on the other hand, posed 17% low complexity, 45% moderate complexity, and 39% high complexity questions (Hiebert et al., 2003).
Though our more successful counterparts are insuring students participate in inquiry based, hands-on learning investigations (Darling-Hammond, 2010), adopting such an approach does not come without a price. Both teachers and students having experienced traditional, skill-based teaching and learning may be uncomfortable with the nature of higher-level tasks (Clarke, 1997; Cohen, 1990).

In fact, when approaching high-level tasks, teachers often revert to “downsizing” and retreat into their existing knowledge and pedagogy “comfort zones” (Stephens, Lovitt, Clarke, & Romberg, 1989, p. 289). Discomfort and frustration often leads to their reliance upon traditional teaching methods, strictly derived from mathematics textbooks (Adams & Krockover, 1997). Teachers have become the locus of content authority, using textbooks as primary resources to guide content, instructional methods, and pacing. Unfortunately, too often, textbooks are not modeled after research, but to promote comfort and ease for consumers (Balka et al., 2009; Hiebert et al., 2003).

Teachers also become frustrated when students struggle with complex material. This sense of struggle, coupled with the necessity of communicating thinking (Clarke, 1997; Romberg, 1988), may lead teachers to believe such tasks were designed for higher level students (Romberg, 1988). Therefore, teachers try to dumb down material by “providing whatever information it takes to get the students back on track” (Hiebert & Stigler, 1999, p. 92). As a result, teachers provide lower complexity tasks to underperforming students (Desimone, Smith, Baker, & Ueno, 2005). In fact, the many perceived differences of ability levels within the classroom, may lead teachers to abandon higher level complexity tasks altogether (Hiebert & Stigler, 1999).
Our educational systems breed social inequalities through continually instituting a basic skill-oriented curriculum to impoverished and minority students (Gutstein, 2006). This is done in attempt to prepare them for skill-based positions. These are positions within the workforce, in which we have essentially predestined them to perform. Conversely, we continue to prepare advantaged students, using a more “standards-based” approach in preparation for cutting edge, innovative positions. We must ensure the promotion of equity in our teaching methods, through establishing and maintaining high expectations, while providing higher-level complexity tasks to all students.

Freire (1989) referred to our traditional sense of teaching as the banking approach to education, where teachers possess the knowledge and make deposits into students. This approach has become second nature and leaves little room for student reasoning within the classroom (Freire, 1989; Wood, Cobb, & Yackel, 1990). These students become successful at replicating and regurgitating teacher modeled information (Balka et al., 2009). Being accustomed to such thinking may lead students to passively accept the unfortunate conditions before them, as part of their indisputable fate (Freire, 1989). Essentially, the traditional banking approach limits the students’ power to act and make changes on the paths before them. Freire suggested we must use problem posing as a means of allowing students to investigate the realities before them. They must not view them as a dooming prophecy, but as a challenge with which to overcome.

Embracing and providing opportunities for students to problem solve and reason may be difficult for teachers, as skill-based instruction is often considered a prerequisite
to engaging higher-level tasks (Schoenfeld, 2002). Teachers and curriculum directors alike, often underestimate student ability when provided a challenging problem. Even kindergartners are able to use inventive strategies to solve problems, without being explicitly taught by teachers (Carpenter, Fennema, & Franke, 2000).

Internationally, Japanese teachers embrace higher level mathematical questioning. They provide richer tasks and distribute them equitably among all students (Desimone et al., 2005). They view differences among student ability levels, as opportunities for sharing multiple, problem solving strategies (Hiebert & Stigler, 1999). Student frustration and confusion is perceived as an integral part of learning mathematics. When students come to their own understanding of the content matter, they build a deeper awareness, both conceptually and procedurally. This further assists them in encountering more complex mathematics (Hiebert & Stigler, 1999; Hiebert et al., 1997). Teachers and students embrace mistakes as opportunities to see the consequences of actions (Hiebert & Stigler, 1999).

This exemplifies the need for teacher confidence when approaching nontraditional methods of learning. Teachers must possess a deeper understanding of mathematics, its language, as well as its symbols and procedures. Ball et al. (2005) suggests, “Knowing mathematics for teaching goes beyond what is needed to carry out the algorithms reliably” (p. 22). Teachers, who have such a depth of understanding are able to illustrate and explain, using pictures and manipulatives.

Star (2007) suggested this mindset requires teachers understand the underlying definitions of procedural and conceptual knowledge. Procedural knowledge involves the
“knowledge of procedures” and includes “comprehension, flexibility and critical judgment and is distinct from knowledge and concepts.” Conceptual knowledge is “knowledge of concepts or principles,” and promotes connection and relationship building (p. 408).

Baroody, Feil, and Johnson (2007) expounded upon these definitions, suggesting a deep interconnectedness among procedural and conceptual mathematics to be necessary for instruction. Conceptual mathematical knowledge provides a framework for understanding, as well as a meaning to fluency. Procedural understanding assists students in making applications that can be flexibly applied and modified when presented unfamiliar situations. If the desired state of mathematics instruction is one that enables students to see material in a distinct, new way while making long-lasting connections between concepts and procedures, lessons must be modeled accordingly. Opportunities must be provided to assist students in deepening both their procedural and conceptual knowledge in an integrative approach (Baroody et al., 2007).

Research indicates students regularly engaged in higher complexity opportunities, more efficiently perform in both procedural and problem solving situations, than those exposed to a traditional, directive approach (Schoenfeld, 2002). Neglecting to provide higher-level tasks to disadvantaged students produces dismal results (Romberg, 1988). Students must be afforded opportunities to access rich problems without direct guidance (Freire, 1989; Hiebert et al., 1997), or spoon feeding from the teacher (Boaler, 2002).

This knowledge-based, constructivist approach places teachers into facilitative roles, where they prompt student learning through providing rich, instructional
opportunities (Freire, 1989; Resnick & Hall, 1998) and collaboratively uncover meaning (Freire, 1989). Such higher-level tasks allow for multiple student entry points, and evoke the creation, selection, and modifications of strategies (Hiebert et al., 1997). A rigorous curriculum allows students the opportunity to question, solve problems, hypothesize, justify, test, and communicate thinking (Boston & Wolf, 2006).

This inquiry-based approach provides students a stronger foundational understanding, than when taught traditional, rote mathematics (Hiebert & Stigler, 1999; Resnick & Hall, 1998). Further evidence reveals students continually exposed to and involved in higher-level tasks evidence the greatest achievement gains (Stein & Lane, 1996). These students not only outperform their traditionally schooled counterparts, but are also better prepared to apply knowledge to new situations (Boaler, 2000).

These classroom environments promote a sense of shared authority, where students have responsibility in their learning through engaging in tasks and justifying and communicating thinking. They must intently listen, make connections, question, and build upon other student knowledge (Freire, 1989; Hiebert et al., 1996).

This sense of shared authority shifts the locus of content authority away from the teacher alone. It requires modifying the traditional definition of a good teacher as “one who explains things so well that students understand, to one who gets students to explain things so well that they can be understood” (Reinhart, 2000, p. 478). Reinhart (2000) described the importance of communication by suggesting learning is “of little value unless it can be communicated to others” (p. 482). Additionally, students desiring to work alone benefit from opportunities to develop priceless, needed communication skills.
When students are afforded opportunities to take ownership of, engage in, reflect upon, and communicate around a challenging task, they are able to create connections with their knowledge leaving a lasting “residue” (Hiebert et al., 1996, p. 20). A problem-based approach is learner-centered, requiring less directive instruction from the teacher. This method of learning, when combined with the discussion of student identified strategies and thinking, promotes increased levels of enthusiasm, engagement, risk and ultimately student achievement in mathematics (Cornelius-White, 2007; Reinhart, 2000).

Allowing students to generate connections among strategies that are of both higher and lower in complexity deepens their content understanding (Hiebert & Stigler, 1999). Successful classrooms in other countries focus on students explaining their findings and questioning others, while creating and discussing conjectures, formulas and problems of their own (Darling-Hammond, 2010). Furthermore, classroom dialogue among students can be instrumental in addressing existing misconceptions, without the teacher serving as the locus of content authority (Reinhart, 2000). Instead, teachers act as facilitators, questioning, intently listening to, and acknowledging student reasoning, without providing validation (Freire, 1989).

Research suggests such communication can be beneficial to teachers, as their knowledge of student thinking is often fragmented. This fragmented knowledge, combined with limited expectations for students, has yielded minimal changes in classroom instruction (Carpenter et al., 2000). Teachers more knowledgeable of student thinking tend to have higher student achievement results. Therefore, it is important teachers continually reflect upon and use Cognitively Guided Instruction (CGI)
principles. As students are given the opportunity of engaging in mathematics, teachers should continually listen to and gather student thoughts through the use of formative assessments. This information, when coupled with teacher understanding of research-based learning, can be used to make instructional decisions (Carpenter et al., 2000; Fennema, Franke, Carpenter, & Carey, 1992).

Although these studies represent a small component of existing research on effective mathematics instruction, they encompass what the National Council of Teachers of Mathematics (NCTM, n.d.b) suggested to be underlying best practices. The Process Standards highlight the importance of problem solving, reasoning and proof, communication, multiple representations and connection making. It is suggested these standards serve as the foundation of mathematics instruction in prekindergarten through twelfth grade.

Using the Process Standards to guide instruction provides students the rich opportunity of solving challenging problems using existing knowledge. This assists students in making connections between strategies and concepts. Students are afforded the freedom to use a variety of representations to organize, document, and communicate their thinking. They are given opportunities to develop, evaluate, and use reasoning and proofs to assist them in solving problems. Increasingly important among the Process Standards, is the opportunity for students to communicate thinking using mathematical language. This requires students to listen to, evaluate, and reflect upon the ideas of others. This method of learning will assist students in future problem solving ventures. It will
allow them to make necessary connections and internalize the significant foundation of mathematics in the world around them (NCTM, n.d.b).

As shown in the described studies, typical classroom instruction is inconsistent with research on mathematics learning. Most efforts lack the ability to raise student achievement levels and close achievement gaps. This does not convey misconceptions that teachers are not working hard, or do not genuinely care about the academic achievement of their students. According to Reeves (2006), teachers are dissatisfied with their lack of success, as it pertains to student achievement results. They sincerely desire their work to be meaningful and transferred into making the ultimate difference in the success of their students. We must consider the mediocrity, pervasive in our nation’s mathematics instruction and achievement may be a result of providing ineffective support through teacher preparation and professional development programs.

Using Professional Development to Enhance Instruction

We’ve accepted failure for far too long. Enough is enough. America’s entire education system must once more be the envy of the world—and that’s exactly what we intend to do. (Obama, 2009, p. 2)

Despite the hundreds of millions of dollars invested in reform efforts by the National Science Foundation (NSF) and the U.S. Department of the Education, there have been minimal improvements in instructional practices and achievement outcomes (Hiebert et al., 2003). Likewise, districts invest countless local resources to improve curricular and instructional decision making, to further enhance the professional growth
of teachers. These efforts do not seem to fit the bill, and often show misalignment to effective professional development, as it pertains to research.

This misalignment is evident upon close examination of the Ohio Educator Standards Board’s six characteristics of High Quality Professional Development (HQPD) (ODE, 2007), and current widespread professional development practices. It is vital to carefully examine such inconsistencies to assist in making determinations that align professional learning opportunities with content and pedagogical improvement needs.

1. “HQPD results in the acquisition, enhancement or refinement of skills and knowledge” (ODE, 2007, p. 73).

When approaching mathematical content and instruction, many teachers feel anxiety stricken. Burns (1998) suggested, “Math is right up there with snakes, public speaking and heights,” furthermore declaring it as a “widespread national problem” (p. ix). Unfortunately, many pre-service and professional development programs do not build confidence and comfort around teachers’ content area knowledge and instructional pedagogy. This is not surprising, considering many preparatory programs for elementary teachers involve a maximum of two to three courses encompassing mathematics content, with only one dedicated to mathematics pedagogy (Fennell, 2007).

The lack of teacher preparation and comfort surrounding curriculum and instruction is shown in a study conducted by the National Center for Education Statistics (NCES). This study suggested only 44% of surveyed teachers felt prepared to implement the state standards and district identified curriculum. Only 45% felt comfortable implementing learned instructional strategies. Additionally, less than one-third of
teachers working with special education and limited English proficiency students felt comfortable meeting their students’ instructional needs (Parsad, 1999).

Discomfort surrounding content and instruction must not be taken lightly. With teacher quality accounting for over 90% of mathematics student achievement variations, at all tested levels (Darling-Hammond & Ball, 1997), it is imperative we carefully examine the professional learning opportunities being offered to teachers.

Among vital considerations, is our focus upon enhancing teacher content knowledge and mathematics’ pedagogy, as it positively correlates to student achievement results (Ball et al., 2005; Hattie, 2009; McNulty & Besser, 2010). This is imperative, as teachers exhibiting above average content knowledge levels outperform their average counterparts. Their students made gains equivalent to two to three additional weeks of instruction (Ball et al., 2005).

Deep content area knowledge and pedagogical foundations are essential elements for successfully implementing inquiry-based learning and assisting students in building necessary connections among concepts. Furthermore, this knowledge better assists teachers in understanding student misconceptions associated with content material. Teacher knowledge, when combined with student communicated thinking, better enables teachers to make instructional decisions that enhance student learning (Darling-Hammond, 1998).

Traditional efforts of professional development often involve training for specific skills and strategies, with little to no regard of their implementation. Often, teachers are not afforded opportunities to practice and experiment with learned skills, and lack the
necessary support and monitoring of their implementation efforts (McNulty & Besser, 2010). Such guided practice opportunities are necessary as a means to deepen knowledge and pedagogy (Fullan, 1993).

McNulty and Besser (2010) highlighted the need for moving beyond traditional professional development efforts by suggesting “we close the achievement gap by closing the implementation gap” (p. 19). Likewise, Pfeffer and Sutton (2000) said,

The answer to the knowing-doing problem is deceptively simple: embed more of the process of acquiring new knowledge in the actual doing of the task and less in the formal training programs that are frequently ineffective. If you do it, then you will know it. (p. 27)

It is important to consider a variety of innovative, HQPD experiences to effectively increase content area knowledge and instructional pedagogy, while providing opportunities to investigate and apply newfound learning. These “specific content strategies may include: aligning and implementing curriculum, examining teaching and learning, immersion in mathematics content, coaching and mentoring, and collaboration with colleagues” (NCSM, 2007, p.2).  

2. “HQPD is influenced by multiple sources of data” (ODE, 2007, p. 65).

Schools have a lot of summative, formative, climate, and perception data. However, research suggests, many schools participate in excessive data collection, with minor changes in the identification and implementation of practices (Dufour et al., 2005). Unfortunately, the data become worthless, unless they are used to make decisions that
impact instruction and learning (Hamilton, Halverson, Jackson, Madinach, Supovitz, & Wayman, 2009).

Effective schools are actually using and benefiting from their data collection process. They use, as Chenoweth (2007) said, “all the data they can get their hands on,” and routinely examine their instructional practices. This has contributed to 15 high poverty schools rising in magnitude of success (p. 217). In isolation, data sources do not provide the necessary information to make informed decisions. Relying upon a single, annual, high stakes test may not provide either time-sensitive data, or a comprehensive look at trends to ensure consistency with reality. Although these data are beneficial for analysis, multiple sources should be collected and triangulated. Commonalities, and/or discrepancies with data will assist in supporting findings or evidencing the need for additional research (Hamilton et al., 2009). Data may include demographic, perception, student learning, and/or school process-related sources (Bernhardt, 2004). Such a comprehensive approach to collection and analysis assists in determining and implementing appropriate, responsive professional development and/or instructional practices at the district, building and/or classroom level (Hamilton et al., 2009).

The HQPD standards suggest educators become deeply involved in data analysis, while aligning practices in effort to enhance student learning (ODE, 2007). Data may be used to make determinations surrounding instructional time, identifying students requiring intervention and enrichment (Brunner et al., 2005; Hamilton et al., 2009), while shedding light upon school wide trends (Hamilton et al., 2009; Marsh, Pane & Hamilton, 2006).
Self-reflection and observation data can also be useful sources for analysis. It is recommended teachers reflect upon their “professional knowledge, strengths and weaknesses in order to develop targeted goals for professional growth” (ODE, 2007, p. 66). Reeves (2010) suggested the use of both evaluative and performance data in identifying success and reflecting upon areas needing mediation. In terms of replication of successful outcomes, these data are beneficial in recognizing effective instructional practices.

To assist with the data collection, analysis and triangulation of data sources, collaboration with stakeholders, partnerships with Universities and/or guided support from administrators or mentors should be considered. Analysis may lead to prescriptions that enhance instructional methodologies (Hamilton et al., 2009). Opportunities for support may include coaching, mentoring, consulting with external experts, and/or observing implementation of instructional strategies (U.S. Department of Education, 2010b).

3. “HQPD is a purposeful, structured, and continual process that occurs over time” (ODE, 2007, p. 62).

Unfortunately, many professional learning experiences lack true purpose and instead reflect the new fads in education. Dufour (2001) referred to these schools as “Christmas Tree Schools,” whereas every new ornament that adorns the tree represents a new fad they are latching onto (p. 3). It is important to note, even though the ornaments may decorate the tree, they do not become part of it. Likewise, many pursued initiatives do not become part of the organization’s culture (Dufour, 2001).
In fact, they may hinder the organization, altogether. The investment of countless resources often leaves individuals feeling an obligation to address multiple initiatives, which may in fact conflict with one another. This not only leads to ineffective implementation, but also “initiative fatigue,” whereas teachers become overloaded and burned out (Reeves, 2010, p. 12). This approach neglects to produce results (Schmoker, 1999) and may in fact result in “massive failure” of the organization (Fullan & Stigelbauer, 1991, p. 71).

Covey (2004) suggested an alternative approach to reform efforts. He stated that highly effective individuals “begin with the end in mind” (p. 97). This mindset requires educators to reduce priorities and initiatives, to those that align with established goals. These goals are identified through careful examination and comparisons made between current happenings and future aspirations. This provides a sense of purpose and priority for implementation (McNulty & Besser, 2010; Robinson, 2007).

While we optimistically assume educational systems are committed to and value established goals, from their onset (McNulty & Besser, 2010; Robinson, 2007), Reeves (2006) suggested commitment and buy-in may not come immediately. Instead, it may require implementation and analysis of results. Too often, schools wait for buy in, and neglect to act, when the cycle of organizational impact is “vision, action, buy-in and more action” (p. 96).

When examining “action,” our current, episodic practices do not fit the bill. Disappointingly, when surveyed, over half of teaching participants reported spending a maximum of one day engaged in professional learning (Parsad et al., 1999). Another
study offered similar findings, suggesting mathematics teachers, on average, participated in only eight hours of content-specific professional learning each year. Less than 10% of teachers had 24 or more hours dedicated to this purpose (Darling-Hammond, 2010). These increasingly low rates of participation suggest teachers may simply be fulfilling the bare minimal requirements for state licensure, which include approximately 15 days of professional development in a five-year period (National Association of State Directors of Teacher Education & Certification [NASDTEC], 2004). To allow for the necessary job-embedded experiences, leaders must be intentional in creating supporting structures. Most importantly, educators must be provided time to engage in professional learning experiences, as well as opportunities to apply and reflect upon their newfound learning (McNulty & Besser, 2010).

Although traditional methods of attending training sessions are valuable for promoting acquisition of knowledge and skills, research suggests the need for additional support in implementing newfound learning and putting it into practice (Joyce & Showers, 2002; Loucks-Horsley & Sparks, 1989). McNulty and Besser (2010), suggested professional development practices should allow teachers opportunities to practice skills and strategies with feedback and support. According to Joyce and Showers (2002) implementing a semi-co complex teaching method, requires teachers practice 20-25 times over an identified period. It is vital that teachers have conversations relating to teaching and student learning, while having opportunities to plan, practice, and provide feedback to one another (Hattie, 2009; McNulty & Besser, 2010). These opportunities would
emphasize the power of modeling, observing, and coaching, and promote the attainment
of skills and refinement of practices (McNulty & Besser, 2010).

However, it is important to note that simply dedicating time to these efforts does
not ensure professional development experiences will be successful. It is important that
designated time has a meaningful purpose (Guskey, 1999). The “effective” use of
ongoing, engaging, professional learning is an instrumental component in successful
professional development opportunities (Hattie, 2009; McNulty & Besser, 2010;
Robinson, 2007).

Learning may not be exclusive to workshops and formal trainings, but to
interactive learning with peers (Joyce & Showers, 2002; Loucks-Horsley & Sparks,
1989). Such opportunities more closely align with the HQPD standards’ quest of
professional development to be “a continual process rather than a single, isolated event”
(ODE, 2007, p. 64).


Building collaborative capacity in schools is a vital component of improving
suggested collaboration is “the daily habit of working together and you can’t learn this
from a workshop or a course. You need to learn it by doing it and getting better at it on
purpose” (p. 69). Unfortunately, many schools are not heeding this call for action.

Traditional “hit and run workshops after school,” do not allow teachers
opportunities to share and build upon knowledge and instructional practices (Darling-
Hammond, 2010, p. 34; Dufour et al., 2005). Collaborative practices during the school
day are unheard of, and U.S. teachers are provided only three to five hours each week for planning, which is often done in isolation.

Not much has changed since Sarason (1971) referred to teaching as a “lonely profession” (p. 102). Each teacher takes responsibility for, and attends to his/her own students, with little or no regard for what is happening in neighboring classrooms. Lieberman and Miller (1984) echoed the prevalence of isolated practice by suggesting the following:

Unlike other professions, teaching does not provide for a shared culture based on the movement from knowledge to experience in the company of one’s peers.

Doctors for instance, learn their profession through a graduated set of experiences all shared with others. Not so the teacher. Once graduated from a preparation program, teachers find themselves alone in the classroom with a group of students without a peer or supervisor in sight. (p. 16)

Isolation places a chokehold on teacher inquiry and learning (Fullan, 1990). And at its very roots, it is considered to be “the enemy to school improvement” (Elmore, 2004, p. 67). Darling-Hammond (2010) suggested that our more successful, international counterparts not only embrace the thought of collaborative inquiry experiences, but provide the structure for, and expectations around teacher participation.

Moving toward a collaborative, inquiry-based model aligns efforts to the action research approach. In this approach, teachers consistently engage in “planning, implementation, reflection, evaluation and revision” (ODE, 2007, p. 62). Throughout this process, teachers collect, organize, and analyze data for shared decision making. (Joyce,
Hersh, & McKibbin, 1983). Teachers engage in intensive discourse surrounding data and research, while heightening expectations encompassing instructional practices and student performance (McNulty & Besser, 2010; Robinson, 2007).

Such structures grant teachers the opportunity to co-plan, research, observe one another, conduct lesson studies, and reflect upon traditional instructional practices (Darling-Hammond, 2010). Collaborative analysis and reflection of data sources may include student work samples and/or taped lessons (Ball & Cohen, 1999). Consistent dialogue about teaching and learning increases opportunities for collaborative problem solving (Little, 1990), and promotes acquisition of knowledge and skills (NCSM, 2007). Collaborating with others improves confidence and increases risk taking (Bruce & Ross, 2008; Darling-Hammond, 2010; Little, 1990) among teachers. Such experiences afford teachers opportunities to share, and have access to, an increased number of resources and effective instructional approaches.

The benefits for engaging teachers in a collaborative, inquiry based environment, moves beyond enhancing practices. It yields an increase in student performance (Little, 1990). Schools with collaboration-practicing teachers observed achievement gains averaging three times higher than that of non-participants (Reeves, 2006).

5. “HQPD involves varied learning experiences that accommodate individual educators’ knowledge and skills” (ODE, 2007, p. 69).

While stressing the importance of collaboration, Fullan (1993) recommended we do not underestimate individuals' professional development needs. Too often, opportunities are delivered to masses of teachers simultaneously, without careful
considerations of their individual, unique needs. This “one-size-fits-all” approach is often embraced as a means of providing convenient, cost effective measures that pacify contractual issues.

The HQPD standards suggest both individual and group learning opportunities reflect upon “knowledge, skills and goals of the educator participants” (ODE, 2007, p. 69). It is imperative that the “design, delivery, intensity and duration of professional development is employed according to identified needs” (p. 70). Teachers should be afforded opportunities to strengthen, refine, and modify pre-existing content knowledge and pedagogy in a differentiated manner (McNulty & Besser, 2010). This allows for a logical progression of professional development experiences to meet the specific needs of individual teachers.

In individualized or guided professional development, an individual or group identifies a perceived need for further development. A formal or informal plan for improvement is established and implemented. Participants proceed to reflect and/or evaluate their learning, based upon pre-identified goals and objectives. These experiences may include, but are not limited to attending trainings, conducting observations, engaging in collaborative efforts, and/or professional readings (Loucks-Horsley & Sparks, 1989).

6. “HQPD is evaluated by its short and long-term impact on professional practice and achievement of all students” (ODE, 2007, p. 71).

Schools exhibiting significant achievement gains should carefully analyze their results. Both administrators and teachers should take responsibility for learning and measure their success based upon student results and learning outcomes (Guskey, 1999).
This requires ownership at all levels of the organization. It also requires the collection, analysis, and collaboration of data (Dufour et al., 2005; McNulty & Besser, 2010). These data should not be collected with the intent of punishing or humiliating teachers but as a means of evaluating the impact of the professional development program, the support systems, and the instructional efforts of student learning. Professional development should be assessed for its impact upon cultural and organizational change, student results, participant satisfaction, and content knowledge acquisition. Implementation levels may be assessed through the collection and analysis of survey, interview, and observation data. The information obtained assists in evaluating both professional development and classroom practices, in an attempt to guide future activities (ODE, 2007).

These evaluative measures should include the collection and analysis of baseline and both short- and long-term data (McNulty & Besser, 2010; Schmoker, 2001). Summative approaches are beneficial, as they provide an overview, evaluating performance as it relates to goals and/or intended outcomes. Formative, short-term assessments assist in determining whether or not the organization is on track to meet pre-identified goals. For example, at the classroom level, analysis may include the continual review of student performance data and work samples (ODE, 2007). These short-term results may identify the need for midcourse corrections or additional support to reach long-term goals. These results may also be motivating and/or reaffirming. Such data may encourage more reluctant teachers to engage in implementation efforts (McNulty & Besser, 2010; Schmoker, 2001).
The concept of providing HQPD is vital to improvement efforts. Educators must carefully consider the many options available to ensure not only the acquisition of knowledge and skills, but also the implementation and sustainability of efforts. Opportunities for providing ongoing, job-embedded support to teachers may be shown in the form of coaching.

Coaching: An Alternative to Traditional Professional Development

*Today, I’m issuing a challenge to educators and lawmakers, parents and teachers alike: Let us all make turning around our schools our collective responsibility as Americans. And that will require new investments in innovative ideas.* (Obama, 2009, p. 8)

Professional development is aimed at assisting teachers in acquiring, refining, and transferring knowledge and skills into practice (ODE, 2007), with ultimate intentions of increasing student achievement (Kowal & Steiner, 2007). Research surrounding mathematics coaching is relatively new, with studies often limited by their small participant sizes. However, we must consider the intent, implications, and impact of this innovative approach to professional learning, and use it as a springboard for future research endeavors.

Burns suggested the role of the coach is to enhance “the mathematics learning of all students by supporting teachers to improve their teaching of mathematics” (Felux & Snowdy, 2006, p. ix). Their role does not provide support from outward vantage points through mentoring (Balka et al., 2009), or through direct work with students as mathematics specialists. Instead, coaches work directly with teachers in the classroom setting (McGatha, n.d.). West and Staub (2003) stated that “Content-Focused Coaching is
not a quick fix for bad teachers” (p. 3). Rather, it embraces the concept of providing ongoing, job embedded, content specific professional development (ODE, 2007).

Though the role of the coach is focused on individualized professional learning, coaches are in unique positions to use their knowledge of research in mathematics to manage building-wide professional development. They become collegial supports in the areas of curriculum and assessment, through the sharing of research-based teaching and learning practices (Balka et al., 2009). Coaches collect, analyze, and communicate student data results, while collaborating with teachers on instructional implications (Chval et al., 2010). Coaches may provide opportunities for teachers to collaborate, examine student work, conduct lesson studies, engage in action research, and/or investigate the cognitive demand of instruction and questioning (Hansen, 2009).

Application of learned skills and implementation of responsive instructional practices requires individualized, differentiated, support to teachers. Coaches must fully understand the foundations of state and district-identified standards and assessments, as well as the “developmental nature of mathematics and the interconnectedness among concepts” (Balka et al., 2009, p. 6). They must embrace and promote the use of the Process Standards as a tool with which to guide planning, implementation and reflection of instructional practices (Hansen, 2009).

Innovative research studies have investigated the impact of coaching upon the acquisition of knowledge and skills, in combination with transfer to practices. The concept of transfer is vital, as it includes implementation with recognition of the impact upon student learning. Joyce and Showers (2002) suggested:
This is the place where the interface between staff development and student achievement exists. The learning environment of the students changes, and those changes are of a quality and amount that enable increased learning to take place. (p. 71)

Showers (1982) investigated transfer of practices in a study of 17 teachers. Nine teachers were randomly selected to work with a coach, while the other eight teachers did not work with a coach. Individuals without ongoing coaching support were much less likely to implement newly learned practices. Additionally, achievement results from 256 students, confirmed those in coached classrooms had significantly higher achievement gains than those in the control group. In 1984, Showers conducted another study of 21 teachers and 131 students. In this study, teachers were randomly assigned to be coached (N=10), partially coached (N=6) and/or not coached at all (N=4). Findings included coached teachers having higher transfer rates for implementing learned strategies and their students evidencing significantly higher achievement gains.

Bush’s (1984) five-year longitudinal investigation of 20 districts and 80 corresponding schools indicated similar findings. When teachers were simply provided descriptions of instructional strategies, the transfer to implementation was a mere 10%. When opportunities to model and practice with feedback were added, the transfer to implementation ranged from 16-19%. When teachers were provided coaching opportunities to support the implementation of practices, a 95% transfer was shown.

Joyce and Showers (2002) did a synthesis of hundreds of studies on coaching. They noted that the simple teaching of a theory had limited correlations to participant
knowledge gain (ES .5). Observing demonstrations yielded minimal increases in the acquisition of skills (ES .5). These methods of professional learning resulted in virtually no transfer to classroom practices (ES 0). Demonstrating and practicing with feedback increased knowledge (ES 1.31) and acquisition of skills (ES 1.18), but continually failed to evidence virtually no transfer to classroom practices (ES 0). Thus, coaching seems to considerably increase the transfer of both learned knowledge and skills (ES 1.42).

Joyce and Showers (2002) suggested the following estimates as rules of thumb for the impact of various professional learning opportunities (p. 78). Teachers studying a theory or listening to lecture may increase participant knowledge by 10%, skills by 5%, but with a 0% transfer to practices. Professional learning opportunities may increase participant knowledge by 30%, skills by 20%, but with a 0% transfer to practices. Practicing implementation of strategies may increase knowledge gain by 60%, skills by 60%, with a 5% transfer to practices. Coaching proved to be the most effective form of professional development among teachers. This method may produce a 95% knowledge gain, a 95% skill acquisition, and a 95% transfer to classroom practices. The profound impact of coaching, coupled with the characteristics of a strong alignment to High Quality Professional Development (HQPD), further encourages investigation of coaching, as an alternative to traditional professional development endeavors.

Campbell’s (1996) exploration of Project IMPACT (Increasing the Mathematical Power of All Children and Teachers), founded in 1989, further exemplifies the impact of coaches upon instructional practices and student achievement. Project IMPACT was aimed at increasing student achievement and changing instructional practices in
underperforming, urban public schools. This project coupled efforts from the University of Maryland and the Montgomery County Schools. Their intentions were to replace traditional, sporadically implemented professional development with a more system wide approach. This study included 6 of the 21 lowest performing schools in the district, each evidencing increased minority and poverty rates. Resulting from a coin toss, three schools were identified as the treatment group, with the remaining three comparable schools identified as the control group.

Teachers in the treatment group received a 22-day summer in-service training. They engaged in problem solving, the use of manipulatives, and investigating teaching for understanding. Coaches, assigned to each building, provided teachers collaborative opportunities to plan, implement and reflect upon practices over the course of the year. The initial project population included 1375, K-3 students, in three urban schools. As a result of additional funding, 1,000 additional fourth and fifth grade students were added in 1993. Classroom observations were conducted in the fall and spring, while student assessments were given in the winter and spring.

Student performance evaluations included 25-40 minute interview assessments for grades K-1, 45-60 minute written assessments for grades 2-3, and 60-90 minute written assessments for grades 4-5. Assessments were given to students in their native languages. Though not immediate, student gains became evident overtime. First grade students in the treatment group demonstrated significantly higher mean scores in problem solving and reasoning. By the middle of second grade, these students had significantly higher gains in
whole numbers, place value and rational numbers, as compared to their non-participating counterparts.

The coupling of traditional professional development and coaching support yielded varying instructional gains among teachers in treatment schools. Of these schools, 40% demonstrated profound changes in their instructional practices over the course of the project. They embraced a more constructivist approach to mathematics instruction, while engaging students in developing a deeper, conceptual understanding of mathematics. Manipulatives were used and student engagement was monitored. Teachers indicated knowledge of student thinking, gained through student responses and observations. Wait time was increased and students were encouraged to share multiple solving strategies. Teachers used this learned information to restate, make connections and synthesize student thinking.

Becker (2001) reported similar findings from three coaches and their cooperating teachers. Though coaches used varying degrees of collaboration, modeling, and directive approaches, they perceived their roles as assisting teachers in building mathematical confidence and recognizing connections among content material. Over the course of Becker’s study, coached teachers developed a more in-depth view of mathematics instruction, as opposed to a page-by-page, textbook approach. This allowed students connected opportunities for learning as opposed to unrelated, episodic experiences. In lieu of rote tasks, teachers focused their instruction on problem solving to promote a conceptual understanding, while becoming more reflective of student understanding. Teachers viewed the qualifications of an effective coach, as being one of “openness;
fairness; non-judgmental demeanor; helpful; dependable; approachable; and, experience” (p. 758). Teachers became appreciative of coaches, as they had an “extra set of eyes and ears in the classroom” to help them better gauge student learning (p. 758-759).

Race et al. (2001) also studied the impact of coaching upon instructional practices. The study participants included 265 teachers from Chicago Public Schools, each of whom participated in ongoing professional development, followed by coaching, and mentoring support. They received sixty hours of professional development over the course of two years, with an additional 15 sessions of coaching, in effort to assist and enhance reflection and the transfer of learning to practice. This coaching support was in the form of modeling, co-teaching, observations and/or conferencing.

In this study, quantitative data were analyzed from 1700 standardized implementation logs. A more in-depth qualitative analysis was conducted using 159 data logs from 159 teachers. Analyzed data confirmed the execution of hands-on learning, accommodating various learning styles. Teachers embedded higher-order thinking opportunities, while embracing a constructivist approach to learning mathematics.

These levels of engagement and depths of understanding were also shown in McGatha’s (2008) research. This research included in-depth case studies of two coaches and provided an innovative look into teacher and coach relationships, while shedding light upon roles and engagement. Analysis of data included journals, pre- and post-survey data, collaborative meetings, and post-interviews with coaches and teachers. These findings confirmed cooperating teachers using student understanding to guide instruction.
Additionally, they provided increased opportunities for engagement in thinking about and communicating mathematics.

The individualized professional development that coaches provide may result in varying amounts of time and support allocated to each teacher. Coaches can spend between 5 and 20 sessions with a teacher, based upon his/her unique needs. Because of this time commitment and the dedication involved, coaches must methodically consider how they will select teachers with whom to work (Hansen, 2009).

Principals may identify struggling and/or problem teachers and request the assistance of the coach. However, these teachers may be reluctant to change. Brown and Harvey (2006) suggested though outcomes may seem ideal, instituting changes may not come easy, as the culture is deeply embedded. Attitudes toward behavior can become second nature, and may in fact be inadvertently reinforced through the structure of the organization. When “changing these old patterns, people must alter not only their behavior but also their values and their views of themselves” (p. 36). As a result, some teachers may be unwilling to participate in the program and hesitant to utilize new strategies in their classrooms, even though they may be in greatest need for reform. They may not be dedicated to allowing coaches, or what Balka refers to as “change agents” (Balka et al., 2009, p. 8), inside their classrooms. Hansen (2009) cautioned that reluctant teachers may monopolize the coach’s time and efforts. These teachers “may be slow to progress because they either don’t have the capacity or choose not to change. If forced, they might make negative experiences public and/or criticize ongoing coaching efforts as well as any new teaching ideas” (p. 50).
When administrators force teachers to work with a coach, it is often viewed as a punishment, and teacher may perceive the coach as an evaluator (Knight, 2009). The direct relationship between the coach and teacher should be nonjudgmental (Joyce & Showers, 1980) and non-supervisory and non-evaluative in nature (Balka et al., 2009; Knight, 2009). In contrast, coaches must have good communication skills and be respectful and encouraging in their efforts (Balka et al., 2009). They must not be directive in their approaches, but instead supportive and reflective (Balka et al., 2009; Knight, 2009). These requirements may be difficult for people with superior content knowledge, who may not have the patience or the psychological training to communicate content, be respectful, and be encouraging.

When choosing teachers with which to work, content and pedagogy may be pre-assessed to determine homogeneous or heterogeneous scheduling. It is most important that teachers chosen are willing and able to obtain support in the refinement of their instructional practices. Approaching clientele in this manner has its advantages, as enthusiastic and eager teachers communicate their excitement to others, opening the door to more reluctant teachers (Hansen, 2009).

This non-evaluative coaching approach provides opportunities for collaboration around content, instruction, assessment, and reflection (Hansen, 2009). It embraces the underlying concepts of professional learning communities, aimed at increasing teacher content knowledge and pedagogy. These communities embrace shared visions and missions, and are committed to collaboration, action, continuous improvement, and ultimately, results (Dufour, Dufour, & Eaker, 1998). This cyclical process involves the
day-to-day support in the forms of pre-conferencing, modeling, observing, coaching and post-conferencing (Hansen, 2009; ODE, 2007).

Pre-conferencing enables the coach to better recognize the teacher’s comfort level, content area knowledge, and pedagogical knowledge about best practices in mathematics instruction and student learning (West & Staub, 2003). Coaches bring their learned knowledge of the content and Process Standards to the table (Balka, 2009). Pre-conferencing provides opportunities for thoughtfully identifying lesson objectives and linking appropriate instructional strategies. The level of cognitive demand may be assessed to ensure students are participating in rich, engaging tasks. During this time, the teacher and coach may discuss potential misconceptions of students, and how they will be addressed during the lesson. They may also establish predetermined assessment techniques and discuss appropriate extension questions to pose to students, capable of furthering the content (Hansen, 2009).

Based upon the planned lesson objectives, the coach and teacher must structure teaching methods accordingly. This may include modeling, observing, and/or co-teaching. (Hansen, 2009; West & Staub, 2003). In McGatha’s (2008) research, coaches perceived modeling as the least effective measure of coaching, as it did not allow for reflective practices, nor did it maintain and promote the teacher as the lead. West and Staub (2003) suggested modeling, however, can be considered a useful method of coaching when demonstrating specific instructional strategies, unfamiliar to teachers. If the coach chooses to model, the teacher must be active in observing the strategy and documenting specific evidence of student learning. After observing, the teacher may
implement the newly learned strategy with ongoing support and feedback from the coach. It is important to note that “over time, the coach will decrease and eventually phase out modeling and situation-specific intervention” (p. 4). As shown in Race et al.’s (2001) study, initially coaches modeled or took the lead, when teachers became uncomfortable with the content or showed reluctance to change. Progressively, the use of modeling specific techniques resulted in teacher enthusiasm and encouragement, as well as a willingness to replicate strategies on their own. Small incremental steps were found to produce enthusiasm, and resulted in additional modifications of instructional practices. Most often, coaches and teachers embrace a co-teaching format, which allow them to share responsibilities for planning and implementation (West & Staub, 2003).

During the lesson, learning follows a knowledge-based, constructivist approach. In this approach, teachers do not directly transmit knowledge (Resnick & Hall, 1998; West & Staub, 2003). Instead, students are actively engaged in constructing their own knowledge, through participating in rich tasks. Teachers and coaches become more facilitative in their efforts and engage the use of the Process Standards to guide instruction. They ask facilitating questions, allowing students opportunities to solve problems using their own strategies, while being encouraged to communicate their findings to others. Students remain actively engaged through posing questions. They make connections, modify, refine, and integrate thinking to formulate conjectures (NCTM, n.d.b; Peshman, 1992).

After the lesson, the coach and teacher engage in a post conference, reflecting upon the success of the lesson, while identifying areas needing to be revisited. These
conversations are instrumental in determining next steps for instruction, including interventions around, and extensions of the content material (West & Staub, 2003). Providing teachers opportunities to work with coaches in planning, implementing and debriefing, further increase levels of mathematics content knowledge and pedagogy. Teachers are afforded opportunities of professional dialogue, based upon their teaching and learning, and become more reflective of their own practices. These opportunities contribute to the development of “professional habits of the mind” (West & Staub, 2003, p.3).

Results of teacher change are shown in Race et al.’s study (2001), in which students became engaged in their learning and classroom management issues decreased. However, increased noise levels led some teachers to become reluctant to providing such opportunities, as they perceived noise as a lack of classroom management.

Barriers shown by coaches included the lack of preparation time with teachers and the lack of teacher confidence levels. Coaches in McGatha’s (2008) research perceived the lack of planning, instructing and debriefing to be a barrier to their work. These were considered by the coaches to be instrumental in their approach to providing professional development.

In Race et al.’s (2001) study, some teachers perceived scheduling and time involved to be a barrier, as they experienced a conflict with other commitments as well as lessons and/or test preparation. Some teachers did not feel the need, or felt pressured to participate in the professional development program.
These professional development opportunities are not possible without the cooperative support of the principal. In an effort to support coaches, principals should attend workshops, involve themselves in learning discussions, and set precedent and structure to support coaching. This requires principals have a clear understanding of the coaching role, and how it relates to student learning. This role should be transparently communicated to others, and adhered to (Killion & Harrison, 2005).

At times, coaches are expected to perform the duties, referred to as “impromptu duties” (Chval et al., 2010, p. 209). These duties include performing administrative tasks, substituting for teachers, preparing materials for state testing, routine paperwork, and running trivial errands. Administrators must support coaches by allowing them to engage in the roles they were intended to perform (Knight, 2009). They must continually be mindful of the coach’s role and honor his/her efforts to provide job embedded professional development (Neufeld & Roper, 2003). Therefore, duties should be limited and equivalent to teachers within their buildings.

Administrators also can misinterpret the role of the coach, expecting them to become “spies/gophers/fixers/enforcers” (Chval et al., 2010, p. 210). Promoting a working relationship involves establishing a non-threatening rapport between the coach and teacher (Balka et al., 2009; Knight, 2009; Neufeld & Roper, 2003). It is essential administrators respect the boundaries of coaches, allowing them to maintain confidentiality and trustworthiness with teachers (Neufeld & Roper, 2003). In fact, Balka et al. (2009) suggested,
If a teacher believes that a coach is talking about them to other teachers, parents, or administrators, then trust will be lost. Trust is at the heart of coaching, because trust is an important enabler for teachers to be willing to try new approaches, and unfamiliar instructional strategies. (p. 25)

In some situations, even teachers misinterpret the role of the coach (Chval et al., 2010), and consider them to be an expert (Joyce & Showers, 2002). Occasionally, teachers incorrectly assume coaches will take over the entire classroom, while they perform other tasks (Chval et al., 2010). Teachers may also assume the role of the coach to be one who identifies and supports struggling students (Chval et al., 2010), instead of being a supportive colleague to fellow teachers (Joyce & Showers, 2002).

Coaching roles may also be unclear to the coaches themselves. Too often, a teacher with no coach training at all, is taken from the classroom and given the title of a coach. Overnight, the teacher transitions from “expert to novice” (Chval et al., 2010, p. 192). New roles and expectations are often unknown to them, as they may have never spoken to or observed another coach. The teacher often feels uncomfortable, and unqualified in undertaking their new role, as coach (Chval et al., p. 192).

Chval et al. (2010) conducted a detailed study of 14 mathematics coaches, serving grades K-7, to identify both perceived roles and experiences at the beginning and end of their first year in the position. Analyzed data included a fall survey, open-ended response questions, writing prompts, semi-structured interviews in the fall and spring, and audio recordings from monthly meetings and training sessions. This study revealed first year mathematics coaches “did not have a consistent vision or expectation of their work with
students” (p. 206). Their roles, as well as time spent engaged in various activities, varied significantly when observed, surveyed, and interviewed. Coaches were unaware of their specific roles and often undertook other jobs, some completely unrelated to their assignments. Some coaches, encountering resistance from teachers, internally renegotiated their roles to more closely align with teachers of at-risk and/or honor students. It is important that coaches perform the duties for which they are intended. These duties include “observing, team teaching, modeling instruction, leading professional development, planning lessons with teachers, and identifying or providing resources to teachers” (p. 200).

The many challenges associated with the perceived roles and expectations of coaches, teachers, and administrators may evidence the lack of a psychological contract. These contracts provide an upfront, understood, yet unwritten agreement of all parties’ expectations and roles. Though the contract may be renegotiated as time progresses, it sets the tone for the work to be done successfully (Brown & Harvey, 2006). Neufeld and Roper (2003) suggested both principals and coaches fully understand and communicate the coaches’ roles to all parties. In some situations, there may be a need for a third party to identify and communicate key roles and responsibilities of both the coach and organization (Brown & Harvey, 2006).

As shown, coaches are in a sphere of their own. They are in an isolated position, as they are neither teachers nor administrators (Chval et al, 2010). Therefore, “Coaches must determine their course of action on their own, often with little support. The job is demanding, and there is no coach to coach them” (Balka et al., 2009, p. 5). Therefore,
after roles have been established, it is important to consider how the coach will become prepared for his/her work (Feger et al., 2004).

This requires coaches engage in their own professional learning experiences (Knight, 2009). These experiences should be aimed at increasing the coaches’ content knowledge and pedagogy, while furthermore building upon their coaching skills (Feger et al., 2004). Research suggests in addition to developing a deeper understanding of mathematics instruction and learning, coaches must acquire other skills, vital to their roles. These areas include, but are not limited to: (a) an awareness of school improvement, (b) how to work with individuals of different levels and personalities, (c) how to engage the adult learner, (d) how to handle conflict and resistance, and (e) recognizing connections among grade levels (Chval et al., 2010).

The need for such experiences became evident in Chval et al.’s (2010) study of first year coaches, described above. These coaches were apprehensive of participating in their own professional learning, as they were concerned it would limit the amount of time they could engage in coaching. They were also concerned teachers may become resentful of them in the process. Despite these concerns, the coaches felt participation was necessary to them in their position. They greatly appreciated opportunities to learn and meet with other coaches.

Districts must move beyond simply hiring individuals to fill coaching positions, and consider how to best support them in their professional learning ventures. This may include in person and/or online collaborative opportunities to further enhance their content, pedagogy and coaching skills (Kowal & Steiner, 2007).
The Ohio State University Mathematics Coaching Program

It’s the founding promise of our nation: That we can make our lives what we will; that all things are possible for all people; and that here in America, our best days lie ahead. I believe that. I truly believe if I do my part, and you, the American people, do yours, then we will emerge from this crisis a stronger nation, and pass the dream of our founding on to posterity, ever safer than before. (Obama, 2009, p. 5)

The deplorable state of mathematics education calls for immediate action, and as Obama suggested, the synchronization of efforts. The Ohio State Mathematics Coaching Program (MCP) couples efforts from Institutes of Higher Education, the ODE, and cooperating school districts in common pursuit to improve student achievement in the area of mathematics (MCP, n.d.a).

This shared commitment elicits the need for transforming current instructional practices within classrooms. The MCP supports districts in providing onsite, ongoing, job-embedded professional development support to increase content area knowledge and pedagogy in both mathematics coaches and teachers (MCP, n.d.a).

Although the conception of the MCP is unique and innovative in its efforts to enhance the field of mathematics instruction, program developers, Brosnan and Erchick (2010) used existing research findings to provide a basis for their work. The uniquely designed Conceptual Framework, as shown in Appendix A, illustrates the interconnected, foundational values associated with the MCP approach. This framework includes mathematical, pedagogical, and contextual elements, intertwined to promote a “Learner Responsive Mathematics’ Education (LRME)” (MCP, n.d.c). The mathematical elements
include the integration of procedural and conceptual mathematics, the need for richly connected content material, and desire to enhance student understanding. The pedagogical elements include the selection of problem-based tasks, and the creation of a learner centered environment where assessments inform instructional decisions. The contextual elements embrace the learners’ culture, and both a sense of shared authority and commitment to social justice in the classroom. Though not exhaustive in nature, the following summary of research builds the framework of the MCP approach (MCP, n.d.f).

The content component of this framework encompasses a deep integration of both procedural and conceptual mathematics (Baroody et al., 2007; Coniam, 2010; Hiebert et al., 2000; MCP, n.d.c; n.d.f; Star, 2007), while establishing valuable, rich connections among subject matter. This builds a framework of understanding for students and elicits the use of reflective and communicative practices

The pedagogical elements include a profound focus upon the Process Standards to guide instruction and reflection (Brosnan, Erchick, & Manouchehri, 2011; Cornelius-White, 2007; MCP, n.d.c, n.d.f; NCTM, n.d.b). This calls for a learner-centered, problem-based approach to mathematics.

The MCP envisions teachers posing rich problems or activities to students and then allowing them to work independently. The teacher poses facilitating questions to promote connection building and a deeper understanding of the content material (MCP, n.d.f, 2011). Furthermore, the teacher encourages multiple representations of solutions, while facilitating discussions for students to communicate their reasoning and conjectures, without providing validation (Friere, 1989; MCP, n.d.c; n.d.f; NCTM, n.d.b).
The Cognitively Guided Instruction (CGI) approach promotes the use of formative assessment information, coupled with teacher knowledge of student learning, in effort to drive instruction (Fennema et al., 1992).

Contextual factors of the MCP conceptual framework include a commitment to shared authority (Freire, 1989; Hiebert et al., 1997; MCP, n.d.c, n.d.f), legitimacy and autonomy (Hiebert et al., 1997, MCP, n.d.f; Pace & Hemmings, 2007). Teachers establish their legitimacy through consistent interactions with students and the learning structure that has been established (Pace & Hemmings, 2007). Students share in the responsibility of learning through communicating, justifying, and making connections (Hiebert et al., 1996).

The MCP embraces an understanding of cultural impacts on student learning, while being committed to social justice and equity (Gutstein, 2006; Gutstein & Peterson, 2005; Hiebert et al., 1997; MCP, n.d.c, n.d.f). This involves setting high standards and providing equitable opportunities to all students, engaging them in higher-level mathematics (Gutstein, 2006). The MCP uses a social justice lens to heighten awareness of community and/or worldwide disparities, while promoting underlying mathematical applications. These applications are beneficial in conveying awareness to socially unjust issues, while substantiating a need for change.

The MCP’s Structural Design, as shown in Appendix B, provides the information and methods by which teachers can obtain support. In this design, the MCP works directly with coaches, who then provide HQPD support to teachers within their buildings (MCP, n.d.e). This allows the program to broaden its impact to numerous schools,
teachers and students throughout the state. The MCP currently works with 57 coaches, collectively serving over sixty rural and urban schools, many exhibiting low performance in the area of mathematics (MCP, n.d.a, MCP, 2010a). These schools are often comprised of a disproportionate number of impoverished, minority, disabled, and/or limited English proficient students (Brosnan & Erchick, 2010).

The structural and conceptual frameworks of the MCP are designed to refine instructional efforts of teachers through HQPD, while focusing upon national and state standards. This has resulted in the unwavering endorsement and support from ODE (Findell, Brosnan & Erchick, 2008; MCP, n.d.a). Title I, School Improvement, and RttT funds often provide schools the funding for hiring coaches at the district level.

At the request of districts, the MCP offers their assistance in the interviewing process (Brosnan & Erchick, 2008; MCP, 2010b, 2011b). In fact, MCP and ODE have partnered to provide optional hiring guidelines and interview protocols, as shown in Appendix C. Recommendations for coach qualifications include but are not limited to the possession of a P-6 Mathematics Specialist License, a degree in mathematics education, successful teaching experience, and knowledge of both mathematics content and pedagogy. It is also ideal for candidates to have experience in supporting struggling students. They should have good personal skills, be providers of professional development, and possess an eagerness to continue in their own learning. In addition to the collection of typical application related materials, MCP suggests conducting performance assessment observations, gathering responses to specific interview questions, and completion of a content and pedagogy inventory. The inventory provided
by the MCP, as shown in Appendix C, assesses the content and pedagogy of potential coaching candidates, when considering different scenarios. A sample scenario is as follows:

After a recent student centered lesson that focuses on classifying shapes based on their properties, a third-grade teacher overheard the following verbal exchange between students in her class: Spike: After we’ve been looking at these shapes all week, I think squares are a whole lot like rectangles. Guido: I don’t think you know what you’re talking about! Everybody knows that rectangles are special types of squares. a) Explain each student’s thinking. b) What concepts are they addressing in their conversation? c) How would you help them develop definitions for squares are rectangles? (p. 251)

Participating coaches are eligible to obtain three years of professional development support, at no cost to the district. Each month, coaches attend at least two days in statewide professional development and two days at facilitator led, regional support meetings. Overall, participation in both general and facilitator led sessions enable coaches to receive approximately 300 hours of professional development each year, for the duration of three years.

Professional development experiences, readings, and collaborative opportunities are aimed at building upon content knowledge, pedagogy and coaching skills (Brosnan et al., 2010c; MCP, n.d.b; 2010c). Driven by the conceptual framework, professional learning progresses in its intensity over the course of the three-year program.
General and regional professional development experiences for first year coaches focus on providing foundational knowledge, pertinent to their positions (MCP, 2010c). They engage in learning as coaches, teachers, and students. They become immersed in problem solving opportunities and scenarios to better assist them in understanding learning at all levels. These experiences further develop content area knowledge and pedagogical foundations that are invaluable to coaching. The use of assessments, coupled with the collection, analysis, and use of data are explored in-depth to enhance instructional decision-making. Additionally, emphasis is placed upon the use of the Process Standards when planning for, executing, and reflecting upon delivery of the lesson. Over the course of the program, coaches unearth methods of using their newfound learning and experiences to assist them in everyday coaching situations (MCP, 2010c).

Second year professional development opportunities intensify content learning, as explorations extend to the middle school level (MCP, 2010b, 2010c). Coaches investigate a variety of assessment methods to analyze student content knowledge and conceptual understandings. These data are used to enhance instructional decision-making. Socio-cultural aspects and equity are also examined at significantly deeper levels (MCP, 2010b, 2010c).

Third year MCP coaches extend their learning in the areas of coaching and leadership (MCP, 2010b, 2010c). They engage in both independent and peer learning opportunities and projects, further enhancing their instructional pedagogy and coaching skills.
Professional development and collaborative support from ODE is provided on an ongoing basis, over the course of the three year program. ODE representatives work with coaches to better assist them in understanding state and national standards, assessments and scoring procedures. This information assists coaches in their day-to-day support of teachers, and provides the framework for professional development opportunities at the building level (Brosnan et al., 2011; Findell et al., 2008).

The professional development design is unique, in that it includes both general learning sessions and follow-up meetings for additional collaboration and individualized support. At regional meetings, coaches are provided support from facilitators. These facilitators are “professional educators with a mathematics background,” working as “college/university professors, professional development specialists, educational service center professionals, district curriculum supervisors and retired mathematics teachers or MCP graduates” (Brosnan & Erchick, 2010, p. 1365-1366).

Facilitators, hired by the program four days each month, attend general sessions with coaches, and assist in building upon the learned content, through providing collaborative opportunities and dialogue around assigned readings. They assist coaches with questions and/or concerns they may have, while serving as liaisons between the coaches, program and cooperating districts (Brosnan & Erchick, 2010; MCP, 2010b).

The structural design of the MCP enables coaches to use newfound knowledge and pedagogical awareness when working in their buildings (MCP, n.d.e). Overall, the breakdown of a coach’s typical workweek mirrors important aspects of their professional learning. A standard schedule may include approximately 50% of time dedicated to direct
work with teachers in the classroom setting, 15% to planning and reflecting, 20% to data and 15% serving on committees and conducting building wide professional development (Brosnan & Erchick, 2009).

Promoting ongoing, job-embedded professional development, unique to teachers’ needs, requires coaches work directly in classrooms (Brosnan et al., 2011). This, in combination with the drive to sustain such efforts, is established by the coach working in one building with the same four teachers, every day, for six weeks. At the end of the six weeks, coaches continue their efforts, as they work with different teachers (MCP, 2011b, 2011c). Eligibility requires teachers to team-teach four days a week, and meet with the coach at least once a week for planning and debriefing. Teacher willingness is gauged through the use of an interest inventory (Brosnan & Erchick, 2009).

Various procedures apply (Brosnan & Erchick, 2009, Brosnan, Erchick, Bao & Zollinger, 2010; Brosnan et al., 2011; McKeny, 2010). Completed interest inventories are used to build schedules that accommodate willing teachers. Coaches take experiences and the perceived needs of teachers into consideration when creating individualized professional development support. Coaches honor confidentiality in their relationships with teachers and assist them in building mathematical content knowledge and pedagogy through collaborative planning, team teaching and debriefing. Although coaches may engage in modeling, co-teaching and/or observing, it is important to distinguish among the use of such approaches. While modeling, co-teaching and/or observing may exist in some fashion, and it is important to provide distinction among these methods. In the MCP approach, modeling is performed strictly to demonstrate specific skills and/or one
exemplar lesson. Observations are used as an evidence tracker, whereas the teacher documents student learning. Both forms offer the opportunities for planning and debriefing discussion, both of which are microelements of the predominant team teaching approach. The program was not designed or intended as a modeling and/or pull out program but instead to support a collaborative, team teaching approach (MCP, 2010b).

The approach embraced by MCP is “curriculum independent because the approach allows the pedagogy to focus on the critical features of instruction” (MCP, n.d.f, p. 1, 2011c; Hiebert et al., 1997). Therefore, professional development efforts are applicable to any school, regardless of their formally adopted curriculum. Individualized coaching support assists teachers in using existing curricular materials as guides, while modifying and improving upon them to promote best practices in mathematics education. Such modifications may involve making problems richer by increasing complexity and/or forming them into open-ended questions. These changes allow for higher level thinking opportunities, while accommodating for differentiation in multiple problem solving approaches. The coach and teacher may work together to fill gaps within their existing curriculum, while using information of existing student knowledge to inform instructional decisions. These decisions may involve both re-teaching and/or enriching mathematics content material (Fennema et al., 1992; MCP, n.d.f).

In addition to individualized professional development, coaches provide building-wide learning opportunities around professional readings, research-based practices and data analysis (Brosnan & Erchick, 2009). Coaches may provide support in the collaborative scoring of practice achievement and MCP problem sets. This allows for
professional dialogue around data collection and analysis, as it relates to student learning and instructional implications involving the Process Standards. The use of both formative and summative data can be explored during planning, instruction and debriefing. Additionally, coaches and teachers can use these data to make longitudinal comparisons evidencing student gains. Such opportunities allow for growth in the areas of content and pedagogy (Brosnan & Erchick, 2009).

Administrator involvement provides the supporting structure necessary for success. A principal’s program has been established to enhance communication between building administrators and the MCP. Principals attend two, half-day sessions and two full-day general professional development sessions, to better understand the program and their important roles within (MCP, 2011b).

Obtaining the desired outcomes of increasing student achievement, through participation in the MCP, requires a deep understanding of, and fidelity to the program (Brosnan et al., 2011; MCP, 2011c). This led to the development of the Program Assurances, shown in Appendix D. These assurances outline specific expectations from all parties, including: Principal investigators, district and building administrators, facilitators, coaches and teachers. The outlined roles and responsibilities ensure priorities, resources, support, and communication efforts from all parties are aligned for successful implementation. While assurances were designed to be followed, those who do not implement the guidelines risk minimal changes in instructional practices and student achievement (Brosnan et al., 2011). Breeches in assurances that prohibit coaches from
fully participating in the MCP are first addressed by facilitators, with information being communicated to, and handled by directors as necessary (MCP, 2011b).

The importance of following program assurances was highlighted in an MCP case study (Harrison et al., 2011). This study compared participating schools’ baseline (2008-2009) achievement scores to those observed upon completion of their first year in the MCP (2009-2010). Differences in achievement were calculated by grade level, and totaled, to uncover the five schools with the highest achievement gains, and the five schools with the lowest achievement gains. These schools were further investigated with data from site visit inventories, end of the year inventories, and weekly facilitator logs. These data were analyzed for common themes. Schools with the lowest achievement gains had passive participation of coaches and breeches in assurances. In these situations, coaches did not act as co-teachers, but instead relied upon modeling or providing intervention to students. These coaches were not fully supported by administration in their coaching efforts, with administrators often assigning an excess of non-related duties and/or responsibilities to their workload. There was also an inability in accommodating the coaches’ role in providing ongoing, job-embedded professional development support to no more than three to four teachers. In contrast, schools experiencing the greatest achievement gains were those who were aligned to program assurances. These coaches worked to establish trust with their teachers and communicated their roles as non-evaluative. They spent most of their time co-planning, co-teaching, and debriefing, with no more than four teachers, for a period of six weeks. They had limited duties and/or responsibilities outside of their coaching role. These coaches worked diligently to bring
attention to student thinking. Facilitators and site visitors used rubrics to rate coaches in knowledge, coaching, pedagogy, and comfort in the process. In this study, coach content knowledge and understanding of the coaching process among those with the highest and lowest achievement gains were similar. However, coaches in schools with the greatest achievement gains possessed higher pedagogy and comfort ratings.

The unique design and implementation of the MCP is profound. Careful detail and attention to formative and summative evaluation processes highlight the impact of the program’s carefully, intentioned efforts and need for further improvement.

**Evaluating Professional Development Efforts**

*What's at stake is nothing less than the American Dream. It's what drew my father and so many of your fathers and mothers to our shores in pursuit of an education.* (Obama, 2009, p. 2)

Within the field of education, we continually offer professional development ventures, with little to no regard for their implementation and/or impact upon instructional practices and student learning (Haslam, 2010). Research suggests strikingly similar trends have occurred in the medical field. In 1910, Flexner visited numerous medical schools and hospitals. He painted a bleak portrait of their lack of implementation and monitoring of best practices, resulting in countless illnesses and deaths. This sent the medical field into frenzy. According to Schmoker (2006), the medical field was turned on end. Similarly, our schools are lacking the implementation and monitoring of effective
practices. Like patients, we often neglect students’ well being, through not providing them the prescribed method to attain a quality education.

Our educational systems too often provide general session professional development opportunities to teachers and assume and/or hope for implementation upon return to their classrooms. The lack of teacher support, monitoring and evaluation can be detrimental to education in every aspect. Potential harm to students can occur when educators neglect to implement best practices and/or continue to implement those that inhibit student learning. According to Haslam (2010), the lack of monitoring structures prohibits districts from making informed, resourceful decisions about future efforts. This oversight is troublesome to time, efforts, and resources. The National Staff Development Council (NSDC) (2000) echoed the need for monitoring and evaluating programs. They suggested “staff development providers continuously learn and improve their performance” through evaluating their own efforts and receiving participant feedback (Killion, 2003, p. 16).

Guskey (1998) suggested detailed consideration of three evaluative categories to support these efforts, including evaluation planning and both summative and formative evaluation measures. Each component involves an assessment of the impact of professional development experiences, through collecting and analyzing data (Guskey, 1998). Without supporting data, programs have no information regarding knowledge gained, skills being implemented and whether or not modifications are necessary (Haslam, 2010). This requires program providers to be intentional and methodical in their data collection and evaluation planning efforts.
It is important, however, to note the difficulty in assessing causal relationships of professional development upon both individual and organizational practices. This is due to the often-limited pre and post observations (Haslam, 2010), as well as the many real world variables that cannot be isolated (Guskey 1997, 2002; Guskey & Sparks, 1996). The collection of various data sources may indicate the program was indeed a contributor to the achieved outcomes.

When determining the data sources to be collected and analyzed, Guskey (2002) recommended being proactive by suggesting, “Good evidence isn’t hard to come by if you know what you’re looking for before you begin” (p. 49). Likewise, Mizell (2009) advised providers, “Don’t conceive and implement a new initiative without creating, on the front end, a sound process for documenting and representing how the project unfolds and what it achieves” (p. 8). This requires developing an overall map of how pre-determined goals will be evaluated.

As shown by Appendix E, the MCP has collected a variety of data sources from coaches, teachers, and students. These sources are both qualitative and quantitative in nature, and include assessment, reporting, interview, site visit, and prompt related data. They provide both summative and formative snapshots of the program. When analyzed, they are useful in determining the effectiveness of the program and corresponding professional development. This assists in tailoring instructional opportunities to be unique and responsive to learners at all levels (Brosnan & Erchick, 2009). In addition to examining what data to be collected, it must be determined by whom, when, and how it will be collected, analyzed, and reported. It is also important to identify critical
information key stakeholders would be interested in knowing (Haslam, 2010; Herman & Winters, 1992).

Guskey (1998, 2001) suggested summative evaluation efforts assess the benefits to student learning and/or achievement. Summative evaluations provide an overall assessment of the program’s intended and unintended consequences upon its completion. These efforts may measure changes in the culture of the organization (Haslam, 2010), and include behavior, dispositions, and climate-related data. These data may be collected through surveys, interviews, observations and documents. The summative evaluation data collected and analyzed by the MCP, includes but is not limited to: The LAMPS, in-depth studies of coaches, problem sets, and OAT data (Brosnan & Erchick, 2009).

The LAMPS instrument is one of the many tools used by MCP to collect data from both coaches and teachers (Brosnan & Erchick, 2009). This instrument is designed to assess gains in content and pedagogical knowledge and skills through the use of pre and post-testing methods. The data collected and analyzed from this instrument have shown both quantitative and qualitative increases in both content area knowledge and pedagogy among coaches and teachers participating in the program (Erchick et al., 2007). For example, when determining the qualitative evolution of content area knowledge, an individual is quoted in the LAMPS pre-test as saying the following about the underlying premises of a geometry question: “Basic geometry math concepts are being addressed here-understanding shapes and their identities.” The post-test response is as follows: “Recognizing or identifying shapes via these attributes: Vertices, angles, closed/open
shapes, comparing” (Erchick et al., 2007, p. 18). This example evidences the evolution of a deeper underlying content awareness.

Quantitative gains verified through the LAMP pre and post-test data included teacher content gains of approximately 13 percentile points, with an effect size of .338. Increases in pedagogy were also shown, with gains of approximately 15 percentile points and an effect size of .385. Relationships were also uncovered between both content and pedagogy responses and equity pedagogy perspectives, as coded from research. Teachers approaching mathematics in an integrative procedural and conceptual approach had statistically significantly higher equity codes than those with trivial, procedural content perspectives (ES 0.65). There were also statistically significant differences among teacher directed and problem-based, student centered approaches (ES 1.54), and among problem-based, student centered and learner responsive pedagogy (ES 0.39). Significant differences were also shown upon examining learner responsive and teacher directive approaches (ES 0.93). Analysis of these data assisted the MCP in discovering teacher-directed and superficial procedural content approaches to inadequately support equity pedagogy. Integrated content approaches, problem-based, student-centered and learner-responsive pedagogies on the other hand, supported equity pedagogy (Erchick & Joseph, 2010).

An in-depth study of nine MCP coaches further supported the growth of cooperating teachers. This study included focus group interviews, individual interviews, observations, and surveys with MCP coaches. Though coaches identified change among teachers as being a difficult venture, they indicated teacher growth in the use of
instructional strategies, and engagement in both professional discourse and reflective practice (Erchick et al., 2007).

From students, the program collects problem sets, and pre- and post-half and full length OAT data, aligned with both state and national standards, to further assist in program evaluation (Brosnan & Erchick, 2009; Erchick & Brosnan, 2009; Erchick, et al., 2007). These student assessments include extended response items for grades three through six, capturing material from all five content standards. Coaches work collaboratively with teachers in scoring and analyzing assessment data. In this process, coaches and teachers learn about mathematics content, student thinking, and areas of proficiency (MCP, n.d.b). Data analysis allows coaches and teachers to identify specific areas needing improvement and make informed instructional decisions. The analysis of assessment data is also beneficial in evaluating the overall success of the MCP efforts, including content, procedural and conceptual understandings. To date, both qualitative and quantitative changes in student achievement have been shown and are nothing shy of profound (Erchick et al., 2007).

For example, analysis of extended response data indicated an increase not only in the number of questions students answered, but also the quality of provided responses. The responses tended to be more articulate and indicated enhancements not only with procedural development, but also the conceptual understanding of mathematical concepts (Erchick, 2007).

The MCP uncovered substantial quantitative gains when comparing first year coached and non-coached schools’ grade three through eight achievement test data. The
data comparisons included only coached buildings within their first year of the MCP. The data suggested relative changes of 4.46% for those ranking proficient and above, and 4.46% among basic and limited performance. Together, the difference between coached and non-coached schools’ performance was approximately 9%. All grades but grade seven demonstrated increases in student achievement, with grades four, five, six, and eight evidencing statistically significant gains (Brosnan, Erchick, Bao, & Zollinger, 2010; MCP, 2010c).

Over a four-year period, grade three through eight student achievement results, between coached and non-coached classrooms, surfaced effect sizes of .52 to .87, respectively. The notoriously difficult grade five and eight assessments had effect sizes of .64 and .82, respectively (MCP, 2010c). Overall, schools involved in the coaching project received average mathematical increases on state achievement tests of 9.2%, while state averages were only 6.4% (Erchick et al., 2007). Significant gains were also shown in various subgroup populations, including these: students with disabilities, minority, and the economically disadvantaged (MCP, 2010c; Brosnan, Harrison, & Harrison, 2010).

Both urban and rural MCP schools have shown academic improvement (Coniam, 2010; Coniam, Brosnan & Erchick, 2010; McKeny, 2010). Within urban school districts, research findings indicated significant improvements in each mathematical content area on standardized assessments (Coniam, 2010; Coniam et al., 2010). Among rural schools that improved was an Appalachian school which evolved from academic watch to excellent over the course of seven years. In the last four years, the school improved from
continuous improvement to receive an excellent rating, with the support of an MCP coach (McKeny, 2010).

Even more profound were student achievement results of schools receiving additional Title I funding in the 2006-2007 school year (Shown in Appendix F; Brosnan et al., 2011). These schools were eligible to receive support from either a literacy or mathematics coach. Schools selecting literacy coaches were then ineligible for a mathematics coach. The remaining schools either chose to have a mathematics coach, or didn’t take advantage of either form of support. Districts having an MCP mathematics coach had significantly higher mathematics scores than schools having either literacy coaches or no coach at all. Interestingly, schools with MCP coaches also ranked significantly higher in reading and writing than those with literacy coaches and those with no coach at all. It was concluded that students exposed to mathematics coaching received higher achievement results, not only in mathematics, but also reading and writing (Brosnan et al., 2011).

These summative data sources are useful to inform decisions on whether to modify, expand or discontinue the program (Guskey, 1998). Although the success of the program has driven continuation of efforts and expansion in funding, waiting for summative data is much too late for midcourse corrections to ensure the program is on track for success. Obtaining this information requires the use of formative evaluation measures (Guskey, 1998). These benchmark evaluations allow for assessing strengths and weaknesses of the program’s professional development experiences. Program evaluators can use collected data to determine the progress of initiatives, which may call for
modifications. These measures assist in providing feedback around satisfaction, learning, and the application of concepts (Haslam, 2010).

The MCP formative assessment measures include, but are not limited to coach reports, facilitator reports, scenario responses, and site visits. These data are informally analyzed by program directors and facilitators to best understand coach perspectives and needs (Brosnan, Harrison, & Harrison, 2010). These measures include the four different levels of formative evaluations, including participant reactions, learning, organization support and change, and application of the newfound knowledge and skills (Guskey, 1998). The first level of formative evaluations includes the assessment of participant reactions to, and satisfaction around the professional development experience. This information assists program developers in improving the format and delivery of the experience (Guskey, 1998, 2001).

The second level of formative evaluations assesses whether or not participants have gained the intended learning outcomes of the professional development experience. This may include the use of reflections, performance assessments, and/or demonstrations. Evaluating this information is beneficial to improve upon the program’s content, design, and organization (Guskey, 2001).

The third level of formative evaluation assesses the organizational support and change. These evaluations are used to determine whether or not implementation of professional development endeavors were defined as a priority, and were encouraged and supported within the organization (Guskey, 2001). This level includes the careful examination of how contextual factors such as leadership, priority, curriculum, and/or
teacher and student changes impact the implementation. It is important to uncover the availability of necessary support and materials for implementation, and to determine whether or not all parties are carrying out their responsibilities (Haslam, 2010). Meeting minutes, surveys, interviews among participants and administrators, reflections, and examination of school records are beneficial forms of evidence. Collecting this information assists in the documentation of needs, and allows for creating and prioritizing implications to support and ensure the program’s success (Guskey, 2001).

The fourth level of formative evaluation assesses the application of newfound learning. This may include the collection of survey, and/or interview data from participants and their supervisors (Guskey, 2001). Recommendations for coach evaluation programs include “survey, observation, interviews and analysis of data” (Kowal & Steiner, 2007, p. 5). Additional data may include reflections and/or visual or audio components. Triangulating data among multiple sources and individuals may be beneficial to ensure accuracy of findings (Killion, 2003). The collected information can be used to improve both content and support received from the professional development program. A large number of participants and schools involved within the professional development experience would require a sampling to be used for the evaluation process (Haslam, 2010).

Conducting formative assessment evaluations requires careful consideration of the person/persons collecting and analyzing the data. External evaluators may be beneficial to present objectivity and credibility to the findings (Haslam, 2010). It is important to train evaluators in using the data collection instrument, particularly if multiple evaluators
will be conducting the work. This will assist in the further refinement of the tool, while promoting depth of understanding around the protocols associated within (Killion, 2003). Both closed- and open-ended questions may be used for interview purposes. However, it is important to note that although collecting qualitative data allows for description, it requires increased amounts of time to collect and analyze. Such an approach furthermore heightens the need for consistency among evaluators in their collection, analysis, and reporting efforts (Haslam, 2010).

When conducting observations, Haslam (2010) recommended transparency in the intentions of program site visits. It is important to make clear to participants the purpose of the visit. It is imperative to reassure “teachers that the evaluation is assessing the professional development and not the teacher knowledge and skills and/or their performance in the classroom” (p. 39).

When conducting observations, Haslam (2010) suggested they be unobtrusive in nature. Collecting data from multiple observations, while avoiding special situations, such as holidays, is important when planning for such formative evaluation efforts. Tools involving the use of ratings or judgment calls are not recommended, but heighten the need for training around the tool, to promote consistency in data collection and analysis. After observations, reports should be written as soon as possible to most accurately portray observer findings (Haslam, 2010).

Evaluators must be increasingly aware of the time involvement associated with collecting, analyzing and reporting data. It is recommended data be collected over multiple years, if the program is similar in duration. Furthermore, issues of participant
confidentiality must be honored, with files being securely stored. Evaluators should know what information should be reported, and to whom. They must thoughtfully consider the audience, and offer quotes that highlight findings. This requires dedicated space within the evaluative tool for inferences and recommendations (Haslam, 2010).

Formative and summative evaluation data may benefit a variety of individuals associated with the professional development program. Uncovering these data will assist supervisors and coordinators in understanding the learning and applications associated with the professional development experience. This assists in better understanding and providing necessary instructional support. Principals, universities, and district leaders may wish to know the cost and outcomes to better comprehend the impact of the efforts, to inform future decisions for replication. This information is especially beneficial for complying with program and/or grant mandates. Additionally, tax-paying community members may be interested in such data to inform future decisions and evaluate the impact of their investments (Haslam, 2010).

Lastly, Killion (2002) recommended continually revamping the program’s evaluation process. This assists evaluators in becoming more knowledgeable and skillful in their work. It further provides opportunities to refine evaluative practices and measures, while enhancing knowledge and skills in the process. Killion suggested:

When evaluators seek to improve their work, increase the use of evaluation within an organization, and build the capacity to engage others in ‘evaluation think,’ they contribute to a greater purpose. Through their work, they convey the importance
of evaluation as a process for improvement and ultimately for increasing the focus on results. (p. 124)

Analyzing Data using a Constructivist Approach

You know these stories; you've lived them, as well. All of you have a similar story to tell. (Obama, 2009, p. 5)

Research in mathematics education suggests students are provided opportunities to personally engage in the learning process and make sense of newfound knowledge through using and refining existing knowledge (Hiebert et al., 1997). Likewise, the constructivist research paradigm focuses upon making meaning based upon our personal experiences, views, and understandings of the world (Hatch, 2002). Therefore, this paradigm embraces there are no absolutes in reality, but instead that “truth is, in fact, what we agree it is” (Hatch, 1985, p. 161). Aligning research with a particular paradigm, such as the constructivist approach, provides a “basic belief system or world view that guides the investigation” (Guba & Lincoln, 1994, p. 105).

Research approaches that closely align to the underlying principles of the constructivist paradigm include both case studies and rich narratives. Researchers work collaboratively with participants to construct reality (Hatch, 2002). In fact, “unless respondents willingly cooperate with an investigator in uncovering ‘truths’ about themselves, the inquirer has no hope of coming to a full understanding of the situation” (Lincoln & Guba, 1985, p. 105).
Constructivist research follows a naturalistic approach, in both interview and observation approaches (Hatch, 2002). This includes a thorough investigation of participants and related data to develop a better understanding of the phenomenon (Lincoln & Guba, 1985), through open-ended interview questions and on-site observations to (Creswell, 2007). This interpretation is reported, with “enough contextual detail and sufficient representation of the voices of the participants that readers can place themselves in the shoes of the participants at some level and judge the quality of the findings” (Hatch, 2002, p. 16).

**Summary**

Data at the international, national, state, and local levels evidence a dismal affair of student performance in mathematics. This is unsurprising, considering the glaring discrepancies of practices in our nation’s classrooms and those of our more successful, international counterparts. Our overreliance upon textbooks has often led teachers to become content authorities, providing the information necessary for students to learn. This is done through modeling, practicing and reviewing content. The need for HQPD is evident, as teachers must be supported in implementing a higher-level, problem solving approach to mathematics. This requires teachers to refrain from telling, and instead become facilitators of learning. It allows students to construct a deeper, conceptual understanding of mathematics. Both the CGI approach and the NCTM’s Process Standards serve as guides, assisting teachers in aligning mathematics instruction to research on student learning.
The coaching process provides an innovative approach to HQPD, while using research-based instructional strategies, aimed at increasing student achievement results. Though the need for additional research on coaching is evident, the coaching process is admirable in its efforts to increase content knowledge and pedagogy in a job-embedded fashion. Coaches provide continual support to teachers through co-teaching, modeling strategies, observing, and debriefing. Challenges and barriers may present themselves, furthermore prompting the need for establishing roles and supporting coaches with their own professional learning opportunities. The Ohio State Mathematics Coaching Program (MCP) provides a framework to support coaches and increase student performance in mathematics. The program works with coaches to increase their content, pedagogy, coaching and leadership skills, while fostering a commitment to social justice in mathematics. Coaches, in turn, provide ongoing, professional learning opportunities to teachers.

The program utilizes a variety of evaluations to assess its effectiveness in raising student achievement, and increasing both coach and teacher content knowledge and pedagogy. Among these evaluations is the site visit, which provides an intimate glimpse into the day-to-day work of MCP coaches, teachers and students. When conducting research, it is important to assess the paradigm that serves as a foundation for how knowledge will be gained and understood. The constructivist paradigm suggests that researchers gain knowledge and understanding through naturalistic inquiry methods. Therefore, the use of case studies, complete with in-depth interviews and observations, assist the researcher in best understanding and reporting the phenomenon being studied.
CHAPTER III

The purpose of this mixed method case study was to analyze, uncover, and report emerging themes from first and second year MCP coach site visit data. Both qualitative and quantitative data were collected and analyzed to better understand implementation of the MCP, coach experiences and changes in professional practices. To protect identities, names of districts, schools, coaches and personnel were not reported.

In this study, data analysis was exploratory in nature and rooted in qualitative research methodologies. Seidman (2006) warned however, there is “danger in overemphasizing the emergent nature of research design” (p. 35). Thus, to avoid a lack of focus and ambiguity around the purpose of this study, a main research question and several sub-questions were pre-identified. Although these questions do not provide an exhaustive list of those that may emerge from data analysis, they provide an initial framework for the research to be conducted.

Research Question

Even though questions may be identified prior to conducting the primarily qualitative research, it is important to note that most questions and themes will emerge over the course of the study (Onwuegbuzie & Slate, 2004). The pre-identified questions included the following, but did not limit the scope of the study:

1. What are the common themes and experiences of first and second year MCP coaches?
   1a. What evidence supports the implementation of MCP practices?
1b. What evidence supports changes in professional learning and instructional practices of coaches and teachers?

Prior to conducting this research study, consent was sought from the MCP to support data collection, analysis, and reporting efforts (Appendix G). The Human Subject Review Board at both The Ohio State University and Ashland University were also consulted to ensure research conditions were permissible and aligned with guidelines for practice.

**Research Design**

Traditional research approaches in 20th century education have relied heavily upon quantitative measures. These methods allow the researcher to answer specific questions through analyzing numerical data in an objective manner. Quantitative research methods were derived from the physical sciences and applied to educational situations. The collection and analysis of quantifiable data, included measures such as ability, score data and survey data (Creswell, 2008).

However, by the late 1960’s, alternative methods to educational research were investigated, in an attempt to fill the void of traditional approaches (Guba & Lincoln, 1988). Qualitative research allows the researcher to focus on the participant’s experiences through collecting data in the form of words, whether spoken or written. Researchers, taking on a subjective role, analyze these data for themes, to better understand the phenomenon being studied (Creswell, 2008).
Despite differences between qualitative and quantitative research methods, Creswell (2008) suggested both are “legitimate modes of educational research” (p. 46). In fact, many believe a mixed approach provides a “better understanding of the research problem than either quantitative or qualitative data by itself” (p. 552). Creswell cautioned that mixed method research extends beyond the simple collection of isolated qualitative and quantitative data sources. Rather, each strand is collected and integrated to better understand the phenomenon being studied, providing the researcher with a more “complex picture of the situation” (Creswell, 2008, p.552). Likewise, Onwuegbuzie and Teddlie (2003) suggested that a mixed method approach allows for a more comprehensive methodology. In this study, both qualitative and quantitative data were collected and deeply integrated in analysis to better understand the unique experiences of first and second year MCP coaches.

Despite the fact that quantitative and qualitative research methods are embedded in everyday practice and can be used in conjunction with one another, researchers tend to align their work more with one approach or the other. Therefore, it is possible to use both, but at varying degrees. Prior to collecting both quantitative and qualitative data, it is important to be proactive in determining the priority of each, the sequence of collection and intentions for integration (Creswell, 2008).

This study used sequential, exploratory procedures, with data being collected using a common form, the Mathematics Coaching Program Site Visit Inventory (MCPSVI), as shown in Appendix I (MCP, n.d.d). Qualitative methods were dominant in this study, as these efforts were far more extensive in nature, served as the initial and
primary means for data collection (Creswell, 2003; Onwuegbuzie & Teddlie, 2003). The foundations did not originate from the development and testing of a null hypothesis. Rather, participants were studied in their natural settings to better understand the unique perspective of their situations and experiences (Thomas, 2003). Data sources were collected in effort to uncover such experiences, and included interviews, observations and documents (Hatch, 2002). Quantitative data were collected simultaneously in the form of a site visit checklist, concerning whether or not certain coaching related characteristics were observed during the visit. This allows for triangulation of data sources to support the research investigation (Onwuegbuzie & Teddlie, 2003).

Additionally, after qualitative data sources were collected, they were quantified through the use of a site visit checklist and rubric, rating comfort levels, content area knowledge, pedagogy, and coaching as shown in the MCPSVI (MCP, n.d.d). Site visitors analyzed the collected data and made their best judgments concerning the leveled ratings. These data were combined with qualitative data at the time of analysis to better understand and explore the phenomenon, while furthermore strengthening the findings of the study (Creswell, 2003). This allows for one form of data to build upon and strengthen the dominant research method (Onwuegbuzie & Teddlie, 2003). The quantitative approach allowed the identification of such measures grounded in data collected by participants (Creswell, 2008) and allowed the researcher to “observe and measure” the phenomenon being studied (Thomas, 2003, p. 2).

This research mirrored a case study format. It was aimed at developing a deeper understanding through examining cases within specific boundaries. According to
Creswell (2007), cases could include an “individual, several individuals, a program, an event, or an activity” (p. 74), and exist through a particular “time, place, or some physical boundaries” (Creswell, 2008, p. 476). This design allows the researcher to develop an in-depth understanding of a phenomenon and is beneficial in conducting program evaluations (Merriam, 1998).

This research study included the analysis of site visit data from first and second year coaches involved in the program, from November 2008 to May 2010. These pre-identified limiting factors bound the research to a particular subgroup of coaches, participating in a particular program, over a specified duration of time. The research was aimed at uncovering shared patterns among coaches, within these identified parameters evidencing the need to use a case study format (Creswell, 2008).

Additionally, Thomas (2003) suggested, “If we can assume that every person, group, organization, or event is unique—unlike any other in its details—then the case study becomes a suitable vehicle for depicting that uniqueness” (p. 35). The program embeds many of its efforts in existing research findings and the intermixing of research principles, coupled with the program directors’ innovative vision for the project, has made the MCP unique, not only to Ohio, but the entire nation. Therefore, the intent of this study was not to generalize findings to other cases. Instead, it provided the opportunity of exploring and illustrating the uniqueness of this one-of-a-kind program and the experiences of the coaches within (Thomas, 2003).
Theoretical Framework

According to Guba and Lincoln (1988), after identifying the use of qualitative methods as a primary means of collecting and analyzing data, researchers should identify paradigms, or underlying beliefs that impact their actions and understandings. This research was situated in the constructivist paradigm, with the researcher’s efforts being aimed at better understanding the world from another’s perspective (Collins & O’Brien, 2003; Guba & Lincoln, 1989). As discussed in Chapter II, the constructivist paradigm embraces the notion that “human beings actively construct their knowledge and do not simply absorb or reproduce reality” (Collins & O’Brien, 2003, p. 76).

This active approach highlights the importance of the mind in constructing reality (Lincoln & Guba, 1985). Therefore, a single reality does not exist, but instead multiple realities, uniquely constructed from personal perceptions and experiences (Creswell, 2007; Lincoln & Guba, 1985). Reality becomes subjective to participants and researchers, who are co-constructing meaning (Guba, 1990; Hayes & Oppenheim, 1997).

Researchers, acting as data collection instruments (Lincoln & Guba, 1985), do not begin their research with theories, but rather “inductively develop a theory or pattern of meaning” (Creswell, 2003, p. 9). This allows for the construction of multiple realities and accommodates for the unpredictable interactions between researchers, participants, and related experiences (Lincoln & Guba, 1985). The constructivist paradigm relies upon data to inform, validate and heighten understandings. Therefore, the quality of the construction is dependent upon available data sources and corresponding analysis efforts (Guba & Lincoln, 1989).
In this study, my constructivist lens focused efforts on better understanding the unique experiences and perceptions of MCP coaches. Data were analyzed, allowing common themes representing the coaches’ reality to naturally emerge. Therefore, meaning was constructed through interactions, observations, and analysis of documents.

The methodologies and paradigm used in this study afforded the opportunity of collecting and analyzing data from first and second year coaches, within their natural settings (Lincoln & Guba, 1985). These data were primarily qualitative, with quantitative measures serving as secondary, supporting data. The methodology, associated with the constructivist approach, involves interviewing and observing participants in their natural elements, in an attempt to “make sense of their worlds” (Hatch, 2002, p. 15). Such an approach aims at better understanding situations focusing on the contexts of everyday life and work (Creswell, 2003). Themes were created and descriptively reported to better illustrate and understand the phenomenon.

**Demographics**

The research context of this study was situated in The Ohio State University, Mathematics Coaching Program (MCP), primarily funded by the Ohio Department of Education. To date, the MCP has worked with 66 districts, 185 schools, 172 coaches, 3,328 teachers and 83,200 students in 34 counties (MCP, 2010a). These districts are comprised of both rural and urban populations, with most being low performing in the area of mathematics (Brosnan & Erchick, 2010; MCP, n.d.a). The program’s focus is aimed at enhancing pedagogical and content area knowledge of participating coaches and
teachers. Professional development experiences were provided to coaches, who in turn provided job embedded professional development to cooperating teachers. Through providing professional development opportunities and experiences, the program’s ultimate goal was to increase student achievement results (MCP, n.d.a; Brosnan & Erchick, 2010).

Numerous forms of evaluative data were collected and analyzed by the program, nevertheless, this study focused on first and second year MCP site visits, spanning from November 2008 to May 2010. These visits were conducted onsite, within the schools in which the coaches worked (Brosnan et al., 2011; MCP, 2010c). In all, 85 site visits were analyzed for emerging themes. Of these visits, 43 were first year site visits, while 26 were second year site visits. These coaches work in 24 of the 610 school districts in the state of Ohio. Table 1, 2, and 3, shown in Table 3.1, Table 3.2, and Table 3.3, highlight participating districts’ Local Report Card (LRC), demographic, and educator quality data from the year 2008-2009.
### LRC, DEMOGRAPHIC, AND QUALITY DATA

**Table 3.1**

*LRC Data for MCPSVI Districts*

<table>
<thead>
<tr>
<th>2008-2009 LRC Categories</th>
<th>Number of Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Designations</strong></td>
<td></td>
</tr>
<tr>
<td>Academic Emergency</td>
<td>1</td>
</tr>
<tr>
<td>Academic Watch</td>
<td>5</td>
</tr>
<tr>
<td>Continuous Improvement</td>
<td>7</td>
</tr>
<tr>
<td>Effective</td>
<td>7</td>
</tr>
<tr>
<td>Excellent</td>
<td>2</td>
</tr>
<tr>
<td>Excellent with Distinction</td>
<td>2</td>
</tr>
<tr>
<td><strong>Indicators Met</strong></td>
<td></td>
</tr>
<tr>
<td>0-9%</td>
<td>3</td>
</tr>
<tr>
<td>10-19%</td>
<td>3</td>
</tr>
<tr>
<td>20-29%</td>
<td>4</td>
</tr>
<tr>
<td>30-39%</td>
<td>2</td>
</tr>
<tr>
<td>40-49%</td>
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<tr>
<td>50-59%</td>
<td>3</td>
</tr>
<tr>
<td>60-69%</td>
<td>2</td>
</tr>
<tr>
<td>70-79%</td>
<td>2</td>
</tr>
<tr>
<td>80-89%</td>
<td>2</td>
</tr>
<tr>
<td>Performance Index</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---</td>
</tr>
<tr>
<td>90-100%</td>
<td>2</td>
</tr>
<tr>
<td>70-79.9</td>
<td>6</td>
</tr>
<tr>
<td>80-89.9</td>
<td>7</td>
</tr>
<tr>
<td>90-99.9</td>
<td>9</td>
</tr>
<tr>
<td>100+</td>
<td>2</td>
</tr>
<tr>
<td>Adequate Yearly Progress (AYP)</td>
<td></td>
</tr>
<tr>
<td>Met</td>
<td>3</td>
</tr>
<tr>
<td>Not Met</td>
<td>21</td>
</tr>
<tr>
<td>At Risk</td>
<td>5</td>
</tr>
<tr>
<td>School Improvement</td>
<td>16</td>
</tr>
<tr>
<td>Value Added</td>
<td></td>
</tr>
<tr>
<td>Exceeded</td>
<td>17</td>
</tr>
<tr>
<td>Met</td>
<td>4</td>
</tr>
<tr>
<td>Not Met</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics Indicators Met</td>
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</tr>
<tr>
<td>0-25%</td>
<td>11</td>
</tr>
<tr>
<td>26-50%</td>
<td>5</td>
</tr>
<tr>
<td>51-75%</td>
<td>5</td>
</tr>
<tr>
<td>76-100%</td>
<td>3</td>
</tr>
<tr>
<td>Attendance</td>
<td></td>
</tr>
<tr>
<td>Demographic Characteristics</td>
<td>Number of Districts</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>90-92.9</td>
<td>3</td>
</tr>
<tr>
<td>93-96.9</td>
<td>19</td>
</tr>
<tr>
<td>97-100</td>
<td>2</td>
</tr>
<tr>
<td>Graduation</td>
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</tr>
<tr>
<td>N/A</td>
<td>2</td>
</tr>
<tr>
<td>70-79%</td>
<td>4</td>
</tr>
<tr>
<td>80-89%</td>
<td>10</td>
</tr>
<tr>
<td>90-100%</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 3.2

*Demographic Data for MCPSVI Districts*

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Number of Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
<td></td>
</tr>
<tr>
<td>0-999</td>
<td>2</td>
</tr>
<tr>
<td>1000-1999</td>
<td>6</td>
</tr>
<tr>
<td>2000-2999</td>
<td>3</td>
</tr>
<tr>
<td>3000-3999</td>
<td>1</td>
</tr>
<tr>
<td>4000-4999</td>
<td>0</td>
</tr>
<tr>
<td>5000-5999</td>
<td>3</td>
</tr>
<tr>
<td>6000-6999</td>
<td>3</td>
</tr>
<tr>
<td>7000-7999</td>
<td>1</td>
</tr>
<tr>
<td>Income Range</td>
<td>Number</td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>8000-8999</td>
<td>0</td>
</tr>
<tr>
<td>9000-9999</td>
<td>1</td>
</tr>
<tr>
<td>10000-10999</td>
<td>0</td>
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<tr>
<td>11000-11999</td>
<td>1</td>
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<tr>
<td>14000-14999</td>
<td>1</td>
</tr>
<tr>
<td>20000-25000</td>
<td>2</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td></td>
</tr>
<tr>
<td>0-24.9%</td>
<td>14</td>
</tr>
<tr>
<td>25-49.9%</td>
<td>5</td>
</tr>
<tr>
<td>50-74.9%</td>
<td>2</td>
</tr>
<tr>
<td>75-100%</td>
<td>3</td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td></td>
</tr>
<tr>
<td>&gt;1%</td>
<td>24</td>
</tr>
<tr>
<td>Asian, or Pacific Islander</td>
<td></td>
</tr>
<tr>
<td>0-1.9%</td>
<td>18</td>
</tr>
<tr>
<td>2-4%</td>
<td>5</td>
</tr>
<tr>
<td>5-7%</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
</tr>
<tr>
<td>0-1.9%</td>
<td>12</td>
</tr>
<tr>
<td>2-4.9%</td>
<td>8</td>
</tr>
<tr>
<td>5-7.9%</td>
<td>1</td>
</tr>
<tr>
<td>Category</td>
<td>Percentage</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>8-10.9%</td>
</tr>
<tr>
<td></td>
<td>11-13.9%</td>
</tr>
<tr>
<td></td>
<td>14-16.9%</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td></td>
</tr>
<tr>
<td>0-1.9%</td>
<td></td>
</tr>
<tr>
<td>2-4.9%</td>
<td></td>
</tr>
<tr>
<td>5-7.9%</td>
<td></td>
</tr>
<tr>
<td>8-10.9%</td>
<td></td>
</tr>
<tr>
<td>11-13.9%</td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td></td>
</tr>
<tr>
<td>0-24.9%</td>
<td></td>
</tr>
<tr>
<td>25-49.9%</td>
<td></td>
</tr>
<tr>
<td>50-74.9%</td>
<td></td>
</tr>
<tr>
<td>75-100%</td>
<td></td>
</tr>
<tr>
<td>Economically Disadvantaged</td>
<td></td>
</tr>
<tr>
<td>0-24.9%</td>
<td></td>
</tr>
<tr>
<td>25-49.9%</td>
<td></td>
</tr>
<tr>
<td>50-74.9%</td>
<td></td>
</tr>
<tr>
<td>75-100%</td>
<td></td>
</tr>
<tr>
<td>Limited English Proficient</td>
<td></td>
</tr>
<tr>
<td>0-4.9%</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3.3

*Educator Qualifications of MCPSVI Districts*

<table>
<thead>
<tr>
<th>2008-2009 Qualification Data</th>
<th>Number of Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers with at least a Bachelor’s Degree</td>
<td></td>
</tr>
<tr>
<td>94-95.9%</td>
<td>2</td>
</tr>
<tr>
<td>96-97.9%</td>
<td>4</td>
</tr>
<tr>
<td>98-100%</td>
<td>18</td>
</tr>
<tr>
<td>Teachers with at least a Master’s Degree</td>
<td></td>
</tr>
<tr>
<td>0-24.9%</td>
<td>2</td>
</tr>
<tr>
<td>25-49.9%</td>
<td>5</td>
</tr>
<tr>
<td>50-74.9%</td>
<td>17</td>
</tr>
<tr>
<td>75-100%</td>
<td>0</td>
</tr>
</tbody>
</table>
Core subjects not taught by highly qualified teachers

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3.9%</td>
<td>19</td>
</tr>
<tr>
<td>4-7.9%</td>
<td>2</td>
</tr>
<tr>
<td>8-11.9%</td>
<td></td>
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<tr>
<td>12-15.9%</td>
<td>1</td>
</tr>
<tr>
<td>16-19.9%</td>
<td></td>
</tr>
<tr>
<td>20-23.9%</td>
<td></td>
</tr>
<tr>
<td>24-27.9%</td>
<td>1</td>
</tr>
<tr>
<td>28-31.9%</td>
<td>1</td>
</tr>
</tbody>
</table>

Core subjects taught by properly certified teachers

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-92.9%</td>
<td>1</td>
</tr>
<tr>
<td>93-95.9%</td>
<td>2</td>
</tr>
<tr>
<td>96-98.9%</td>
<td>10</td>
</tr>
<tr>
<td>99-100%</td>
<td>11</td>
</tr>
</tbody>
</table>

To accurately identify and deeply understand common themes of first and second year coaches, proactive measures were taken in the data collection process. To uncover emerging themes and develop a deeper understanding within the bound system, a convenience sampling was used to identify participants. This research involved the selection of participants across the state, different in terms of the communities, districts, and schools in which they work, but linked through their involvement in the MCP.
Seidman (2006) suggested that despite such differences, the use of maximal variation allows patterns to emerge from those involved with a bound system.

My access to MCP coaches came naturally, as I served and continue to serve as one of two site visitors to the program. It was my intent to better understand emerging themes among first and second year coaches. Therefore, my participant selection process was modeled accordingly. Ideally, I would have included site visit data from all first and second year coaches. However, my analysis was limited to districts and coaches who signed The Ohio State University’s MCP Data Use Memorandum of Understanding. This permission granted allowance for their data to be used in research studies. There were very few coaches who did not grant data access to the MCP, allowing my sampling to be more than representative of the population.

**Instrument**

The Mathematics Coaching Program Site Visit Inventory (MCPSVI), shown in Appendix H, provided a common data collection instrument, used by both MCP site visitors (MCP, n.d.d). This instrument promoted the collection and analysis of interview, observation, and document related data. The main component of the form included 20 interview questions to be asked of coaching participants. The MCPSVI interview questions were primarily open-ended in nature, and were focused upon the work and impact of the coach. While the interview protocol focused on open-ended questions, there were a limited number of closed-ended questions that were asked of coach participants. These questions did not support a depth of understanding, nevertheless, they provided
insights on necessary, underlying research elements. Such topics included scheduling, identifying the district curriculum, and being aware of the duties and responsibilities of coaches. The MCPSVI allotted space for additional supporting comments from the principal and a cooperating teacher, as well as documentation of observation related data (Creswell, 2007).

Quantitative measures include a basic checklist to evidence whether or not specific coaching characteristics were shown in the site visit, concerning scheduling, building dynamics, and whether or not I was able to meet with teachers, coaches, and principals during the visit. Additionally, collected interview, observation, and document data were analyzed and quantified, through the use of a three point Likert scale. This scale assessed the level of coaching, content, pedagogy, and comfort. The MCPSVI tool also provided a final comments page to synthesize interview, observation and document related data.

Validity was established through the use of experts, field-testing, and multiple revisions to refine the data collection tool. Brosnan and a hired, retired principal with 28 years of evaluation experience collaboratively created the tool. The tool was reviewed by faculty and graduate research assistants for ambiguity and missing program elements to ensure clarity. Brosnan and the principal field-tested the tool in two MCP sites, which led to further refinement. Additionally, for one year, facilitators used the tool with coaches outside of their region, and collaborated around refining the tool (P. Brosnan, personal communication, May 25, 2011).
Several measures were taken to enhance credibility and trustworthiness in the findings. The standard protocol was beneficial for ensuring reliability, as it allowed for both site visitors to look for similar information during observations, interviews, and document collection and analysis. Creswell (2003) also stressed the importance of conducting member checks to enhance internal validity. In effort to develop a true understanding of the coaches’ perceptions, site visitors asked clarifying, as well as follow-up questions. They occasionally requested follow up visits in effort to obtain additional information and details they deemed necessary.

According to Yin (1984), collecting and analyzing multiple sources of evidence makes the use of case studies appealing. In doing so, a broad range of data is said to provide a more “convincing and accurate” depiction of findings (p. 91). This increases the construct validity, as multiple sources of evidence enhance the findings. In this study, observation, interview, and document data were collected. Coaches, serving as the study’s participants, were interviewed, to better understand their unique experiences and perceptions. Collection and analysis of teacher and administrator comments, in combination with observation, and document-related data, allowed the researcher to triangulate findings, while furthermore enhancing the credibility within (Creswell, 2003).

To ensure reliability, or whether or not the same findings would be shown if repeated by another, site visitors practiced collecting and analyzing data together (Merriam, 2002). They conducted several visits together each year to ensure consistency in collecting, analyzing, and reporting findings (Brosnan et al., 2011; MCP, 2010c). To further increase internal validity, site visitors regularly engaged in peer debriefing
(Merriam, 2002). After visits, site visitors would discuss their findings and experiences, ensuring consistent analysis of data and appropriate quantifiable decision-making (Brosnan et al., 2011; MCP, 2010c). Any questions arising, regarding visits, would be collaboratively uncovered to ensure common understandings and accurate portrayal of findings. Site visitors also collaboratively discussed the scheduling of follow-up visits to collect additional data to better understand the phenomenon, if necessary.

**Data Collection**

First and second year coaches involved in the MCP received at least one site visit each year. Such visits provided a snapshot of what was actually happening in schools and classrooms, including the implementation of MCP assurances. Collected and analyzed data provided additional details on the experiences of coaches and program implementation. This informally allowed the opportunity of shaping general professional development sessions and regional cohort meetings (Brosnan et al., 2011; MCP, 2010c).

To provide consistency in recording and reporting findings, two site visitors conducted all visits MCP coaching participants. These visitors worked for an Educational Service Center as Educational Consultants. Each had experience as mathematics educators and held advanced degrees in Curriculum, Instruction and Administration. They met with Program Directors concerning site visits of MCP coaches, and attended monthly professional development sessions, to ensure they remained current with the program’s teachings and expectations (Brosnan et al., 2011; Brosnan & Erchick 2010d).
The time allotted for each site visit varied, depending on each situation, and included the collection of observation, interview, and document data. If necessary, additional visits were scheduled to assist in better understanding the experiences and roles of coaches. The site visit and data collection methods were standardized, as case studies tend to follow a formal protocol (Yin, 2009). The use of a common, standardized tool (Appendix H) assisted in keeping researchers on track, collecting and examining appropriate sources of evidence. It assisted in the intentional, proactive efforts to triangulate observation, interview and document data.

Lesson observations allowed site visitors to observe coaching in action. This assisted in determining whether the structure and behaviors were consistent with other forms of collected data, as well as the MCP approach (Brosnan et al., 2011; MCP, 2010c). Listening to and observing teachers, coaches, and students in their everyday environments, provided information about roles, relationships, communication, connection building and emphasis of the Mathematical Process Standards. A common tool was used to support look and listen for’s.

The site visitors operated from a changing observer role. Visitors began observations as non-participant observers, due to their unfamiliarity of the settings, situations and individuals within. They desired to be unobtrusive to better understand actual classroom happenings (Sanders, 2000). According to Creswell (2008), a non-participant observer is an “outsider who sits on the periphery or some advantageous place to watch and record the phenomenon under study” (p. 222-223). During the lesson observation, site visitors recorded notes about what was seen and heard from teachers,
coaches and students that supported or negated content and pedagogical MCP approaches (Brosnan et al., 2011; Brosnan & Erchick 2010d).

As lessons progressed, and students became more engaged in individual or group problem solving investigations, site visitors could choose to switch to the participating observer role in effort to obtain additional information. In this role, the site visitor could engage in questioning teachers, coaches or students, to better explore and make deeper meaning of surface level observations (Creswell, 2008).

During the lesson, site visitors created raw field notes, providing details about what was seen and heard. Descriptions were carefully documented, using as much detail as possible. Later, site visitors processed notes, including details remembered, while aligning them to key components on the site visit data collection form (Hatch, 2002).

Interviews were also conducted, with coaches serving as the study’s participants, and administrators and teachers providing supporting data. According to Yin (2009), effective case study research requires the researcher to ask good interview questions and accurately interpret the results. Interviewing requires that the researcher be a good listener and allows the stories to unfold, rather than being entrapped in pre-existing conceptions. It requires careful attentiveness to evidence that may seem contradictory to pre-existing notions, as well as an understanding of the topic being studied. Though interview duration varied, site visitors typically interviewed coaches for one hour. To promote consistency in data collection efforts, site visitors followed the interview protocol within the MCPSVI tool. The protocol provided a framework for collecting data, in addition, there was flexibility in allowing follow up and exploratory questions in an
effort to obtain a more in-depth understanding of coach practices and experiences (Seidman, 2006). These questions were aimed at better understanding the work of the coaches their impact within the school. These interviews took place in a one-on-one format, behind closed doors, typically in the coach’s office.

In addition to interviewing mathematics coaches, site visitors met with administrators and teachers to triangulate findings. Administrators were asked to provide input on how things were going, the support their coaches provided, as well as instruction and learning since the implementation of the MCP. Likewise, when site visitors asked teachers questions to uncover the evolution of planning, instructional and reflective practices since working with coaches. These conversations were approximately 10-15 minutes in length, and were conducted, within each individual’s own office and/or classroom (Brosnan et al., 2011; MCP, 2010c).

In addition to collecting observation and interview data, pertinent documents were reviewed and information documented to support and validate findings (Brosnan et al., 2011; Sanders, 2000). Some documents were identified in advance, while others stemmed from conversations between the site visitor and coach. Such documents included the following: schedules, data, lesson plans, curriculum maps, organized professional development agendas, and resources, as well as notes from debriefing/planning and evidence trackers. Additional documents were analyzed and included MCP facilitator and coach documents, assurances, and corresponding program research. These data were instrumental in uncovering the underlying essence of the MCP and assisted in providing possible areas of focus for themes.
During the visit, site visitors precisely documented what they heard and observed within the structure provided by the MCPSVI. This included data collected from interviews, observations, and documents (Appendix H; MCP, n.d.d). Qualitative notes concerning the coaches’ comfort levels, content knowledge, pedagogy, and coaching skills were quantified through the use of a three point Likert scale. Collected and analyzed data were used to communicate final comments about the coach’s role in the building; including areas of strength and those needing improvement or substantiating follow up visits (Brosnan et al., 2011; MCP, 2010c).

**Data Analysis**

After collecting data from multiple data sources, the data were reviewed through immersion in the data. Agar (1980) recommended to “Immerse yourself in the details, trying to get a sense of the interview as a whole before breaking it into parts” (p. 103). I coded each interview, observation, and document by participant, district, and school. This allowed me to return to the data in its original form if necessary, while protecting the anonymity of districts and participants in the process. While reading the data from the site visits in their original form, I recorded memos, identifying important ideas, inferences, and possible connections for future analysis (Creswell, 2008).

Afterwards, I sought ways to organize and make sense of the data, assisting me in logically organizing the information, while managing the magnitude of data. Analyzing collected data can be done by hand, or with the assistance of computer programs (Creswell, 2008). In this study, I chose to organize data by question (Herman & Winters,
1992) and themes, by hand, assisting me in developing deep and accurate understandings of first and second year MCP coach experiences.

Quantitative data, uncovered through the application of a Likert scale, assessed content, pedagogy, and coaching related elements. These were integrated with qualitative interview, observation, and document data during analysis. This assisted in the development of themes, which promoted better understanding of the concept at hand.

Within each theme, multiple perspectives were documented and differentiated among first and second year coaches. Creswell (2008) suggested that including multiple perspectives illustrates different viewpoints and additional data sources that may or may not support the theme.

Another area addressed in this study was the concept of external validity. Aligned with Seidman’s (2006) perspective, these research findings were not aimed at generalizing information to other groups, but to accurately represent their experiences, providing enough detail, “that those who read the study can connect to that experience and how it is constituted, and deepen their understanding of the issue it reflects” (p. 51). However, Firestone (1993) suggested this can be done on a case-to-case transfer basis. The reader must determine which components are applicable to his/her unique situation, based upon the “rich, thick description” provided (Merriam, 2002, p. 29). The more details and descriptions that are present, the better opportunity readers will have to make such comparisons. Additionally, this study exercised maximal variation of participants, as they were from both rural and urban school districts across the state of Ohio. This may
allow the findings to be comparable to other rural and urban school districts looking to participating in the MCP.

The collection and analysis of these data will be beneficial for the program in better understanding the common experiences and practices of coaches in their day-to-day work. Such information may be useful when making decisions about assurances, professional development and related support. Additionally, other coaching programs throughout the nation may find the information beneficial in enhancing their own research efforts and practices. Other interested parties may include those funding this, and similar projects, in an effort to better understand the day-to-day impact of their support to such programs. School districts may also benefit from learning the experiences and roles of mathematics coaches, to determine if this investment may impact professional development and student achievement in their buildings.

**Summary**

This mixed method case study was designed to facilitate a deeper understanding of the commonalities among first and second year MCP coaches, as well as their practices and experiences in the field. Collecting and analyzing a variety of data sources, including documents, observations and interviews was instrumental in uncovering emerging themes. Creswell (2007) suggested the importance of identifying and reporting forms of qualitative data to be collected and analyzed in advance, possibly through the use of a table. Below is a list of the data sources collected in accordance with the frequency of their use.
Table 3.4

*Types and Frequency of Qualitative Data Collection*

<table>
<thead>
<tr>
<th>Types of Data</th>
<th>Frequency of Use</th>
</tr>
</thead>
<tbody>
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<td>Documents</td>
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</tr>
<tr>
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Qualitative data sources were collected and quantified using Likert, three scale rubrics, to rate content knowledge, pedagogy, and coaching-related skills. Data were analyzed upon collection and organized into emerging themes. Reliability was enhanced as site visitors conducted several on-site visits together each year, developing a common understanding of data collection and analysis. Internal validity was established through data triangulation, member checks and collaboration among site visitors. The concept of external validity was accounted for through providing rich, detailed text from which readers can generalize concepts as appropriate to their unique cases.
CHAPTER IV

Results

This study was designed and implemented in an effort to better understand the common experiences and themes among first and second year MCP coaches. The 43 first year and 26 second year coaches serving as participants in this study, worked in a variety of educational environments, ranging from rural to urban, and impoverished settings. Of these coaches, 10 experienced continued participation, receiving site visits in both their first and second year with the program.

The common thread linking coaches to this case study was their participation in the MCP, thus providing a unique glimpse into their experiences. Although other entities may make comparisons to these findings, based upon similar operating structures, it is not the intent of this study to generalize information from this uniquely bound case.

A common protocol, the MCPSVI tool, shown in Appendix H, was used to collect site visit data (MCP, n.d.d). This tool aided researchers in their pursuit of collecting interview, observation, and document data. It provided structure to data collection efforts, while not threatening the researchers’ ability to further investigate pertinent issues. Although data were primarily qualitative in nature, final ratings quantified the findings. In this chapter, qualitative data will be presented, with quantitative data used to support overall findings.

Quantitative data included MCPSVI criteria, rated on a three point Likert scale: (1) does not meet expectation, (2) meets expectation, and (3) exceeds expectation. Mean ratings were calculated for both first and second year coaches. The relative change of
those participating in the program and receiving site visits for two consecutive years was also determined and presented within appropriate themes (MCP, n.d.d).

Overall content, pedagogy, coaching, and comfort level ratings were quantified on a rating scale including low, medium, and high. First and second year overall rating data were presented in percentages. This information was further quantified to numerical values, in an attempt to determine the mean relative changes of coaches with continued participation in the program.

Upon careful analysis and triangulation of data, several common themes emerged that shed light upon the trends and experiences of first and second year mathematics coaches. The common themes will be addressed within this chapter, with research questions and implications being further addressed in Chapter V.

The major themes presented in this chapter include the following: (a) establishing identity, (b) planning for coaching, (c) the coaching process, (d) instructional approaches consistent with MCP, (e) greatest accomplishments, (f) greatest challenges and (g) professional development needs. These themes, along with corresponding subthemes are shown in Table 4.1. When reporting data associated with identified themes, the names of coaches, teachers, principals, and school systems, were not used to protect the anonymity of participants.
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Establishing Identity

Among common themes in the MCPSVI data, were the recognition and implementation of roles, as identified by MCP, administrator, and individual teacher needs. Within this theme, several subthemes surfaced. These subthemes included the following: (a) an identity crisis, (b) a juggling act, (c) the coach as an equal, (d) the coach as an expert, (e) the coach as an advocate, (f) the coach as a resource, and (g) the coach as a staff developer.

An Identity Crisis

In most instances, math coaches were appointed to newly created positions within districts, thus contributing to their somewhat unknown or unidentified roles. Though comfort levels varied, MCPSVI data, as shown in Table 4.2, suggested second year MCP coaches received higher comfort ratings than first year coaches. Comfort levels of first year coaches were as follows: 14% low, 55% medium, and 31% high. Comfort levels of second year coaches were 15% low, 27% medium, and 58% high. Qualitative data analysis furthermore supported these findings, as first year coaches appeared to possess more discomfort and apprehension in their new roles. One first year coach said, “in the beginning, I was terrified,” while another described an awkward feeling of “blindly doing something.”
First year coaches eagerly craved detailed information pertaining to their roles and “exactly” what their day-to-day activities entailed. One coach expressed her frustration in not fully understanding her role up front. The “MCP wants us not to do anything with teachers until after our first meeting, but the problem is, no one knows what our role is.”

Urgency in understanding and communicating their roles led coaches to intensively search for answers from the MCP. This was exemplified in one coach’s comment: “I need someone to tell me the next step in the process. How do I coach? What do I do next? Tell me more about coaching.” Facilitators recommended they “slow down” and be patient, as they were still in the process of learning their role.

Data suggested patience is virtue. First and second year follow-up site visits revealed, with continued program participation, coaches became more comfortable in their roles. In fact, second year coaches, having continued experience in the program, showed relative changes in their comfort ratings of +.55, when using a three point Likert scale. Coaches were appreciative for MCP professional development, as they gained the opportunity of collaborating with other coaches, and observing coaching in action. This further assisted coaches in becoming increasingly aware of and more comfortable in their role. After attending MCP professional development, one coach affirmed, “The light bulb came on. I’m getting more comfortable. I’ve got a lot to learn, but I’m not afraid of it.”
A Juggling Act

Coaches were more than willing to perform their assigned duties and represent their building or department by serving on various committees. Often, these ventures were either directly related to mathematics or allowed them the opportunity to “get to know the students.” In many situations, coaches simultaneously fulfilled their obligations, while implementing program assurances with fidelity. However, some coaches were not as fortunate, and experienced an internal struggle between conflicting district and/or building expectations and commitments to the MCP.

Coaches were aware of and accepting of the role set forth in signed MCP assurances, but felt overwhelmed when their districts or schools overloaded them with expectations and responsibilities, inconsistent with their assigned roles. One principal commented on the ramifications, “It is hard for her to maintain connections with the classroom and kids. This is not her. We are pulling her.” Added expectations and responsibilities often included testing, teaching, intervention, substituting, and an overload of duties and/or committee responsibilities. One coach estimated being out of the building for approximately 50 days, when combining her personal and formal professional development. Another was mandated to attend district meetings and provide district professional development for 31 days over the course of 4 months. Coaches with obligations to multiple buildings overwhelmingly experienced added frustration with the work overload.

In some cases, coaches felt the need to serve on certain committees and/or to coordinate formal professional development opportunities. However, as one coach
suggested, it is difficult to “have cake and eat it too.” They came to the realization that additional duties tacked on to their assigned role, left them with less and less time to do the coaching job for which they were intended. As one coach shared, “Not being in the building has been frustrating when trying to sit down with teachers, plan with them, and be there on a daily basis to support them.” These added responsibilities led coaches to believe they wore “too many hats,” were “spread a little thin,” and were performing a “juggling act.”

Added responsibilities outside the MCP heightened feelings of discomfort, as they became increasingly confused of their role as coach. They felt an obligation to the MCP, as well as to their districts and buildings. One coach acknowledged a feeling of frustration by suggesting she was not “doing either job well,” while another felt she was being caught in the middle.

It is difficult not knowing who my boss is. MCP has clear expectations, and I understand why. The principal has her own agenda. And, there are two different coaching models in the district. The district has ideas of what we should be doing and their expectations with us. The curriculum specialist supports MCP, but his boss is the district too. I signed both the assurances for MCP, and my contract for the district.

Coaches desired to live up to everyone’s expectations, but highlighted the need for roles to be established, identified, and supported by all parties. As one coach put it, “I need MCP, my building, and my district to realize I am one person. What exactly do you want me to focus on?”
Coaches experiencing the conflict of district and MCP priorities highlighted the need for administrative support. The coaches believed the “principal plays a vital role” in generating a true awareness and understanding of the program’s intentions. One coach advocated for “buy in from the administration and central office, as they need a true understanding of what the math coaches do and what the program is about.”

This clarification was believed to further enhance the success of the program. As one coach said, “It is important they support the program vocally. If they see it is valuable, so will others. If this is not done, coaches have this weird unknown position.” One coach suggested, “The principal is a huge fan and the teachers respect the principal, so if she says it is a good program, then the teachers respond.”

Developing an understanding of, and prioritizing the needs of the program would furthermore assist administrators in making informed decisions about assignments, responsibilities, and scheduling. Ultimately, coaches desired administrators protect their roles and ensure fidelity to the program, to impact overall success within the building.

The Coach as an Equal

Initially, many teachers misinterpreted the coach’s role to be that of an evaluator. This is shown in one coach’s comment: “It is hard to convince teachers that I am not evaluating them.” Some teachers were skeptical of the newly appointed role of the coach, their pay raise, as well as their close proximity to the office.

In several instances, administrators further contributed to the misconception of the coach as an evaluator, through setting expectations beyond MCP assurances. Some
administrators mandated coaches engage in walkthroughs and/or forced coaching relationships with struggling teachers. One coach experienced a principal asking evaluative questions of him: “Off the record, is this person a good teacher?” The coach, fully understanding his role, developed an overwhelming sense of frustration in being viewed as a spy/evaluator for the principal. “This is not my job, I am a cheerleader for everyone, see for yourself.” Similarly, another coach placed in a building due to low achievement test scores, felt the need to prove she was not “here to fix you, but work with you to help kids understand math better.”

Coaches found the misinterpretation of their roles as evaluators to be a hindrance to their work, and felt overcoming this perception to be difficult and time-consuming, but not impossible. They had to gain respect from all parties involved. They sincerely wanted to prove themselves as equals and clarify their intent to “help, not evaluate.”

Though some teachers were initially nervous and/or skeptical of the mathematics coach, as time progressed, they began to see the coach in a different, non-threatening light. One teacher commented, “He is not the bad guy, he is the math guy,” while another described the coach as a “breath of fresh air. She is not there to observe or evaluate, but is there to help.”

The Coach as an Expert

MCP coaches were often labeled and perceived as math experts in their buildings. Many administrators and teachers commended and respected the expertise of coaches, as they could see the big picture in content progressions across grade levels. Some teachers
referred to their coaches as “math guy” or “math lady.” Principals often commented about how nice it was to have a “math expert in the building.” The comfort levels of coaches assuming an expert role, varied. Some coaches were more than comfortable in this role, as they considered themselves to be experienced and proficient with math content. The level of discomfort from these individuals was minimal at best.

Although most coaches were comfortable with content, several coaches described the need for support when increasing complexity to accommodate grade levels they were unaccustomed to teaching. These coaches needed “more knowledge of the intermediate curriculum” or requested the program “prep me for working with the middle school level.” One coach confided,

I taught fourth grade for 18 years. I am more comfortable with grade five, and fairly with grade six. I am over my head in grades K, 7, and 8. The teachers I work with have been great. I tell them they are the experts. I will help you with the process and you help me with the content.

In addition, a small number of coaches, most of whom previously taught high school or middle school mathematics, suggested the need for support in “scaling down the content to an appropriate level.” One coach expressed her desire to “make the content real to them [students], while not giving them baby material.”

Additionally, several coaches struggled when communicating with teachers lacking sufficient content area knowledge. One coach suggested her concern with teachers simply “not knowing what they don’t know,” and another questioned, “When a teacher says something incorrect, how do I handle it?” Specific examples of teachers
communicating misconceptions to students included a teacher relaying “a square could not be a rectangle,” another incorrectly using PEMDAS to teach order of operations, and still another communicating to students, “You cannot take seven from three.”

Beginning coaches often felt uncomfortable in their role as math expert, as they were still trying to identify their roles and what they entailed. They experienced a sense of discomfort in living up to unrealistic expectations that they knew everything about mathematics content. One coach admitted, “I get nervous when I am expected to have all of the answers or be able to fix something.” Often, these coaches suggested they needed to brush up on concepts they were not expected to cover in their previous work as teachers. Many of these coaches perceived their own growth in both content and pedagogy, and believed they progressed alongside the teachers they coached.

Coaches were assigned an overall rating, based upon site visitors’ perceptions of their content knowledge. First year coach content ratings were as follows: 12% low, 45% medium, and 43% high. Second year coach averages were as follows: 4% low, 35% medium, and 61% high. When converted to a three point Likert scale, coaches experiencing continued participation in the MCP evidenced a mean relative change of +.20.

The Coach as an Advocate

Coaches served as advocates for mathematics instruction and student learning. They strived to prioritize mathematics instruction in the similar manner in which districts prioritize literacy. They advocated for similar time spent on mathematics instruction,
scheduling, the implementation of family fun nights, and/or formal professional development opportunities. As one coach contended, students and teachers are beginning to see “we have to pay attention to math too.”

Coaches would often see potential in students, unknown to teachers. One coach remarked, “I love not knowing who the kids are. I can sense it, but don’t know. It’s a nice perspective. It is fresh.” Coaches worked diligently “trying to convince teachers that kids can learn without telling them.” Another illustrated a sense of advocacy by stating, “Teachers have to buy into the fact that these students can do it. They can get it.”

With coach support, teachers “are beginning to see the many things that students can do.” Coaches worked with teachers in posing problems or content material, originally thought to be too difficult or near to impossible for students of a particular grade or ability level. Whether such problems were initially met with laughter, or referenced as being “stupid,” teachers were ultimately willing to pose them to students. After working with the coach in posing such problems, one teacher reported, “I used to skip lessons and parts of lessons. Now, with support, and this way of teaching, I am doing these questions.” Another teacher allowed her students opportunities to extend their investigations of money and confessed,

For the first time, I taught first graders to make change. I had no idea they would catch on so well. All of my students were able to make change. I wanted to skip it, but didn’t. I am pleasantly surprised.

A coach referenced first grade teachers embracing this “way of teaching and that first grade students can really write about their thinking process.” Teachers have come to
the realization that “even first grade students are capable of solving increasingly difficult problems, including concepts of multiplication and division.”

In addition, teachers began to see previously underperforming or unengaged students experiencing success with challenging, investigative tasks. One coach said,

Teachers are seeing the children gaining more confidence in what they can do as a learner, and the teacher is witnessing this. Mostly all kids, especially the ones that teachers think can’t do it . . . do it!

Coaches and teachers had countless stories of students who “wouldn’t normally do anything, working and thinking,” students who typically stare into space becoming leaders in math, or those who previously shut down “now engaged and held accountable.” One particular student, uninvolved and slouching in class for the first six to eight weeks, became motivated and volunteered to share his thinking with the class. The positive attitude not only increased his confidence and engagement in mathematics, but also carried over into other subjects. “Math was his big breakthrough. He has moved from the right answer thinking to process thinking.”

Amazingly, teachers not only began to recognize an increased potential in students, but also became advocates for the MCP way. One previously reluctant, non-cooperative teacher, developed a newfound understanding of what students were able to do, with the support of her math coach. She confronted nay-saying teachers, with limited expectations for student learning, in a staff meeting. She announced, “I am tired of this. These kids can do it. I’ve seen it. [The coach] is doing wonderful things.”
The Coach as a Resource

MCP coaches acted as resources to all teachers, including those outside their current rotations. Coaches were “always available” to support teachers in their instructional efforts. Teachers felt comfortable going to coaches with questions regarding content and/or instruction. Coaches responded through providing suggestions of strategies and/or resources to support their individual needs. One principal referred to a coach as being “very helpful answering questions, getting resources for teachers, and supporting teachers with mathematics instruction.”

Provided resources included, but were not limited to released OAT or OGT questions, rich problems, and/or manipulatives to support their work. Coaches also provided assistance in preparing for the school year and grading practice achievement assessments. They collected, organized, and displayed student data into easily understandable and useful formats. They supported buildings in identifying, ordering, purchasing, and organizing math manipulatives for instructional use. Coaches provided teachers with materials and/or information on various strategies to support their learning, while spurring conversation among teachers within the building. Teachers appreciated the “ideas and support” provided by coaches, as they extended current instructional practices and/or textbook driven strategies currently in use.

Coaches also extended themselves to teachers through making informal visits to classrooms and providing continual support in collaborative planning efforts. While working with one teacher at a particular grade level, coaches also embraced the opportunity to support, engage, and plan with other teachers, simultaneously. This
enabled coaches to expand the use of different strategies and/or resources to benefit other teachers and students within the building. This is illustrated in one coach’s efforts to continue “offering support, to even the teachers who have not welcomed her, in the form of activities, support, and assistance.” One coach said teachers at “the same grade level talk” with each other, bring, and discuss “materials related to the subject of task.” The coach followed up with “each teacher to determine their plan of action.” These opportunities allowed teachers to collaboratively discuss strategies for teaching a concept, rather than “how they used to teach it and the students didn’t get it.”

In addition, teachers who previously worked with coaches suggested continued opportunities to engage in collaborative planning efforts. One principal stated, “Teachers that [the coach] has previously worked with, are continually using him as a resource. They bounce ideas off of him and ask him for suggestions.” This is furthermore echoed in one teacher’s remarks, “We still plan together and talk together, even though she is not working with me at this time.”

**The Coach as a Staff Developer**

Consistent with the MCP approach, coaches typically provided professional development support to three to four teachers, each day, for at least four days a week. Every six weeks, coaches rotated, and worked with new teachers. As shown in Table 4.2, first year coaches received mean ratings of 1.84, with second year coaches rated 2.29, on a three point Likert scale, in terms of their abilities to follow this approach. Coaches experiencing continued participation in the program evidenced a mean relative change of
+.30. Coaches struggling to adopt this model worked with fewer or additional teachers than outlined in the MCP assurances. In some instances, coaches worked with teachers beyond the identified six-week time frame, due to scheduling conflicts, needs, and/or willingness of teachers.

When coaches were asked about the coaching process and their support to teachers, they overwhelmingly communicated the need to embrace a differentiated, job-embedded approach. The varying entry points of teachers heightened the need for coaches to embrace an adaptive role in their support, with the process looking “a little different in every room.” Therefore, coaches structured their support to accommodate being at “different places in the process with different teachers.” This differentiation was necessary, because “with each teacher, there are important things to be working on.” Teachers struggled with a variety of issues to varying degrees that included but were not limited to content, classroom management, questioning, wait time, planning, and/or the use of the Process Standards. Areas of support were identified through teachers completing and submitting interest inventories, in addition to interactions and/or observations from coaches.

When working to meet the individual professional development needs of the teacher, coaches felt the necessity to “begin where the teacher is and go slow.” One coach stressed the importance of “taking baby steps and being patient with teachers. . . moving along in the process at their own pace.”

Coaches suggested the coupling of such job-embedded offerings with formal professional development opportunities. One principal said the coach “has provided so
much information to the teachers, done trainings, and provided pd during staff meetings.”
Opportunities often included staff meetings, district professional development ventures, and/or before or after school sessions. Coaches capable of providing such opportunities, worked with teachers on issues, such as data analysis, OAT short answer and extended response scoring, the creation and use of rich problems, questioning, and/or the Process Standards. One principal referenced a coach’s staff presentation, of “a table full of math manipulatives,” with the coach talking “about each one and how the teacher could use them.”

Coaches, unable to provide traditional forms of professional development, desired to increase such offerings to teachers. First year coaches said, “The pd [professional development] schedule is already filled up,” or that they had “run out of time,” to present during staff meetings. Another stated, “I don’t get to work with teachers during waiver days or early release. I am working already toward next year.” MCPSVI data suggested the longer coaches participated in the MCP, the more formal professional learning opportunities they were able to provide.

Of districts offering formal professional learning opportunities, several abused the coaches’ roles as staff developers. As previously mentioned, these districts would repeatedly remove coaches from their day-to-day work to provide formal professional development opportunities to teachers at the district level. This inhibited the coaches’ abilities to provide job embedded professional learning opportunities, consistent with the true work of the coach. Coaches in these situations were unable to support teachers in a consistent ongoing fashion, through collaborative planning, co-teaching, and debriefing.
Planning for Coaching

Coaches suggested several factors serving as important variables when making the preparations and determinations of teachers with whom to work. These factors included the following: (a) establishing relationships; (b) teacher willingness; (c) scheduling; (d) building assignments; and (e) prioritizing needs, while further evidencing the (f) need for administrative support.

Establishing Relationships

Coaches overwhelmingly highlighted the need for establishing relationships and building rapport with teachers. They considered trust to be one of the most critical factors in building relationships, while ultimately promoting a sense of willingness within teachers to engage in co-teaching partnerships. This was exemplified in coaches’ comments: “Teachers and coaches must have a trusting, respectful relationship,” and “Once trust is built, and teachers are comfortable, then you can take them where they need to go.”

In cases of first year coaches, approximately 44% were hired from within the building, 39% from within the district, and 17% from outside the district. Dependent upon any existing rapport with teachers, coaches determined various methods effective in building coach/teacher relationships. With or without an existing rapport, coaches felt the need to create or reestablish a trusting relationship with teachers, proving the genuine intentions of their new, non-evaluative roles.
One coach, experiencing uncertainty in her newly merged building, disclosed, “No one knows each other, or who to trust.” Coaches felt the urgent desire to break down these walls and convince teachers they did not make a vertical move when accepting the coaching position. This is illustrated in one coach’s experiences.

Some teachers are skeptical of her new role and view her move as a vertical one, rather than a lateral one. They now perceive her as an authoritative, evaluative figure. She has tried to dispel this, and has been successful in being embraced by some teachers.

Another coach suggested, “It is difficult with the coaching position. You cannot make someone do something or evaluate them. I am instead getting them to trust me.” Though difficult, coaches persevered to prove themselves as equals, and build trusting relationships with teachers.

In an effort to establish relationships with teachers, coaches suggested the need to make themselves visible and accessible. They went out of their way to personally check in and talk with teachers, whether in hallways, classrooms, and/or lunchrooms. Coaches provided listening ears to teachers, whether they posed questions or just the need to vent. One coach advised, “You have to listen and be empathetic. Teachers have a lot on their plates.” Coaches felt “It is important to respect each other, and understand where they are coming from, while trying to move them the best you can.” In some situations, coaches were frustrated with their new math series. Coaches listened to, and supported teachers in their implementation efforts, which further assisted them in building relationships with their teachers. They also provided a sense of encouragement and support to staff
members. One teacher said, “It’s nice to have [coach name] here to tell me it’s okay not to do what everyone else is doing.”

Coaches also recognized the importance of their role as a resource to teachers. As previously mentioned, this role involved numerous efforts on behalf of the coach to support teachers in their instructional efforts. Though time consuming, coaches recognized these efforts as a means to build relationships and impact teacher willingness. As a result of their efforts, “doors are opening.” One coach said,

I made myself available at the beginning. The grade two teacher came and asked me to help with a lesson. I got into grade two by helping. . . This got my foot in the door.

In the beginning, some first year coaches even initially resorted to serving duties and/or substituting to support teacher needs. Coaches perceived these efforts to be instrumental in establishing relationships and increasing willingness for collaborative partnerships.

I spent a lot of time in the secretaries’ office. I filled in for the secretary just to get to know the teachers and students. I have even subbed just to build rapport. I built the rapport by pulling my weight and doing my job. And, finally one teacher in grade three let me in her room.

**Willingness of Teachers**

Coaches overwhelmingly stressed the necessity of following the MCP approach, through selecting and engaging in working relationships with willing, “receptive”
teachers. One particular coach suggested these teachers to be “the ones who will most likely change anyway.” Teaching participants must be willing to invite coaches and thus, new strategies into their classrooms. One principal initially expressed concern with this approach. He assumed “we wouldn’t be able to get teachers on board.” But, the coach “strategically chose teachers who were willing to learn.” Overall, most coaches followed suit, assessing teacher willingness through interest inventories, and building schedules to accommodate.

Shown in the data were discrepancies among teacher willingness for change. One coach illustrated this by stating there is a “division of those who want to change and those who don’t believe in change.” In many buildings all or most teachers welcomed coaches with openness. Other coaches had partial or limited success in their initial efforts to identify willing teachers. One coach suggested of requests, “Some were urgent, some whenever, and some didn’t reply.”

A sense of urgency was felt from some teachers who wanted all of the support they could get. This included learners who embraced innovative practices, individuals new to teaching math, and/or those new to a particular grade level. One coach discussed her strategy for selecting teachers by stating, “I began with the two new teachers. Then I put out a letter to the other grade three and four teachers. Who wants me and when do you teach math?” In this coach’s situation, her “schedule just fell into place.” In many instances, willing teachers even “switched their math times, just so I [the coach] could come in.”
In contrast, some teachers were unwilling to rearrange their math teaching time to accommodate the coaches’ schedules. In these situations, coaches discovered “all teachers want to teach math at the same time.” Other unwilling teachers included those who were new to the program and/or skeptical, or who lacked understanding of the math coaches’ role. Coaches were often seen as individuals with the sole purpose of being “here to fix you,” or sent from the central office. This level of mindset from some teachers, created an unwillingness to work with the coach in a formal co-teaching partnership. Apprehensive about the program’s intentions, some teachers fell by the wayside and became observers of the coaches’ work with other teachers, from afar.

In addition, some teachers felt they were not in need support, due to their status in the building. Hesitant to change, some veteran staff members, having taught the same way for twenty plus years, were not as willing to participate. Also hesitant, were teachers considered to be model teachers by administrators, and already receiving phenomenal results with students. They felt apprehension to change; fearing their students’ test scores would drop. One coach suggested his concerns about teachers not knowing what they don’t know. One teacher has achievement test scores of 97-98%. Both the administration and the teacher were happy with that. And, the previous administrator said on many occasions that everyone should be getting those numbers . . . The challenge becomes for the teacher, why try doing something different? If her scores drop to 89%, it proves the model doesn’t work. Another coach reflected on her work in a previous district with “bad test scores” but with a greater willingness to try new things. “The students are passing the tests in this
[higher performing] district, but they are less prepared for life than where I come from.”

In these situations, coaches suggested teachers might be perceived as successful, and unwilling to work with the coach, but still in need of reform. The fact is, both high and low performing teachers may fall under those “who just don’t get it and aren’t willing to change.” This challenge led coaches to work diligently to prove themselves as valuable assets and/or evidence results to spark a sense of willingness within these teachers.

However, in the cases of lower-performing teachers, coaches did not always have to wait or work for buy-in. Some administrators took it upon themselves to trump the foundational MCP approach to “Go where you are welcome.” One principal commented after observing the success of coaching in the classroom, “My biggest frustration with the program is having to go into rooms where she has been invited . . . especially considering that I am seeing that the teachers she is working with are becoming stronger teachers.” These principals went outside of the MCP framework and set “expectations” that coaches work with certain, pre-identified teachers.

These forced partnerships were often required for teachers new to a grade level or content area and/or those with poor instructional methods or OAT achievement results. One particular principal commented on teacher reluctance, “One teacher does not want to work with her and is digging in her heels, but has no choice.” Another suggested a teacher’s work with the coach as a last resort. The principal stated,

Our value added has been good, but not good enough. This teacher does not have the content knowledge and had no choice but to work with [coach name]. In fact,
I am thinking of putting her on a plan if things do not improve. I have two years of documentation.

Despite the seemingly good intentions of administrators as change agents, coaches preferred to follow the MCP approach. One coach suggested, “Corporate people try to tell me who I need to work with. I would rather have the teacher come to me or I ask the teacher how it would feel if I came in a couple of times a week.” In fact, coaches went to the point of suggesting teacher willingness as a necessity for the success of the coaching process.

In many cases, coaches referenced unwilling teachers becoming willing as time progressed and they began to view the support as beneficial. In fact, even teachers admitted to being “skeptical” and/or “nervous at first,” but in the end “it was fine.” Even more amazing is that once these partnerships were established, once-reluctant teachers did not want coaches to leave their classrooms.

Coaches suggested such transformations and teacher willingness resulted from relationship building, teachers observing success of the program, and through word of mouth. One coach said, “This has worked beautifully. Some have originally sought me out, and others by the word of mouth.” Another said, “As I went into the classrooms, the word of mouth method worked and I got into more!” Once-reluctant teachers talked with others about their work with the coach, and newfound experiences with student learning. This included teacher lunchroom talk—“You wouldn’t believe what he said”—in reference to a student’s profound thought while solving a challenging problem. A coach shared,
The one teacher that is the most outspoken in the building . . . one that would definitely not be for the MCP way . . . she has the most buy-in . . . the program has spoken for itself and the approach.

In several cases, students became the “biggest selling point” of the coaches’ work. Students enjoyed working with coaches during lessons and wanted them to be in their classrooms. Coaches said, “When I’m not in the classroom, students ask where I’m at and if I’m coming back” and that “Kids cheer when I come into the room. Yeah! I love math!"

One student didn’t want me to leave and said to me, I feel smart when you’re in my classroom, because you let me do math my way and not their way.

These factors led teacher willingness to grow over the course of the first year. One coach suggested, “Once I got into a few classrooms, the word spread that I was not scary,” but instead “non-threatening.” Some first year coaches felt next year would be even better, with one suggesting “100% better,” now that relationships have been established and teacher willingness has grown.

The willingness to participate became increasingly evident in the second year. Experiences of a second year coach, sheds light on the evolution of teacher willingness. “Last year, teachers seemed slightly nervous about what she would be doing, but by the end of the year, they were making plans about working with her this year.” Teachers were able to observe the successes of those whom previously worked with the coach. The data speak, with teachers recognizing that coached classrooms were experiencing something great and/or obtaining data results at a greater increase than that of non-
coached classrooms. Experiences and successes led teachers to confront coaches and request help. This is highlighted in a second year coach’s experiences.

Because of the successes last year, the teachers are recognizing it and I am getting a lot of questions and teachers requesting my help. In one class I worked with at [school], every student passed every algebra question on the OAT, last year . . . There were two teachers who didn’t want me, now they are waiting for me to go to their algebra classes.

As relationships were built, and word of the program spread, some coaches experienced all teachers becoming receptive to support. They became willing and eager to engage in co-teaching partnerships. The ability of the program to speak for itself, led coaches to uncover that willingness must not be forced and would come naturally with time.

**Scheduling**

After identifying willing teachers, coaches examined teacher schedules to determine with whom they would work. As shown in Table 4.2, coaches were rated based upon providing support to three to four teachers for at least four days each week, as consistent with MCP assurances. Based upon a three point Likert scale, the first year coach mean rating was 1.84, and the second year mean rating was 2.29. Those experiencing continued participation in the program evidenced a mean relative change of +.30 in providing such support to teachers from their first to second year of coaching. The success in following this model didn’t always come easily.
In fact, coaches suggested scheduling to be one of the greatest challenges in the coaching process. In some buildings, all teachers and/or certain grade levels of teachers had conflicting math instructional times. According to one coach,

No one has told me I can’t come into their classroom. The only problem is scheduling. Only one teacher has math in the afternoon, so I have been with her a lot.

Others mentioned, “Everyone has math at the same time in the building,” and “I have been in most all classrooms, 7 of 10, but not in the other three because of scheduling problems.”

Coaches desired teachers and administrators to accommodate scheduling conflicts. One coach illustrated this in her comments, “Most teachers have math in the morning, so it is important they are flexible with their time.” Another said, “I pleaded with some teachers to teach math in the a.m.” As previously mentioned, in some situations, building administrators and/or teachers willingly responded by accommodating such conflicts. This was confirmed by a math coach who said, “One teacher even changed their math time so I could get to all of the teachers that wanted me to help in their classrooms.”

In other situations, inflexibility limited the teachers with whom the coaches were able to work. This is exemplified in one coach’s experiences.

Everyone said they wanted to work with her at the beginning of the year.

However, their schedules had already been developed. And, many teachers were
teaching math at the same time. And, they didn’t want to change their schedule for the year.

In addition to mathematics’ instructional time as a barrier, conflicting duties and/or other building or district responsibilities restricted the grade levels coaches were able to work with. These often included recess, lunch duties, committee obligations, or professional development support. In some situations, administrators worked with coaches to accommodate their needs and alleviate or switch duty responsibilities to allow certain teachers the opportunity of working with the coach. In fact, most administrators honored coaches’ workloads, by assigning them no more duties than a typical teacher would receive. However, one coach, having limited duties, felt if weren’t for being “under the umbrella of the MCP, they would be pulling her” as they are “pulling the literacy coaches, to be a substitute in the classrooms.”

Another concern that was shown in several buildings was the conflicting precedence of the literacy program. With literacy often the priority, some coaches had to advocate for adequate instructional time for mathematics, and/or for common collaboration time, or professional development, which took time away from literacy initiatives. One coach suggested, “There isn’t enough time in the day to spend on math after getting all of the literacy in.” Another suggested, “One of my biggest problems is teachers having the time . . . The time to teach math . . . Our literacy program requires so much time out of the day.” This precedence was further communicated through the district having common planning time, professional development time, and/or afterschool programs dedicated solely to literacy initiatives. In these cases, coaches had to advocate
for mathematics, work collaboratively to determine a solution, and/or be flexible in accommodating the already existing literacy initiatives.

**Building Assignments**

Most coaches were assigned to one building and were successful in scheduling their work with teachers. This single assignment enabled coaches to focus their attention and efforts toward planning, co-teaching, debriefing, and building level needs. Several coaches however, were assigned to multiple buildings. This was a common, glaring concern of these coaches, and seen as one of the greatest challenges in their work.

Coaches exemplified their grave concerns in having responsibilities in multiple buildings with their comments: “I just get something started and have to leave them”; “It’s hard to connect to the other building when I am gone”; or it is “difficult to estimate what to expect when I come back to a building if I’ve been gone to another.”

These coaches were splitting their days and/or weeks in two buildings. They not only had more teachers to work with, but also additional building level responsibilities and duties. These issues spread coach time too thin and limited their abilities to plan, co-teach, and debrief with teachers on a consistent basis.

In addition, a small number of second year coaches experienced difficulty in administrators wanting to replicate the successes experienced with their first year of participation. In these situations, coaches had to work with more than four teachers, often with less time, and in more than one building. This is illustrated in a coach’s experience
transitioning from working with one building, as a first year coach, to two buildings, as a second year coach.

She finds it difficult to work in two buildings, due to factors such as building relationships, planning time, and resource locations. She suggests the ideal situation would be working in one building. She felt she was making progress at [the building she was at last year], and as though she is needed there. She has seen tremendous growth with these teachers and feels that not being there to talk with the teachers and as a support system for them, will lead them to regress back to old habits and teaching methods. She said that she didn’t realize how important this was at the beginning of this year, but now that she has experienced it, she is aware that it is far from an ideal situation. She feels like she is also missing out on spur of the moment meetings and announcements, as she is not in either building on a full time basis.

Coaches stressed the importance of their districts in honoring the MCP approach, by allowing them to continue their work in providing job embedded professional development support to teachers. To effectively do so, coaches perceived “the need to be in one building.”

Prioritizing Needs

In addition to selecting willing teachers and building accommodating schedules, many coaches prioritized teacher need using several key factors. Some coaches began working with teachers and/or grade levels they knew and/or felt comfortable with. Other
considerations included a sense of urgency expressed by the teacher, or perceived by the coach. This sense of urgency may have stemmed from teachers being new to a particular grade level, new to teaching mathematic content, or in need of refining their instructional skills. In these cases, coaches felt the need to work with teachers on content and instructional techniques relevant to teaching mathematics.

In some situations, coaches were “urged” or “strongly encouraged” to work with certain and/or all tested grade levels. As one coach suggested, “Sometimes, the principal asks me to go into a specific classroom.” These requests were often a result of “testing needs” and/or “based on scores last year.” When “strongly recommended,” but not forced to work with these teachers, coaches obliged and prioritized this need in combination with their desire to support willing teachers. One coach prioritized her schedule by declaring, “I am leaving it up to them [willing teachers],” but also honor administration, “if the principal requests I go into a certain class.”

This was done in delicate balance, as some OAT-tested grade level teachers found it difficult to give up what they were comfortable with, and to embrace an entirely new approach to teaching. In fact, some teachers thought they “can’t do the MCP process consistently because of the OAT,” feeling they must traditionally prepare for the test.

Need for Administrative Support

Coaches overwhelmingly communicated the need for administrative support in their role. In effort to better understand and advocate for the process, several coaches expressed the need for “communication with administration and MCP.” One coach
wondered, “how much the higher powers from [school] truly understand this program” and “would love for them to join us for a [professional development] session to see what the program is about.” Coaches felt both “teachers and administrators have to feel the same need and want to support the process. Having a common goal and understanding can make the process successful.”

As previously discussed, coaches suggested administrators support them through allowing them to work with one building, and the willing teachers within. One coach confirmed this in her comments that she needed administrative “support and recognition . . . that it needs to be a single building for relationships.” They stressed the importance of having administrative support in the teacher selection process and highlighted the need for flexibility in scheduling and arranging duties to allow for coaching partnerships. One coach appreciated that the “administration is very supportive of protecting her schedule.”

Coaches experiencing challenges hoped “changes will be made next year to better support the program.” And, in some cases, principals lived up to their “supportive” roles in revising schedules or advocating for the program. One coach suggested her principal is “already looking at the schedule for next year.”

Coaching Process

As shown in Table 4.2, first year ratings on coaching were as follows: 23% low, 66% medium, and 31% high, with second year coach ratings as follows: 23% low, 27% medium, 50% high. The relative change of coaches participating in the program for two consecutive years was +.33. Coaching roles and their support varied, depending upon the
unique content and pedagogy needs of cooperating teachers. Despite the variations in providing individualized support to teachers, several commonalities of the coaching process became evident. These subthemes included the following: (a) pre-conferencing, (b) observing, (c) modeling, (d) co-teaching, (e) debriefing, and (f) embracing a progressive approach.

**Pre-conferencing**

Assisting and supporting teachers when planning for instruction was among common subthemes within the coaching process. As shown in Table 4.2, coaches were rated, based upon their ability to collaboratively plan at least once a week with cooperating teachers. First year coaches were rated 1.94, and second year coaches 2.25, on a three point Likert scale. Coaches experiencing continued participation in the program, and having site visits in their first and second year, evidenced a mean relative change of -.05.

Teachers often resorted to pacing guides and textbooks to mandate the scope and sequence of their instructional efforts. Using these materials as crutches, they were hesitant to modify and/or revise materials in effort to comply with standards, best practices in instruction, and/or student data needs. Teachers resorted to these materials to ensure all content was covered prior to testing, and as a means of dependency when they were familiar concepts at a surface level. Several districts mandated the use of these resources, as a means of ensuring integrity and fidelity to programs. This left little room
for change, and often became counter-productive to embracing a more conceptual approach to mathematics that accommodated student needs.

Coaches worked closely with teachers in their planning efforts, using district resources as a starting point for their work. Coaches and teachers collaboratively examined and evaluated the materials, supplementing and modifying lessons in an effort to provide rich, engaging opportunities for students. Student data, identification of possible misconceptions, previous assessment questions, and Process Standards were used to further enhance instructional decisions.

The degree to which teachers and coaches were able to engage in collaborative planning was reflected in their instructional efforts. True, co-teaching partnerships developed when coaches and teachers engaged in extensive, collaborative planning ventures. Coaches unable to plan with teachers either fell into the role of solely modeling lessons, or acting as assistants and/or providing “impromptu or spontaneous” support. One coach suggested while working with a teacher, he “peeks in another room, to see what the teacher is doing, because they have no time to meet.” Another confessed she simply “talks about things they could be working on, pops into classrooms, and makes statements to support what the teacher is doing.”

Some second year coaches expressed a growing concern for limited co-planning. This was due to serving additional teachers and/or buildings, in attempt to replicate the many successful experiences encountered in their first year of coaching. This is illustrated in once coach’s experiences, whereas she
is not really planning with teachers this year. Her coaching pretty much consists of walking around, monitoring, and assisting students. She does not feel that this is what MCP wants out of her, but has taken what she can get.

Overwhelmingly, coaches suggested pre-conferencing as an instrumental and beneficial component, sometimes not adhered to due to scheduling conflicts, multiple building assignments, and/or teacher reluctance. Though coaches suggested there is “not enough time,” they felt the “need to work on this.”

**Observing**

Coaches discussed the need to spend time observing teachers at the beginning of their partnership. These observations, in combination with information uncovered through interest inventories, led coaches to better understand teacher needs. One particular coach suggested, “The first 2-3 days I observe the teacher and kids.” Simply observing, led coaches to uncover the “teacher’s style,” and get a handle on classroom management. This information assisted coaches in understanding the starting point of their work, prior to engaging in a co-teaching partnership.

Coaches not only used observations to acclimate to classrooms, but also as a means to better understand student thinking. Some coaches introduced teachers to, and used evidence trackers as a means to observe and document student thinking throughout the lesson. Knowledge of student solving strategies and/or misconceptions became beneficial in evaluating lessons and better understanding next steps for instruction.
Modeling

Overall, most coaches were reluctant to model full lessons. This was illustrated in one coach’s comment that “I try not to model” and instead “mostly team teach.” If choosing to model, coaches were very intentional in their efforts to model specific instructional strategies for teachers.

Teachers may be uncomfortable with mathematics content, new to a grade level, unsure of themselves, or need additional support in refining their instruction. When coaches observed discomfort with content and/or instructional strategies, they would simply jump in and model, or the teacher would simply ask for help. This was illustrated in one coach’s experiences, whereas teachers “often look at her [the coach], and she knows to jump in and take over a certain part they may not be comfortable with.” Similarly, other coaches suggested they “model if needed on certain concepts” or “periodically . . . if it is an area she [teacher] is weak in content wise.”

These opportunities have allowed coaches to model specific strategies or techniques in a purposeful manner. The strategies being modeled included but were not limited to the use of rich questioning, wait time, the use of the Process Standards, using mathematical knowledge in the room, and/or the use of an evidence tracker. One coach said, “I model think alouds to show kids what I want them to be doing” and another that she “tries to use good questioning and modeling things such as think, turn, and talk.”

As coaches modeled specific strategies, such as questioning, teachers often copied their behaviors, asking similar questions of students or applying similar strategies to other concepts, math sections, and other content areas. One teacher said of her coach, “She
models ways to teach and strategies. I see, she helps me, I do it” or “she shows me different strategies I may not have thought of.” Another mentioned, “I feel I am a good imitator. This is my first year in math. I like listening to her to get a refresher and so I know how to do it myself.”

A small minority of coaches were in the extreme, either continually modeling full lessons, or acting as mere assistants to the work. In these limited situations, common patterns emerged. As previously discussed, these coaches often lacked common planning time with teachers, causing them to embrace a “fly by the seat of my pants” mentality. Either the teacher or coach planned and prepared for the lesson, sparingly communicating about their efforts, causing one to take the lead and the other to simply assist.

**Co-teaching**

In most cases, the coach and teacher engaged in a co-teaching relationship, with collaborative planning being an instrumental factor in determining the depth of the partnership. Co-planning allowed participants to move from simply modeling or assisting, to engaging in true, co-teaching relationships. This successful and rewarding team partnership led to further comfort between the teacher and coach. This developing relationship further allowed the coach opportunities to support teachers with content, pedagogy, and classroom management.

During the co-teaching approach, teachers and coaches alike, shared responsibility for the delivery of the lesson. In fact, one coach said they “usually team teaching with shared responsibility from all agents.” After a lesson, a teacher reflected,
“This lesson was typical. I jump in, or she jumps in when I am teaching and she has something to add.” Both coaches and teachers continually described their co-teaching efforts as a “back and forth approach,” where they “chime in, jump in, and work together, bouncing off of one another.” They collaboratively supported one another, and most importantly the students, throughout the lesson. In some situations, “there was no lead teacher,” but most followed the format of the “the teacher leading and I [the coach] supporting.”

As previously discussed, teachers engaging in co-teaching partnerships were very much appreciative of coaches modeling strategies, or interjecting to ask supporting and/or extending questions in effort to enhance the lesson. They valued the coaches’ perspectives on lesson components and the direction in which the lesson was going. Teachers also felt coaches were capable of seeing the “big picture” and could assist them in understanding where content fits. One teacher suggested he didn’t like where the textbook was going with a lesson. The coach responded, “Let’s look at where the book is going with that.” The coach worked with the teacher in uncovering the underlying elements of and rationale for the lesson.

Later, two other teachers were talking about how stupid the lesson was and how they were just going to take it out. This teacher gave the other teachers the rationale for where they were going and why.

Coaches furthermore assisted in bridging gaps from what students learned in previous years, while ensuring a broader depth of understanding to assist in preparation
for subsequent years. One coach felt teachers were more comfortable in asking questions about vocabulary and/or concepts, asking where content “fits in at the upper level.”

Debriefing

After implementing lessons, coaches debriefed with teachers. As shown in Table 4.2, the coaches’ ability to debrief was rated on a three point Likert scale. The mean rating for first year coaches was 2.00, with second year coaches rated 2.38. Coaches experiencing continued participation in the program evidenced a mean relative change of +.30, after converting to a three point Likert scale.

During debriefing, the coach and teacher discussed “what went well” and “what we would change.” In addition, coaches often brought a sense of awareness to student thinking and/or misconceptions. Such conversations assisted the coach and teacher in adapting to best meet the needs of their students, and in understanding where they would go next with the content.

Most debriefing was informal in nature, allowing little time for the teacher and coach to formally sit down and reflect. Rather, debriefing was done “on the fly.” The teacher and coach often debriefed throughout the lesson, as new information emerged from questioning and communication of student thinking. One coach referenced informal debriefing efforts during the lesson.

We usually debrief while the students are in groups. We talk about what we are seeing. Then we both walk around and observe students in the groups and ask questions. Then we get together and discuss what we see again.
Coaches also stressed the importance of debriefing immediately after the lesson, “while the lesson is fresh in our minds.” This assisted in determining the needs for upcoming lessons. Coaches furthermore described the informal nature of debriefing after lessons. In an attempt to accommodate busy schedules, coaches debriefed with teachers in the hallways, while on the run to specials, during lunch, or extra activities. In some situations, coaches suggested a more formal approach to debriefing would be seen as an “interruption” to the teacher’s day, or that they simply “don’t want to give me much time.”

The common, informal, approach to debriefing led most coaches to believe it was an area needing extra attention. They felt the need to not “brush it under the rug.” They believed it was important to have more in-depth, reflective conversations concerning instructional strategies and how they relate to student learning. Coaches believed it to be “critical to reflect,” and furthermore suggested this area as one that “needs growth.”

**Embracing a Progressive Approach**

Providing coaching support varied, depending upon the specific needs, comfort, and willingness of teachers. Some teachers needed more guidance and modeling of strategies and/or concepts, while others needed support in refining their instruction. One particular coach illustrated this when reflecting upon the teachers with whom he works. Some teachers are “tied to being the center of information. In those cases, I am a silent observer, who helps the students.” In other situations the coach does “seamless co-teaching . . . assisting and jumping in.” In another room, he and the teacher looked for
evidence of student learning. He suggested “2/9 teachers are exemplifying the OSU model, 4/9 have flashes of good collaboration and student centered approaches” and several teachers “are not ready to let go of straight lecture.”

Coaches also referenced the evolution of their involvement and support as time progressed. Typically, in the beginning of the coach/teacher relationship, coaches modeled a lesson for teachers to observe. Next, they partnered to collaboratively plan and co-teach lessons, with coaches modeling specific instructional strategies. As time progressed, coaches reduced their level of involvement in lessons. In limited instances, however, coaches felt the need to continue offering high support, in fear that teachers would revert back to their old ways. They had trouble “knowing when to let go.” One coach said of teachers, “Some do it, but with others, when you go back in, it’s like starting over.” Another suggested she was “hesitant to move on, as the teachers may slip back.” She further justified staying in a classroom, saying, “It would be different if others were knocking at my door.”

**Instructional Strategies Consistent with the MCP Approach**

Analysis of MCPSVI data suggested implementation of instructional strategies, consistent with the MCP approach, and correlated to NCTM’s Process Standards Table 4.2 shows that the average first year coach ratings in coaching teachers to use the Process Standards regularly was 2.00, with second year coaches being rated 2.37 on a three point Likert scale. Coaches having continued participation in the MCP, for two consecutive years, evidenced a mean relative change of +.15. These implemented strategies included:
Embracing a Conceptual Approach

When reflecting upon instructional strategies implemented by teachers, it is important to consider the evolution of such strategies over time. Many teachers’ instructional methodologies were initially described as being traditional in nature. Teachers “put their students into rows and expected them to be quiet and not get out of their seats unless directed to.” They were “very structured” and gave “worksheet after worksheet” to students. Coaches suggested teachers did too much “leading,” and “telling.” They gave students “way too much information.”

All parties seemed to experience a transformation in teaching practices. Principals observed “teachers moving from being more procedural to more conceptual in their teaching approaches,” and noticed both “higher level questioning and expectations in the classroom.” Another principal saw the evolution of strategies, with the ongoing support of the coach.

I am seeing teachers moving from a pencil paper rut. Teachers are comfortable with her [the coach], and feel safe asking her questions and trying new things. I always see teachers in her office asking her questions.

Coaches suggested teachers “are getting the desks out of rows and into groups.” “Instruction is more student centered” and “less teacher directed.” As a result, “students are engaged” and using manipulatives. A coach noted that after she “pulled [the
manipulatives] out of the cupboard and put them at the students’ level . . . [the teacher]
left them there,” allowing them to be more accessible. There is “constructive noise” in the
classroom, and “students are no longer expected to be robots.” One coach summed up her
experiences overtime with a teacher, stating, “She was very traditional. She is now on
board with the MCP way.” Coaches believed teachers were beginning to see the
differences in simply providing “content and students having a conceptual
understanding.”

Teachers also recognized and communicated a change in their instructional
efforts. One teacher advocated for mathematics to be “more student led, than me
throwing it at them.” Another referenced her work with the coach, and desire to continue
investigating an engaging approach to learning mathematics.

This way of teaching is definitely different than the traditional, teacher directed
model where we say . . . this is 10 cents. Now kids are exploring and working
collaboratively. I am pleasantly surprised. I will be interested to see how it works
with other topics.

No matter where teachers started on the continuum, coaches worked to support
them in modifying their instructional approaches. Due to the teachers’ unique starting
points, the level of conceptual mathematics or implementation of corresponding
instructional strategies may not have been ideal in all situations. But regardless, coaches
recognized and celebrated teachers were “attempting to use the strategies.” Some
teachers, began to implement “think, pair, share,” and “provided higher level questions,”
while partially relying on their comfort in more traditional approaches. Coaches
recognized even though teachers made “some progress,” they identified there was still “room to grow.”

**Problem Solving**

Coaches assisted teachers, commonly sole providers of information, in allowing students opportunities to think for themselves. This involved “asking more open ended questions and allowing for wait time.” As a result, teachers must allow for opportunities to “let kids do the work.” Coaches and teachers became intentional in their efforts to critique and revise traditional low level, solution-based problems, accordingly.

Table 4.2 shows that first year coaches scored an average of 2.19 and second year coaches 2.42 on a three point Likert scale, in coaching teachers to identify and/or create rich problems from their curriculum. Coaches having continued program participation for two consecutive years evidenced a relative change of +.40 in this work.

As consistent with other areas of the coaching process, coach involvement in identifying and/or creating rich problems progressed over the course of their work with teachers. In the beginning, coaches may have provided several rich, problem solving tasks to the teacher. Next, coaches and teachers worked to co-create problems, with teachers taking over this role toward the end of their partnership. This is shown in one coach’s comments of “seeing more rich problems on their own” as time has progressed.

These experiences afforded students the opportunity to build upon existing knowledge, through engaging in problem solving, as there were multiple entry points and/or solutions. When presenting problem solving opportunities, attention began to shift
from a simple answer. Coaches instead worked with teachers to “look at the students’ work and not just the answers” and “how students are solving the problems.” “They [teachers] are accepting more than one answer.”

The focus on problem solving led one principal to suggest, “The kids are engaged and I see inquiry, hands-on learning, with students using manipulatives.” Similarly, a coach said, “They are getting the manipulatives out more . . . not as often as I would like, but they are getting better.” As a result, students became motivated to engage in mathematics. It was no longer seen as a chore. Students previously “on the fringes of classroom discussion became more involved.” They were intrinsically driven to engage in rich tasks, and couldn’t be pulled from mathematics. Some were working through the bell, while others requesting “just five more minutes.” Teachers and coaches suggested they would have to “drag them from math.”

Though ultimately rewarding and motivating, problem solving opportunities were initially met with resistance from the students. One coach shared,

At first, students were frustrated because no one was going to help them, or give them the answer. Now it has evolved into students thinking outside the box, using a variety of strategies building confidence levels.

When first presented such opportunities, students asked questions such as, “Why can’t you just tell us?” One principal said,

At the middle school level, students have been spoon-fed for years. So this is different. Students get frustrated when they have to think for themselves. This is
something we are beginning to overcome. And, the more that we do it with the
students, the more comfortable they will be with it.

Similarly, teachers experienced difficulty with the transition toward rich, problem
solving situations. As OAT and OGT testing neared, one coach revealed it to be “difficult
for teachers to give up what they are comfortable with and try a new approach this time
of year.” In fact, “crunch time for testing,” led some teachers to feel “there is no time to
dive into one rich problem.”

The use of instructional time continued to be an issue with teachers desiring to get
through the content and/or follow the pacing guides set forth by the district. One coach
said a teacher “is eager to implement change and open to suggestions, but is still
struggling with the time the student-centered approaches take.”

In addition, some teachers were initially uncomfortable in taking a back seat as
students were attempting to solve rich problems. Teachers, being accustomed to their
roles as providers of information, initially felt the need to walk students through solving
problems, step by step. Therefore, problems intended to challenge students had become
structured and procedural in nature. When using a rich problem, they would “teach it in a
traditional way.” One coach said, “The teachers still want to show kids instead of turning
the problem over to them.” In these cases, “teachers are doing open-ended questions, but
they just need tweaked.”

Teachers slowly began to embrace this approach, with continued support from the
coach. In one instance, a math coach provided an article to a teacher to read, which led to
her realization, “If students aren’t struggling, they aren’t learning.” Coaches asked
teachers to trust in student ability. One coach was quoted as saying teachers have to buy into the fact that “These students can do it. They can get it.” Coaches often made suggestions to teachers that they wait, “try, and see what happens.” Though teachers were uncomfortable watching students struggle, they allowed wait time for problem solving. A principal suggested, “I’ve seen improvement in questioning skills. And, think time for students to respond has improved in teachers. It takes time.” The waiting idea paid off. Teachers were often “amazed” and/or “shocked” at the ability of students to conquer problems on their own. Teachers began to move from the mentality of “I can’t, to a yes, you can.” Another suggested, “The kids are being challenged and that’s how they learn.”

Teachers raised expectations of students, considering them to be capable problem solvers. One regular education teacher expressed her frustration for the special education teacher’s limited expectations for students and traditional approach to problem solving.

I am having problems with the special education teacher. She does not want to let go. Did you see her draw the chart on the board? She was basically doing the problem for them. She babies them. They can do it! I have seen it. I will be having discussion with her.

Teachers became appreciative of the number of indicators and/or concepts addressed in a rich problem. One teacher confided in her coach, “Wow! Do you realize how many indicators were involved in this lesson?” As time progressed, many teachers began to embrace instructional techniques or tasks they believed “wouldn’t work” in the past, but now had become “the only way to teach it.”
Multiple Representations

In addition to supporting teachers in providing rich, problem solving opportunities to their students, coaches also worked diligently to ensure they “allow for multiple ways to solve them.” One teacher suggested she is no longer “asking, what is the answer to number one, number two, but how did you get that . . . we are moving beyond having one possible solution.” Another suggested the coach has helped them move “beyond solving problems one way . . . there are multiple solutions.”

Coaches worked with teachers to encourage students, when presented rich problems, to personally select methods for organizing and representing their thinking. They highlighted the need for students to use their existing knowledge to solve. Coaches and teachers encouraged the use of multiple representations by suggesting a charge for the class to “present as many ways as we can.” They also both acknowledged and extended student thinking around strategies by suggesting, “I like your method. It’s a little different than others I have seen,” “Who used a different strategy?” and “Can you show your work in another way?”

When presented problems, students used manipulatives, drawings, words, or numbers to solve and/or represent their thinking. As a result, students were “not afraid to speak up,” began “showing more than one way to solve a problem,” and became “more open to sharing and talking.” Some coaches and teachers made reference to the use of an evidence tracker to document student thinking and/or solving strategies.

Coaches and teachers advocated for the need of multiple representations when solving, and a genuine focus on the process over solutions. A teacher suggested, “I live
the MCP way because when I grew up there was only one way to do math and that was the way the teacher taught it.” The process essentially gets students to “think instead of memorize.” One coach suggested a class of fifth grade students, having experienced traditional classroom instruction for years, was unable to solve a simple, standard subtraction problem. The coach and teacher worked with the students, allowing them to solve in their own ways and communicate their thinking. The coach suggested, “You just can’t go wrong with multiple strategies. There is more than one right way.”

In fact, as a result of being afforded opportunities to use different methods for representing and solving problems, “light bulbs are going off.” Both coaches and teachers suggested students were successful, and were becoming more confident in and taking ownership of their work.

**Communicating**

As a common practice, teachers and coaches allowed students opportunities to think independently, and to work collaboratively with others. Students were able to communicate with one another about problems and the different possible approaches for solving. When students would become stuck, or needed an extension to the problem, the coach and teacher asked them to work together to find another way. During an observation, students not only worked together to solve a problem, but also collaboratively uncovered, without the teacher, that “their solution was incorrect, because their answer didn’t make sense.”
At lessons’ end, coaches and teachers typically facilitated a share-out by individual and/or groups of students. During this time, students were afforded the opportunity of sharing their thinking, strategies and/or representations with the rest of the class. This was often done through students projecting and/or displaying their work for the class, while communicating their thinking to others. The continual sharing opportunities led students to become comfortable and eager in communicating with others about their work. They became “more open to sharing and talking,” and began to “think and talk mathematically.” Attention was drawn to the vocabulary being used. In a first grade classroom lesson, students were referencing addends, variables, and equations.

Coaches and teachers questioned students about their work, while students asked questions of one another. They also asked students to rephrase another student’s words, or “parrot,” with questions like, “Can you tell me what she just said?”

One particular teacher referred to an article given to her by the math coach, “Never Say Anything A Kid Can Say” (Reinhart, 2000). She suggested, “I am learning to ask more questions and let kids do the explaining.” Another advocated, “Students can explain better to each other and help each other. Students are able to own up to their answers and it is easier for them to remember” than when taught by the teacher.

In addition, through listening to students communicate their thinking, coaches and teachers recognized struggling students measuring up to their “smarter” counterparts. One coach referenced his dealings with both with an honors and pullout, special needs classroom. When presented the same rich problem, the coach heard similar discussion
from students in both classrooms. He suggested one “wouldn’t have been able to tell the
difference” between the two groups of students.

Listening to students, assisted teachers and coaches in focusing more attention on
thinking and learning, as opposed to teaching. This allowed for teachers and coaches to
better understand the information learned, any misconceptions, and/or how to proceed
with future lessons. As shown in Table 4.2, coaches were rated based upon their ability to
coach teachers in learning how students think. First year coaches were rated an average
of 2.13, with second year coaches rated 2.42. Coaches experiencing continued
participation in the program over two years, evidenced a mean relative change of +.30.
Coaches worked with teachers to evolve from being sole providers of information and
become listeners to listen and respond to student thinking.

**Reasoning**

Coaches assisted teachers understanding the importance of student reasoning and
justification. They supported teachers in identifying appropriate questions to allow for
students to communicate, extend, and justify their thinking. Students, engaged in solving
problems in their own ways, were encouraged to justify their reasoning. Coaches and
teachers probed students, “How do you know? Show us,” “convince me,” and “prove it.”
Students were also asked if their approaches would always work or if they could prove
their work in other ways. Focusing on student reasoning, rather than solutions, has led
teachers to realize there “is no right or wrong way, as long as they can justify their
thinking.”
As shown by Table 4.2, coaches were rated concerning their ability to coach teachers in questioning techniques to support and extend student learning. First year coaches were rated an average of 2.19, with second year coaches being rated 2.56, on a three point Likert scale. Coaches experiencing continued participation in the coaching program over the course of two years, evidenced a mean relative change of +.35.

Initially students were apprehensive or uncomfortable with such questions. In fact, when questioned about their work, some students were led to believe they had the incorrect answer, causing them to shut down. Over time, however, as the teacher and coach asked questions requiring students justify their thinking, students became more comfortable and confident in their answers. In some cases, students begin to expect these questions and suggested to adults, “You have to ask us questions about our thinking.” In addition, students themselves “have begun to mock her [the coach] and ask each other these questions as they work.” One student even challenged another, suggesting, “I can prove you wrong!”

Connection Making

Coaches also modeled how to effectively use mathematical knowledge in the classroom, and were rated accordingly, as shown by Table 4.2. First year coaches were rated an average of 2.19, while second year coaches averaged 2.52. Coaches experiencing continued participation in the program, with site visits in both their first and second year, evidenced a mean relative change of +.60.
As students were solving and creating representations of their work, the coach and teacher circulated throughout the room, asking students questions to better understand their thinking and selected strategies. The coach and teacher would often debrief during the lesson, and select a variety of strategies to be shared out with the rest of the class. These strategies were purposefully selected and presented in manner to allow for connection making and/or extensions to student thinking. While students were sharing their representations, other students identified and/or made connections with their own work. Some students suggested they solved the problem the same way, in a similar fashion, or different altogether. This assisted in making connections among less and increasingly complex strategies.

**Greatest Accomplishments**

Coaches were asked to reflect upon the greatest accomplishments associated with their work. They overwhelmingly pointed to changes in both teacher and student behaviors. These data, embedded in other themes, will be referenced again, to reiterate the overall findings within the study. Common subthemes of coaches’ greatest accomplishments included: (a) Opening doors, (b) ah ha’s on strategy/maintaining, (c) increased expectations of students, and (d) student participation and enjoyment.

**Opening Doors**

As previously discussed, there were many situations where once skeptical, unwilling teachers became eager to engage in coaching partnerships. Coaches discussed
their desires to work within the classrooms of reluctant teachers. Doors were often opened through coaches building trusting relationships and proving themselves as non-threatening, valuable assets to teachers. Coaches communicated a great sense of accomplishment when once reluctant teachers willingly invited them into their classrooms. This is illustrated in one coach’s sense of pride in “getting the one negative third grade teacher to let me into her classroom, and for her to trust me.” They believed this approach was superior to, and more rewarding than, being forced to work with reluctant teachers.

**Ah-ha’s on Strategy/Maintaining**

Coaches also experienced great accomplishment when teachers implemented and found value in instructional strategies, consistent with best practices and the Process Standards. Often, the need to embrace different instructional strategies became evident through breakthrough, ah-ha moments. These moments were a result of modeling strategies, and/or through cooperative implementation of strategies with the assistance of the coach.

Teachers began to use their instructional materials as resources, and strived to be less traditional, or directive in their approaches. One coach referenced a teacher who initially asked, “I can’t tell them anything?” furthermore suggesting she was “beginning to see a breakthrough on this.” Another said of a teacher,

*She got it! She has put all of the pieces together and gets the MCP philosophy. She sees the value and betters herself by asking how she can do it.*
Teachers focused less attention on teaching and problem solutions, and more attention upon student thinking and learning. This is shown in one teacher’s breakthrough, “I am learning it is okay for my students to be frustrated and not always get an exact answer. Greater emphasis is being placed on the process.” This was furthermore shown through teachers asking rich questions and issuing wait time. Students became engaged through using multiple representations, and communicating and justifying their thinking.

Coaches felt a great sense of pride when teachers not only changed instructional strategies, but also continued with implementation, long after they had left their classrooms. One coach suggested a sense of accomplishment “when teachers come to me and use what I have brought to their classrooms and do it because they say it was effective, not because I told them to.” Another found delight “when teachers come back to you, and are still talking the talk, and doing stuff even when I’m not there.” Still another said upon reuniting with a teacher after being away, the teacher proudly displayed student work, saying, “Look what I did!” These teachers became great vocal advocates of the instructional strategies and/or practices, making the program an easy sell to others. They found the new instructional approaches to be superior to those previously used, as they observed students, including those with learning difficulties, become engaged, enthusiastic, and successful in their efforts.
Increased Expectations of Students

As previously discussed, prior to the coaching experience, teachers often underestimated student abilities and provided them “way too much information.” Coaches were excited to see once doubting teachers develop a newfound understanding of student capabilities. General education students, lower level students, and students with learning disabilities, all outperformed the preconceived notions of teachers. One principal affirmed, “Even the lowest performing students can do it.” Coaches said, “The special ed kids are getting the math. The teachers are realizing they can do it” and “ESL kids are understanding the math more.” Teachers noticed “how engaged the students were, and how they were getting the concept when I [the coach] was in the class.”

Student Participation and Enjoyment

Coaches talked about feeling a great sense of success, as students engaged in mathematics like never before. As previously discussed, teachers began to do more listening and questioning, and less traditional facilitating. As a result of providing rich tasks, students became engaged in mathematics, not as participants, but as constructors of knowledge.

Students in MCP-coached classrooms participated in solving rich problems, using their own strategies, while communicating and defending their thinking. Students, including those with limited success in traditional education, experienced “breakthroughs” in their understanding of mathematics. They became motivated and empowered in their abilities to solve increasingly difficult problems. Student fears had
dissipated and they had now become eager to share their learning strategies. One particular teacher said students of whom “normally won’t talk, speak up,” and had their “attitudes turn around.” Surprisingly, teachers discovered that student enthusiasm and confidence in their mathematical abilities had spilled over into other subject areas.

As a result of students being engaged, coaches and teachers suggested a decrease in student misbehaviors. One teacher remarked, “When students work in groups, they don’t have the opportunity to misbehave. One student in particular would misbehave to get attention, now he gets attention in a good way.” Others mentioned, “when students are engaged, discipline disappears” and that when not engaged in rich problems, students “find the math work to be tedious and we have more behavioral problems.”

**Greatest Challenges**

Analysis of MCPSVI data showed several common challenges of first and second year coaches. These challenges have been integrated and discussed within other themes presented in this chapter. They will be referenced within this theme to further reinforce the findings. Within the greatest challenges, several subthemes were these: (a) time, (b) scheduling, (c) administrative support, and (d) role perceptions.

**Time**

Coaches continually commented on the need for more time. Those particularly concerned were coaches consistently pulled away for district and/or building committee meetings, testing, and professional development needs. In addition, some coaches were strapped for time, as they were working in multiple buildings. These additional
responsibilities limited the amount of time coaches were able to spend providing job embedded professional development support.

Coaches were also concerned about limited time for planning and debriefing efforts. As previously mentioned, coaches suggested these efforts as getting “brushed under the rug,” and being “on the fly,” “quick,” and “short.” One coach mentioned, “finding time to sit down with teachers is challenging” and another that “teachers don’t want to give me much time.” Data suggested coaches having limited to no planning time with teachers to promote either the coach as an assistant or a modeler of instruction. This time was seen as a critical component to their work in changing instructional practices and becoming reflective practitioners. One coach confirmed, “It is critical for teachers to reflect.” There was an overwhelming “need to do more planning” and “need to work on post conferencing.”

**Scheduling**

As previously discussed, coaches suggested the importance of schedules accommodating their needs to work with teachers. They stressed the importance of duties, planning, and instructional times to be arranged, so as to not conflict with the coaches’ intended work. Barriers in scheduling not only limited the number of teachers and grade levels coaches could work with, but also the effectiveness and depth of their efforts to best meet individual needs.
Administrative Support

Coaches perceiving success in their positions reflected upon their appreciation of their administrators’ support. In these situations, coaches referenced administrators as “very supportive,” or in having “good support from the administration,” which was deemed as a “necessary” component to the success of their work. In some situations, even though certain structures were not already in place, principals worked to ensure they were “supporting the teachers more, as he [the coach] had more input” in factors such as scheduling. One principal shared with the site visitor, “You are not going to see what you want to see today. But, next year we are going to fix it.”

Some coaches suggested the lacking support of their administrators to be concerning. These coaches felt “dealing with administration to be most challenging” and a barrier to their work. They perceived the need for administrators to fully understand and communicate the program’s intentions, while following assurances to enhance coaching success. One coach advocated that administrators developing a better understanding of “what the program is about and entails, would make work much more rewarding and successful.”

As previously discussed, this included the need for support in a variety of areas. Coaches felt it was important for administrators to advocate for their work within one building. They also suggested the necessity for administrators to schedule with coaching in mind, being flexible to accommodate coaching partnerships. Coaches bombarded with responsibilities often wished administrators would allow them to focus their attention on coaching, and limit their duties, committee assignments, and formal professional
development initiatives. Additionally, coaches felt strongly that administrators respect their work with willing teachers and neglect to force collaborative partnerships.

**Role Perceptions**

Coaches suggested another challenge in their work was assisting teachers in better understanding the coaching role. As previously mentioned, several teachers were skeptical of coaches’ intentions, and perceived them to be evaluators. As a result, coaches saw the need to develop trusting relationships with teachers and clearly communicate their intentions. Coaches often proved themselves through their work, acting as a resource, and through word of mouth.

**Professional Development Supports**

Among common themes was the need for the MCP, as shown by coaches, teachers, and principals. Principals and teachers yearned to have continued support from the coach, while coaches desired to have additional learning opportunities encompassing their work. This theme included the following subthemes, complete with supporting evidence: (a) need for the program, (b) need for professional development, (c) need for collaborative opportunities, and (d) being torn between professional learning and coaching.
Need for the Program

Districts overwhelmingly communicated the necessity of participating in the program. Principals couldn’t speak highly enough of the support they were receiving from the coach and their great appreciation and “love” for the program. One principal declared the “MCP is the best thing that has happened here.” Another reflected back upon his previous years of coaching support by suggesting he was “glad MCP took over our coaches and put direction in it and some meat to it.” Still another suggested, “MCP is not just a luxury, but is a necessity.” Principals appreciated the role of the coach as a staff developer. One suggested, "We have no staff development in our district, so the MCP way is great staff development for getting teachers to implement. Their instruction is very hands on. It is nice to have a math expert in the building."

Principals communicated both quantitative and qualitative accomplishments as a result of the job-embedded staff development opportunities provided by their math coaches. They referenced gains in state and district assessments, with one having a 28% increase on state achievement tests. Others suggested value-added gains in all five quintiles and increased ratings on short answer responses. One principal even accredited “the math value added increases and huge jump in their OAT scores to [their coach].” As previously discussed, principals were pleased that teachers increased their use of “high yield strategies,” and expectations of students, allowing students opportunities to grapple with content. They became excited to see students engaged in mathematics, communicating their thinking, and defending their reasoning. One principal reported, “I
have seen growth in teachers . . . professional growth,” with another “seeing wonderful progress.”

The principals also expressed gratitude for formal professional development opportunities coaches were able to provide, as a result of MCP professional development sessions. One principal suggested “the knowledge [the coach] is bringing back from Columbus pd sessions is great.” This included the use of rich questioning, the Process Standards, and the critique and scoring of OAT short answer and extended response items.

Teachers echoed the sentiments of their principals. Coaches suggested, teachers were “amazed and excited” about the new resources and information provided by the MCP. One teacher classified the coach as a “sponge. She brings me articles and we discuss them for several hours a week.” Similarly, a coach remarked,

They enjoy when I come back from the MCP program, because I share what I have covered and what we have learned. I always come back from MCP with some ODE knowledge. I share different ideas on how to present stuff.

In addition, teachers desired and appreciated coach assistance when focusing on mathematic concepts. They were appreciative of new concepts that sprang from the minds of coaches and enjoyed having someone to “bounce ideas off of.” They were thankful for the coach’s support in rich questioning, and in facilitating instruction to allowing for communicating and defending their thinking. They appreciated support as it pertained to OAT scoring, and data analysis through formal professional development efforts. One coach said, “I am doing data work for the teachers that they don’t have time
for.” Likewise a principal suggested the coach’s efforts in OAT data analysis, stating “She is doing a good job breaking down the information to teachers.”

Many teachers admitted to changing their teaching methods, and expressed the desire for continual support from the coach. One teacher added, “Every teacher needs a coach.” Another expressed her gratitude to the coaching program, suggesting she had done things with her students they “haven’t ever done or wouldn’t have done if it wasn’t for MCP ways of teaching.”

Many principals and teachers suggested a fear of losing coaches and/or the support aligned with the MCP. Principals referred to times of “budget crunches,” with “next year depending on funding.” They talked about how “disappointing” it would be to lose their coaching support. Some comments, relaying their hope for program continuation, included “I sure hope OSU keeps getting funded,” or “are we going to get this next year? We only got it because our scores are so bad.” A teacher advocated, “I hope the program continues. My ways of teaching are changing and the student learning is changing. It is all positive.”

The thought of the program ending and/or districts being unable to support future years from an MCP coach spurred a sense of urgency and call for action. In several situations, principals and teachers talked about the need to “petition” or “talk up the program” to keep their coaches and/or stay involved in the program. One teacher wrote a letter to the district board of education communicating the students’ love for “hard problems” and her appreciation of the coach. With the coach’s support, the teacher felt the need to “look at student thinking on paper and encourage them to do more.”
One principal, fearful of losing his coaching support suggested, “I hope to continue the program. If they had taught math like this when I was a student, I would have liked it more.” Both principals and teachers highlighted the importance of changing the way mathematics is taught and yearned for continued support from the coach in making the transition. A principal suggested his “only beef with the program is that they (MCP) need to get out here and see the great things that are happening.”

**Need for Professional Development**

Coaches overwhelming stressed the importance of their involvement with the MCP and desired to continually receive professional learning support from the program. This was illustrated in statements such as “Columbus is doing a great job preparing us to coach” and it is “imperative that a program be attached to make the coaching process successful.” Another coach suggested

Understanding by design affected me four years ago, and this coaching program has also impacted me. You never know about the political aspect-if someone comes in and adopts the new flavor of the month . . . Whether I can continue to do this with OSU’s guidance may come into question, eventually. And, if I am not always a coach, this has helped me be a better teacher.

Coaches expressed the desire for added information from the program, regarding their role, and what it entailed. They were grateful for having the opportunity of observing coaching while effective mathematical practices were put into action. They also appreciated opportunities to role-play and/or discuss real life scenarios, highlighting
their personal experiences and/or struggles in their work. One coach “loved role playing a coaching scenario,” recommending “it is done from the January session on.” She thought it would be “beneficial to role play work with resistant teachers, who may be weak in content and processes in their instructional efforts.” They expressed the desire for the continuation of such practices, as they believed they were critical to the success of the program.

Coaches believed the professional development program supported their content needs, through engaging in rich problem solving and content discussions. As shown by Table 4.2, first year coaches’ content ratings were as follows: 12% low, 45% medium, and 43% high. Second year coach content ratings included: 4% low, 35% medium, and 61% high. Coaches involved in the program and having site visits for two years evidenced a relative change of +.20, when using a three point Likert scale.

The content support provided by the program was beneficial to coaches unaccustomed to teaching certain concepts, or grade levels. They expressed the desire to continually brush up on content and/or understand concepts at a deeper level. As previously discussed, coaches expressed the need to effectively, but yet reasonably scale up or scale down content materials, to both meet the demands of and continue to challenge certain grade levels.

Coaches also received pedagogical support from the program. As shown by Table 4.2, first year coaches’ pedagogy ratings were as follows: 17% low, 52% medium, and 31% high. Second year coach pedagogy ratings included: 4% low, 38% medium, and 58% high. The average relative change in pedagogy was +.25 on a three point Likert
scale. Coaches appreciated MCP professional development opportunities that provided them better handle on understanding student learning and teaching mathematics. As previously discussed, teachers gained from the modeling and collaborative implementation of the Process Standards and rich questioning emphasized by the program.

Coaches enjoyed participating in professional development opportunities and learning new things to bring back and implement with the teachers, such as OAT scoring, rich questioning, accountable talk, and pre and post conferencing. One coach suggested when she is in Columbus, “the day flies,” and she wants “all she can get,” with another stating,

The professional development from OSU and the support from facilitators and other people in the group has been phenomenal. This is more support than I have ever had in my previous years as a coach.

The coaches’ positive regards for the program were profound, with limited concerns shown in the data. Coaches yearned for even more support and continued participation in the MCP. Like sponges, coaches wanted to soak in more and more. Coaches most often highlighted the need for the program to notify coaches in advance of different tasks they must complete. One coach suggested,

Asking for it tomorrow reflects poorly on me. I hate to ask teachers last minute that I need this. Also, if we are given time to complete things, we can work on it in advance and do it well.
Another suggested, “It ruins rapport with teachers when they throw things at us.”
There seemed to be a general consensus among coaches for the need of better communication and organization from the program. On several projects coaches were not given enough lead-time, leading to frustration in not being able to give their best.

**Need for Collaborative Opportunities**

Coaches were not only thankful for the professional development they received through the program, but were also appreciative of the “face to face” collaborative opportunities made available through their local facilitator groups. Being “neither teachers nor administrators,” coaches appreciated the opportunities of collaborating with other coaches, and enjoyed being “part of a team.” Monthly facilitator meetings allowed the coaches to obtain support, suggestions, ideas, and simply talk shop with other coaches.

Coaches discussed the support of their facilitators to be “invaluable.” Facilitators provided coaches a “great buffer,” and assisted in ensuring their success through troubleshooting with districts. Facilitators often bridged the gap between the program and school in effort to ensure understanding and highlighting the need to follow the MCP assurances. Coaches appreciated facilitators following up with districts via e-mails, house visits, and phone calls to support the work.
Being Torn between Professional Learning and Coaching

As previously mentioned, coaches felt an extreme need for their own professional development, as it was reflective in their work with teachers. In addition, administrators and teachers alike were appreciative of the support coaches provided in their roles, as a result of the MCP professional development.

However, in limited cases, antagonism developed within districts, concerning math coaches attending the monthly MCP professional development and facilitator meetings. Though these coaches found their professional learning opportunities to be vital to their work and success, the guilt associated with attending the meetings was insurmountable. One coach suggested, “Having literacy coaches there all of the time, makes it more challenging” but that professional development “support is needed to make it more successful.”

Several principals added to the pressure through making comments about coaches being out too much. In one district, a principal commented:

Does (coach name) really need four days of in-service each month? We really don’t like him being gone that much. Could the facilitator just do one day a month?”

Another suggested, “I do have an issue with her being out of the building so much between the Columbus meetings, and local facilitator meetings.” They questioned the necessity of coaches being out for MCP professional development, and preferred they remain in the building or district as much as possible. Data suggested the few districts presenting the coaches’ absence as a major issue, were simultaneously pulling coaches
out of the classrooms. In these districts, coaches were called on to provide frequent, formal professional development opportunities to teachers, or to fulfill a variety of district and/or building responsibilities.

Interestingly, the professional development opportunities the coaches were providing, were consistent with the knowledge gained from attending MCP professional development. These offerings were often centered on rich questioning, OAT/OGT short answer and extended response scoring, data analysis, article sharing, and the use of the Process Standards. One principal suggested:

“It’s a catch 22. This district is very tight in terms of professional development we send our teachers to. I know that the superintendent is concerned about how much she is out of the building. But, that is also where she gets her ideas and information.

Summary

Data from 69 first and second year MCP coach site visits were analyzed, organized into themes, and presented within this chapter. These themes included the following: (a) establishing identity, (b) planning for coaching, (c) the coaching process, (d) instructional approaches consistent with MCP, (e) greatest accomplishments, (f) greatest challenges, and (g) professional development supports. Uncovering these themes was instrumental in better understanding the unique experiences of first and second year MCP coaches, and the implementation of aligned instructional strategies. The themes will be summarized, with research questions and findings discussed in Chapter V.
Table 4.2

Mean Ratings of First and Second Year MCPSVI Data

<table>
<thead>
<tr>
<th>MCPSVI Data</th>
<th>Mean Ratings on Three Point Likert Scale</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>First Year</td>
<td>Second Year</td>
</tr>
<tr>
<td></td>
<td>n=43</td>
<td>n=26</td>
</tr>
<tr>
<td>Co-plan for the day with teachers and select instructional strategies</td>
<td>1.94</td>
<td>2.25</td>
</tr>
<tr>
<td>Co-teach in at most four or at least three classes daily, for four days per week</td>
<td>1.84</td>
<td>2.29</td>
</tr>
<tr>
<td>Coach the teacher in learning how students think</td>
<td>2.13</td>
<td>2.42</td>
</tr>
<tr>
<td>Coach the teacher in how to use the mathematical knowledge in the room</td>
<td>2.19</td>
<td>2.52</td>
</tr>
<tr>
<td>Coach the teacher in questioning techniques</td>
<td>2.19</td>
<td>2.56</td>
</tr>
<tr>
<td>Coach the teacher in using the Process Standards regularly</td>
<td>2.00</td>
<td>2.37</td>
</tr>
<tr>
<td>Coach the teacher in identifying and/or creating rich problems from their curriculum</td>
<td>2.19</td>
<td>2.42</td>
</tr>
<tr>
<td>Debrief with teachers at least once per week</td>
<td>2.00</td>
<td>2.38</td>
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</tbody>
</table>
Table 4.3

*Overall Ratings of First and Second Year MCPSVI Coach Data*

<table>
<thead>
<tr>
<th>Overall Ratings</th>
<th>First Year Coaches</th>
<th>Second Year Coaches</th>
<th>Continued Participation in MCP</th>
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<td></td>
<td>n=43</td>
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<tr>
<td>Content</td>
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</tr>
<tr>
<td>Low</td>
<td>12%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>45%</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>43%</td>
<td>61%</td>
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<tr>
<td>Average Mean</td>
<td>2.33</td>
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<td>+.20</td>
</tr>
<tr>
<td>Pedagogy</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>17%</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>52%</td>
<td>38%</td>
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<td>High</td>
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<tr>
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CHAPTER V

Introduction

Chapter V begins with a brief review of the research questions and methodology. The results of the study will be summarized and discussed. In addition, both limitations and implications of the study’s findings will be addressed.

Statement of the Research Question

This case study was designed to investigate the unique experiences of first and second year MCP coaches. The overall research question, and corresponding sub questions that framed the study included the following:

1. What are the common themes and experiences of first and second year MCP coaches?
   1a. What evidence supports the implementation of MCP practices?
   1b. What evidence supports changes in professional learning and instructional practices of coaches and teachers?

These questions were designed to focus, but not limit the emerging nature of the study. They were instrumental in establishing the study’s overall research design, the underlying theoretical framework, as well as data collection and analysis efforts.

Review of Methodology

This mixed-methods case study was conducted to better understand coaching experiences, program implementation, and the professional growth of first and second
year MCP coaches. Though coaches worked in schools across the state of Ohio, they were uniquely bound by their affiliation with the MCP.

This study embraced a constructivist approach, as I sought to understand the unique perspectives and experiences of MCP coaches. This approach heightened the need to collect data onsite, or within the location in which the program was implemented. Thus, two site visitors, traveling statewide, conducted visits at the schools of participating coaching. Each coach received at least one site visit. Follow ups were conducted in effort to clarify or deepen the understanding of the data. This study included data from 43 first year and 26 second year MCP coach site visits, conducted from November 2008 to May 2010.

During these site visits, a common tool, the MCPSVI, was used to provide a basis protocol for data collection, and promoted the collection of interview, observation, and document data (see Appendix H). The MCPSVI included a protocol of 20 interview questions to be asked of coaches. These questions provided a framework for data collection, but did not limit the site visitors’ ability to ask follow up questions, in an effort to better understand the phenomenon being studied. Interviews with coaching participants were approximately one hour in length (MCP, n.d.d).

In addition to collecting interview data, site visitors observed the coach and teacher facilitating a mathematics lesson. These observation notes were instrumental in better understanding the dynamics of the coach/teacher relationship and the implementation of instructional practices consistent with the MCP approach.
Collected documents included, but were not limited to coaching schedules and lesson plans. These sources served as a means to better understand program implementation and alignment with assurances. Analysis of documents enabled the researcher to verify the comments and concerns of coaches.

Another secondary data source, shedding light on common trends and experiences of coaching participants, included comments from both administrators and teachers. These comments were used as a means to triangulate data sources and were beneficial in providing a sense of depth and richness in reporting.

The study embraced a mixed method approach, as both qualitative and quantitative data were collected, analyzed, and triangulated. The majority of data were qualitative in nature, as open-ended questioning resulted in rich, descriptive responses and observation notes (MCP, n.d.d). Quantitative measures were used to support qualitative findings. The quantitative component to the MCPSVI data collection tool included a checklist of site visit observables. When processing qualitative data, site visitors quantified overall results, using a three point Likert scale. These ratings quantified the site visitors’ perspectives on content, pedagogy, coaching, and comfort levels.

Data collection, analysis, and triangulation assisted in the development of common themes. The themes that emerged assisted in better understanding coach experiences, implementation of the program, and professional growth, as identified in the study’s underlying research questions.
Summary of Results

Data analysis and hand coding efforts yielded several common themes of first and second year MCP coaches. The seven overarching themes, along with corresponding subthemes are outlined in Table 4.1. The overall themes included: (a) establishing identity, (b) planning for coaching, (c) the coaching process, (d) instructional approaches consistent with the MCP, (e) greatest coaching accomplishments, (f) greatest challenges, and (g) professional development support. These themes capture and communicate common first and second year MCP coach experiences, and furthermore shed light on the research study’s sub-questions, dealing with implementation and professional growth.

Discussion of Results

In this section, findings will be discussed, correlated to previous research on mathematics instruction and coaching, and used to shed light on the study’s underlying research questions. The overall research question addressing common themes among first and second year MCP coaches will be the focus of the section, with subthemes, including instructional practices consistent with the MCP, and evidence of professional learning addressed within.

Establishing Identity

Consistent with existing research, first year MCP coaches were initially apprehensive of the roles and responsibilities associated with their newly appointed position (Chval et al., 2010). Due to undefined, unclear roles, coaches in Chval et al.’s
study often engaged in other non-coaching tasks to occupy their time. In contrast, MCP coaches, while also concerned with their roles and responsibilities, were provided an initial start-up document to provide an intentional foundation to their work. Although instructed not to engage in formal coaching until attending their first professional development session with the program, they were charged with completing specific tasks in preparation for their work (MCP, 2010b). The tasks uncovered in MCPSVI data included but were not limited to presenting the program to building teachers, having teachers complete interest inventories, and building coaching schedules accommodating no more than four teachers for a six week period (Brosnan & Erchick, 2009; MCP, 2011b, 2011c). While completing these tasks, coaches were afforded flexibility to provide support and duties, as a means to establish relationships and rapport with teachers (MCP, 2010b). Initially, coaches were given a potpourri of tasks, but their concerns were predominately the interpretation of their roles and discerning how coaching should look. They sincerely desired to have all of the details upfront.

As time progressed, initial concerns in understanding the specifics of the coaching role subsided. Coaches became increasingly comfortable in their roles over the course of the first year, and into the second year. Support opportunities, through the program’s professional development and facilitator meetings, were instrumental in defining their roles and implementing them with increased confidence. In their second year, coaches were not only more comfortable with their roles, but better prepared to begin coaching immediately at the start of the school year.
This growing sense of comfort was further confirmed in a November 2011 presentation from third year MCP coaches to both new, first year coaches and continuing second year coaches (MCP, 2011a). Coaches were asked to create a visual illustration of their coaching role, on chart paper. One illustration by a group of new, first year coaches was that of a coach with a noose tied around his/her neck. This spurred conversation throughout, and several first year coaches admitted to suffering discomfort in their newly appointed roles. Second and third year coaches reflected progression in comfort over the course of their participation in the program. They provided reassurance to first year coaches, suggesting they be patient and that a sense of comfort and confidence in their role would come. A third year coach reflected,

"Mid way through year one, I was ready to go back into teaching. After a year, I could go back into the classroom if I didn’t like it. I was ready to go back. But, by the end of year one, I was liking it. I told the superintendent that I was ready to quit mid year, and the superintendent said, “I know…. That’s why I didn’t meet with you then.” And then I advocated for my job the second year.

The third year coach described how comfortable she became with her role, and how she developed a growing belief in the program. She shared that her school “went from meeting one indicator in math, to all but one and being excellent. It does prove itself. Trust the program.”

Illustrations of coaches further depicted coaching roles to be strikingly similar to those uncovered in this study. Both portrayed coaches as experts, advocates, resources, and staff developers. In addition, coaches referenced the balancing aspect of their work.
Coaches believed their roles were rooted in balancing the support of both students and teachers, or in balancing the many hats and/or roles associated with the coaching position. Such commonalities further validated the findings of this study.

The recognition of such roles did not come easily. MCP coaches not only yearned to make sense of their new positions, but also worked diligently to communicate their role to teachers. Coaches formally presented the program to teachers, a method they considered valuable in boosting understanding, while gauging teacher willingness through use of the interest inventory (MCP, 2010b). However, consistent with previous research, coaches perceived some teachers initially misinterpreted the role of the coach. Some considered the coaching position to be evaluative, which is not at all consistent with the intentions of the role (Balka et al., 2009; Joyce & Showers, 1980; Knight, 2009). Many coaches referenced the need to effectively communicate their intentions and further establish rapport with teachers to prove their roles to be non-evaluative in nature (Chval et al., 2010). In addition, consistent with the Joyce and Showers (2002) research, coaches were often labeled the math experts in the building. Though some were comfortable with this role, many felt they were learning alongside teachers and not worthy of this “know all” status (Chval et al., 2010). Coaches wanted to be viewed as supporters to teachers instead of evaluators, or experts.

Within their positions, coaches became advocates for teachers, student learning, and sound instructional practices. They advocated for added attention to the subject of mathematics and recommended that scheduling, professional development, and additional activities support this importance. They advocated and communicated high expectations
to students, including their participation in solving tasks of increased cognitive demand.

Coaches also served as resources to establish trusting, willing relationships with teachers. These coaches collected and distributed data, resources, and manipulatives, and/or served duties to gain entry into classrooms (MCP, 2010b). Coaches assisted teachers they were and were not working with, in collecting and analyzing data, and collaboratively determining next steps for instruction. They were also in unique positions to both serve on district improvement committees and provide building wide professional development opportunities (Brosnan & Erchick, 2009; Brosnan et al., 2011).

The coach role was primarily that of a staff developer. The MCP provided professional development to coaches, who in turn provided job-embedded professional development to teachers, as illustrated in the program’s Structural Design (MCP, n.d.e). The implementation of the program’s assurances allowed coaches to work with up to four teachers, a minimum of four days a week, during each six week period (Brosnan & Erchick, 2009; MCP, 2011b, 2011c). Consistent with the program’s intentions, coach schedules showed the majority of coach time being spent coaching, planning, and debriefing with teachers in an effort to modify instructional practices (Brosnan & Erchick, 2009; Brosnan et al., 2011; Hattie, 2009; McNulty & Besser, 2010).

The staff development opportunities coaches provided aligned to the HQPD standards and corresponding research. Most coach time was dedicated to providing ongoing, job-embedded professional development in teacher classrooms (Brosnan et al., 2011; ODE, 2007). Coaches structured the level and intensity of support to embrace the individual needs of cooperating teachers (McNulty & Besser, 2010; ODE, 2007). In
doing so, coaches provided both content and pedagogical support to teachers. Coaches collected, collaboratively analyzed, and assisted in teachers in using multiple sources of data to inform instructional practices, while ultimately informing the coaches’ work in each classroom. This included but was not limited to collection and analysis of achievement tests, district assessments, and evidence tracker data (ODE, 2007). Coaches provided collaborative professional development opportunities to teachers through planning, professional development, data analysis, and reflecting (Ball & Cohen, 1999; Darling-Hammond, 2010; Dufour et al., 2005; ODE, 2007). Coaches supported teachers in planning for, introducing, implementing, practicing, and reflecting upon a variety of instructional strategies (Hattie, 2009; Joyce & Showers, 2002; Loucks-Horsley & Sparks, 1989; McNulty & Besser, 2010). It is further recommended staff developers evaluate the impact of their efforts. Coaches, teachers, and administrators found the impact to be profound in modifying instructional practices, gaining achievement related results, increasing expectations, and enhancing student engagement (ODE, 2007).

The coaches’ pursuit of understanding, communicating, and implementing their role with fidelity exemplified the need for administrative support. In limited cases, administrators added non-coaching-related responsibilities and tasks to the coaches’ duties (Chval et al., 2010). This included an overwhelming number of duties—substituting, serving on committees, and/or providing formal professional development opportunities. They became engaged in nothing less than a juggling act. This further increased the need for administrators to understand the true role and responsibilities of the coach and their role in supporting, as defined in Appendix D (Killion & Harrison,
This requires administrators provide structures that focus coaches’ efforts on providing job-embedded professional development to teachers (Knight, 2009; Neufeld & Roper, 2003).

**Planning for Coaching**

When planning for the work, coaches felt and communicated the necessity to establish trusting relationships with teachers and prove their role as non-evaluative. They provided listening ears to teachers, as well as resources and encouragement. Coaches believed these efforts assisted in establishing non-threatening relationships, while increasing teacher willingness to engage in collaborative, co-teaching partnerships.

Coaches were intentional when considering a variety of factors and selecting the three to four teachers they would partner with (Hansen, 2009; MCP, 2011b, 2011c). Teacher willingness was an initial concern of coaches and consistent with the MCP approach to the work. Coaches used interest inventory results to gauge willingness to engage in planning, co-teaching, and debriefing efforts, and scheduled their work accordingly (Brosnan & Erchick 2009; Brosnan, Erchick, Bao & Zollinger 2010; Brosnan et al. 2011b; McKeny, 2010; MCP, 2011a). MCPSVI data indicated the willingness of many teachers to participate, with some willing to change their instructional times to become eligible for participation. Other factors contributing to the selection process of coaches, teachers new to grade levels, teachers at tested grade levels, and/or those teachers that administrators requested coaches work with.
In some situations, teachers were unwilling to engage in co-teaching partnerships, and to change in general (Balka et al., 2009). These teachers included those apprehensive to stray from testing preparations, those skeptical of the coaches’ intentions, and in some situations those already exhibiting high achievement results. Consistent with findings from Race et al.’s (2002) study, additional barriers in teacher participation included scheduling and test preparation. In addition, some coaches experienced work time limitations due to obligations in multiple buildings, conflicting duties or responsibilities, and/or conflicting instructional times.

Although the majority of administrators supported the coaches’ preference of working with willing teachers, limited situations prompted an effort by administrators to force such relationships. This produced less than optimal conditions for change. In fact, it placed some coaches in an administrative, evaluative role, which is inconsistent with the concept of coaching (Balka et al., 2009; Joyce & Showers, 1980; Knight, 2009). As consistent with previous research, MCP coaches felt working with reluctant teachers not only be an ineffective use of their time, but also detrimental to their future work (Hansen, 2009).

Coaches preferred to follow the MCP approach, and stressed the importance of working with willing teachers (Brosnan & Erchick 2009; Brosnan, Erchick, Bao & Zollinger 2010; Brosnan et al. 2011; McKeny, 2010; MCP, 2011a). They thought their efforts naturally opened doors to others, some of whom were previously reluctant (Hansen, 2009). In this study, doors were opened by the word of mouth and through observing the impact of coaching from afar (McNulty & Besser, 2010; Reeves 2006;
Coaches highlighted the importance of administrators honoring their work with willing teachers, and being patient and understanding in recognizing that such willingness grows with time. These coaches suggested the need for principals to understand the necessity in providing supportive structures to allow for successful, job embedded professional development efforts (Chval et al., 2010; Killion & Harrison, 2005; Knight, 2009; Neufeld & Roper, 2003).

The Coaching Process

Coaches’ schedules illustrated their work in providing ongoing, job embedded professional development to up to four teachers, for a six-week period (MCP, 2011b, 2011c). Consistent with the MCP approach, coaches provided observation, conferencing, modeling, and co-teaching support (Brosnan & Erchick, 2009; Hansen, 2009; MCP, 2010b; ODE, 2007; Race et al., 2002).

Prior to engaging in co-teaching relationships, many coaches observed teachers. This was done in an effort to better understand the teacher’s unique starting points, style, and classroom management, and provide a foundation for the work. During pre-conferencing, coaches worked with teachers in designing effective lesson delivery. Consistent with Becker’s (2001) findings, coaches referred to teachers previously moving page by page, relying on the textbook to drive instruction. Coaches worked with teachers to use textbooks as resources, and not guides. They worked with teachers to review existing curriculum resources, and revise, and/or supplement to ensure rich problem solving opportunities (MCP, 2010c). Therefore, the work of the coach was not dependent
upon any specific curriculum or resource, but rather best practices of instruction. This supports MCP’s “curriculum independent” design (Hiebert et al., 1997; MCP, n.d.f, p. 1, 2011c).

The coaches worked with teachers to provide more problem solving opportunities to students, and increase the cognitive demand of such problems (Becker, 2001; Hansen, 2009). They collaboratively planned to make mathematics more engaging for students (Hansen, 2009) and incorporate the Process Standards in instructional practices (Balka et al., 2009; NCTM, n.d.b; Peshman, 1992). In some pre-conferencing conversations, the coach and teacher discussed potential student misconceptions and how to accommodate instruction to ensure understanding of concepts, and how student learning would be assessed (Hansen, 2009).

During lessons, coaches engaged in modeling and co-teaching, to varying degrees. Coaches were uncomfortable modeling lessons, but instead modeled with intention (McGatha, 2008; MCP, 2010b). Ball et al. (2005) suggested that providing engaging opportunities for students requires a sense of increased confidence and understanding of mathematical concepts. When coaches sensed discomfort in content or in implementing different instructional strategies, they simply jumped in and modeled for the teacher. The specific strategies modeled (West & Staub, 2003), included but were not limited to questioning, wait time, and the use of an evidence tracker. In addition, coaches modeled strategies consistent with the Process Standards. Teachers appreciated the support of coaches in modeling such strategies.
Coaches typically embraced a co-teaching model (MCP, 2010b, West & Staub, 2003). The level and intensity of support varied, depending upon the unique needs of teachers, with involvement often decreasing over time. Coaches worked with teachers in stepping away from being the sole providers of content knowledge. They assisted teachers in allowing students opportunities to construct and share their knowledge to bring about a deeper conceptual understanding of the content matter (Resnick & Hall, 1998; West & Staub, 2003), and in building connections among concepts and ideas. Throughout lessons, coaches worked with teachers in continually using the Process Standards to guide instruction (Balka et al., 2009; NCTM, n.d.b; Peshman, 1992).

During post conferencing, coaches worked with teachers to reflect upon successes, areas needing further development, and next steps for instruction including extensions of learning. In addition, some coaches, used evidence trackers, discussed evidence of student learning, and next steps for instruction (West & Staub, 2003; MCP, 2010b).

Similar to McGatha’s (2008) findings, MCP coaches perceived a lack of time in planning and debriefing to be barriers to their work. MCPSVI data showed coaches who lacked planning time with teachers either solely modeled lessons, or became mere assistants to the work. These coaches recognized an extreme need to increase both pre-conferencing and debriefing efforts to become successful in their positions.
Instructional Approaches Consistent with the MCP

The MCPSVI data indicated an evolution in instructional practices of teachers working with coaches. Though pre- and post- observations were not conducted, an understanding of the evolution was developed through triangulation of interview comments on previous instructional practices, and both interview and observation data on current instructional practices. Prior to their work with coaches, many teachers were described as being more traditional in their instructional efforts. They acted as content authorities and providers of information (Freire, 1989), with some relying solely upon textbooks for instruction (Adams & Krockover, 1997). Students worked primarily in isolation, completing lower level, pencil/paper worksheet oriented tasks (Darling Hammond, 2010). Problems and sharing were solution oriented, with little detail on the process and/or multiple strategies for solving. There were limited opportunities for students to use manipulatives, solve problems in their own way, communicate with others, and justify their thinking.

It is important to note, each teacher had unique starting points prior to his/her work with the coach. Therefore, even in situations where modified instructional practices were not refined, progress was made. Teachers were practicing, finding value in, and replacing previously sacred instructional strategies with new approaches. Coaches celebrated substantial and minimal gains in progress. In some cases, the minimal gains were major breakthroughs, considering the pervasiveness of traditional instructional strategies. In these cases, though coaches were ecstatic with the progress made, they also recognized there were more mountains to climb.
With the coaches’ support, teachers implemented and refined MCP related instructional strategies, which included the use of the Process Standards (Brosnan et al., 2011; Cornelius-White, 2007; Hansen, 2009; MCP; n.d.c, n.d.f; NCTM, n.d.b). This included providing students opportunities to engage in higher-level tasks (Schoenfeld, 2002). This required that the coaches work with teachers to assess the cognitive demand of instructional questions (Hansen, 2009). This work included the careful analysis of existing curriculum resources in attempt to select, revise, adapt and/or supplement problems to allow for rich, or open-ended solving opportunities for students (MCP, n.d.f). This highlights the MCP’s design of being “curriculum independent because the approach allows the pedagogy to focus on the critical features of instruction” (Hiebert et al., 1997; MCP, n.d.f, p. 1, 2011c).

Similar to previous research, the initial posing of higher-level problems led to discomfort amongst teachers and students (Clarke, 1997; Cohen, 1990). Often, students were frustrated when presented higher-level tasks, as they wanted to be guided through solving. Many teachers experienced discomfort in observing students struggling to solving problems, and wanted to jump in and assist them (Boaler, 2002; Cohen, 1990; Friere, 1989; Hiebert et al., 1997; Stephens et al., 1989). In fact, when first providing such opportunities to students, teachers often presented questions in a traditional manner, leading students through the problem solving process (Hiebert & Sigler, 1999; Stephens, et al., 1989). Some teachers also expressed apprehension about such time consuming tasks, as content coverage was necessary before state testing (Race et al., 2001).
With the support of coaches, teachers began to appreciate rich problem tasks. Teachers uncovered many standards and/or concepts covered in higher-level problems. When teachers thought problem difficulty exceeded student abilities, coaches advocated that students could handle such problems, and encouraged teachers to be patient, and exercise wait time (Gutstein, 2006, Gutstein & Peterson, 2005; Hiebert et al., 1997; MCP n.d.c, n.d.e, 2010b, 2010c). Overtime, teachers became more comfortable with students experiencing confusion and allowed students to solve problems without explicit guidance. Research suggests this to be an essential component to mathematics instruction (Boaler, 2002; Friere, 1984; Hiebert et al., 1997; NCTM, n.d.b).

When posing rich problems, coaches worked with teachers in allowing for multiple entry points, and strategies of varying complexities (Hiebert et al., 1997; Hiebert & Stigler, 1999; MCP, n.d.c, n.d.f; NCTM, n.d.b). MCPSVI data indicated multiple representations of problems, in which students used manipulatives, drawings, words, and numbers to represent and solve problems. Students were also provided challenges to solve problems in a different manner. When presented rich problems, coaches worked with teachers to focus attention on the process over the solution. Students became constructors of their own learning, and capable of their own a-ha’s (Friere, 1989; Resnick & Hall, 1998). Through allowing multiple strategies, teachers discovered both young- and low-achieving students were able to experience success (Carpenter et al., 2000). As a result, teachers became advocates for posing such problems to all students (Gutstein, 2006). Research suggests this assists students in developing a better understanding of concepts and procedures (Hiebert et al., 1997; Hiebert & Stigler, 1999).
Students were provided opportunities to work collaboratively with others in effort to uncover meaning and make sense of problems (Freire, 1989; NCTM, n.d.b). While students were working, it was common for coaches and teachers to circulate, asking them questions about their thinking (MCP, n.d.f, 2011). At the end of most lessons, students were provided formal opportunities to display and share their work with the class. This method shifted content authority from the teacher, traditionally explaining everything to students, to students actually communicating their thinking (Hiebert et al., 1996; Reinhart, 2000). The teacher and coach often worked together to select students to share out, in a specific order that may assist the students in making connections among ideas, including those of less and increasingly difficult complexities (MCP, n.d.f). The coach brought an understanding of connections among concepts and to higher-level mathematics in their work with teachers (Balka et al., 2009; Hansen, 2009).

Students had shared authority in the classroom and were given opportunities to communicate, justify, and make connections among their work (Hiebert et al., 1996; NCTM, n.d.b). As a result of using self-initiated strategies, students became more comfortable and willing to share their work with others. While sharing their work with the class, the teacher and coach challenged students to explain, prove, and justify (Hiebert et al., 1996; MCP, n.d.c, n.d.f; NCTM, n.d.b). There was some evidence of accountable talk, with the teacher and/or coach encouraging students to “parrot,” or rephrase what others said. In addition, some used evidence trackers to document student learning (MCP, 2010b). Coaches suggested information gained from students’ sharing their thinking, aided themselves and teachers in analyzing gained student knowledge as well as any
misconceptions they may have. Coaches believed this information to be helpful during debriefing to assist in understanding where they should go next with the material (Brosnan et al., n.d.d; Carpenter et al., 2000; Fennema et al., 1992; MCP, n.d.f).

However, as MCPSVI data suggested, debriefing often becomes an act that gets “brushed under the rug.” This leads one to question the number of missed instructional opportunities, as a result of more informal approaches to debriefing. It is important that time is set-aside for these purposes.

**Greatest Coaching Accomplishments**

Coaches felt a great sense of accomplishment when teachers, who were once reluctant and/or skeptical of working with them, became willing to engage in such partnerships (Hansen, 2009). As previously discussed, willingness increased by the word of mouth, and through observing the impact of coaching efforts (McNulty & Besser, 2010; Reeves, 2006; Schmoker, 2001).

In addition, coaches were excited about teachers experiencing breakthroughs when implementing specific instructional strategies. Unlike previous studies, this research neglected to make comparisons between the impact of traditional and coach related professional development upon transferring learned skills into practice (Bush, 1984; Joyce & Showers, 2002). However, the findings did suggest teachers implementing different strategies, through continual practice and support from the coach (McNulty & Besser, 2010; ODE, 2007). As student success was observed, teachers began to consider newly implemented strategies superior to those previously used. These strategies
included but were not limited to the use of the Process Standards, higher-level mathematics, and both hands-on and constructivist approaches (Bush, 1984 Joyce & Showers; 2002; Race et al., 2001).

Through implementing strategies, many teachers who initially underestimated what their students could do (Carpenter et al., 2000), observed student success, and heightened their expectations for students. Once reluctant and/or unsuccessful students experienced success in ways never imagined. Students who were previously considered to be low achievers and/or learning disabled had breakthroughs in mathematics, becoming engaged and enthusiastic about mathematics. They became comfortable in taking risks, solving problems in their own way, and communicating their thinking to others (Cornelius-White, 2007; Reinhart, 2000). Similar to Race et al.’s (2001) findings, coaches suggested student engagement in mathematics decreased classroom disruptions. Through providing rich tasks, and a hands-on approach to learning, coaches motivated students to participate, and the students seemed to be less likely to engage in risky behavior.

**Greatest Challenges**

Coaches found several different factors to be the greatest challenges to the work. They suggested some teachers initially misinterpreted their role to be that of an evaluator. They felt the need to prove themselves as equals, and build non-threatening relationships and rapport (Balka et al., 2009; Knight, 2009; Neufeld & Roper, 2003). Previous research suggested proving their roles, as non-evaluative in nature, to be a common trend among
first year MCP coaches in schools having the highest achievement gains (Harrison et al., 2011). This research study further uncovered these initial barriers weakened overtime, as coaches were able to establish rapport with teachers.

Although many coaches were able to work with teachers and administrators in flexibly scheduling their work with teachers, a limited number of coaches were less fortunate. These coaches considered scheduling to be a major barrier to their work (Race et al., 2001). In these situations, some or all teachers were scheduled to teach mathematics at the same time. Coaches developed a sense of frustration when faced with scheduling conflicts, conflicting duties, and/or responsibilities to multiple buildings, all of which placed constraints on their efforts (Chval et al., 2010). Interestingly, previous MCP research suggested an excess of duties and/or conflicting schedules to be a common trend among schools with the lowest achievement gains (Harrison et al., 2011).

Consistent with McGatha’s (2008) research, some MCP coaches perceived a lack of planning, instructional, and debriefing time to be barriers to their work and desired additional time to be dedicated to such efforts. The MCPSVI data showed those who were unable to engage in planning served solely as modelers, or mere assistants to instruction. Harrison et al.’s (2011) research identified a focus on coach modeling and intervention to be a common trend among first year MCP schools having the lowest achievement gains. On the contrary, schools with the highest achievement gains dedicated time to co-teaching over modeling, and made pre-conferencing and debriefing a priority.
Although many coaches had administrators who supported and upheld program assurances as shown in Appendix D (Brosnan et al., 2011; MCP 2011b, 2011c), some did not. In these situations, coaches struggled and believed they were not set up for success in scheduling and/or assigned responsibilities. Both coaches who were and were not supported in these regards, stressed the importance of administrators providing the structure to promote success. This heightened the need for administrators to understand and communicate the role of the coach to teachers, while providing a structure holding job embedded professional development at its central focus (Killion & Harrison, 2005; Knight, 2009; Neufeld & Roper (2003).

**Professional Support Needs**

Through their work with the MCP, coaches received ongoing professional development support in foundational knowledge, content, pedagogy, the Process Standards, assessment, data, and instructional decision-making (MCP, 2010c). As consistent with the structural design of the program, coaches used the learning from their personal professional development to impact the work within their buildings (MCP, 2010b, n.d.d). MCPSVI data showed districts’ extreme appreciation for the MCP and the support of their coaches. Support was primarily in the form of job-embedded coaching, in addition to providing a variety of formal professional development opportunities.

Administrators and teachers alike were appreciative of the program’s work, and ultimately, of the coaches’ impact within their individual buildings. They spoke about both quantitative gains through local or state assessments as well as qualitative gains in
the evolution of instructional practices. Credit was given to the MCP and the ongoing support of the coach. Teachers began to provide students exciting, engaging opportunities in mathematics. They provided rich problems and questioning, which afforded students opportunities to solve problems in their own ways, and communicate, and defend their thinking.

The daily support coaches provided teachers assisted in the transformation of practices. In addition, coaches provided formal professional development opportunities as a result from knowledge gained at the MCP professional development sessions. These included but were not limited to short answer and extended response scoring of OAT items, the discussion of articles, the use of rich problems, and data analysis (Brosnan & Erchick, 2009). MCPSVI data suggested with continued participation in the program, coaches were able to offer more formal professional development opportunities to their staff. Administrators and teachers expressed their appreciation of the coach’s efforts, and became implementers and advocators of their work, and the coaching position.

In Chval et al.’s (2010) study, coaches, being neither teachers nor administrators, often lacked necessary support in their positions. Research suggests the importance of districts considering how coaches will be prepared (Feger et al., 2004). Like teachers, they need their own learning experiences (Knight, 2009), that enhance their knowledge of content, pedagogy, and coaching. Coaches, in this study, discovered their affiliation with the MCP to be instrumental in supporting their efforts. The support assisted coaches in both content and pedagogy, and gave them a deeper understanding of their roles and what they encompassed. When coaches looked to grade levels they were unaccustomed to
teaching, they looked to the program for support. They appreciated the opportunity of observing both the coaching process and mathematics instructional techniques. They enjoyed engaging in role-plays, observing, and discussing various techniques related to real life coaching scenarios. In addition, coaches appreciated the small group collaborations made available through their local facilitator groups. They appreciated the facilitator’s support in their daily work and in acting as a liaison to the program. MCPSVI data showed that site visitors’ perceptions of the coaches’ content and pedagogy increased with continued program participation. The coaches’ only recommendations for improving the program included the need for increased organization to better communicate assigned tasks and deadlines.

Coaches in Chval et al.’s (2010) study were somewhat apprehensive of committing time to such professional development, as they believed it took time away from their coaching efforts. However, they also stressed the need to participate in professional learning experiences, which included collaborating with other coaches. This study revealed similar results, as MCP coaches were also very appreciative of their professional learning opportunities and considered them a necessity to support their work. While most districts were supportive and advocated for the coaches attending their own professional development, a limited number were not so encouraging. These districts expected coaches to spend time in the building, and felt that attending MCP professional development took them away more than they would like. However, the data suggested these coaches were being pulled continuously due to numerous district initiatives, with MCP being a minimal contributor for their absences. It is important to add, that the same
districts concerned with coach absences communicated how pleased they were with the professional development opportunities coaches were able to provide. These professional development opportunities resulted coincidently, from their attendance at MCP sessions.

Limitations

Though minimal, it is important to highlight the limitations of the study. Though populations associated with each coach’s sites were diverse in their composition, coaches were bound by their affiliation with the MCP. Therefore, the intentions of the study were not to generalize findings to other populations. The study was instead aimed at investigating and better understanding common experiences and trends among MCP coaches. Consequently, generalizing findings of this bound case to other populations may be problematic. However, detail was provided to better assist the reader in understanding potential comparisons of their existing program to the one associated with this study.

An additional concern would be the limited amount of time spent in each coach’s building, as it relates to the validity of the study. Coaches received at least one site visit each year, with some receiving multiple visits. These visits were prearranged to accommodate planning, scheduling, and geographic locations. It is important to note that these site visits provided snapshots of observed and shown happenings throughout schools and classrooms. Optimally, each coach would receive more than one visit. This would provide additional supporting data to better understand actual occurrences and experiences. Given resource constraints, site visitors accommodated these potential barriers through triangulating observation, multiple interviews, and documenting data
during each visit. If the need to collect additional information was shown, additional, follow-up site visits were scheduled. These measures assisted in enhancing the validity of findings and most accurately understand and report the evidence before us.

Furthermore, it is important to recognize the difficulty in claiming causal relationships. This is due to the absence of pre- and post- site visits and the inability to accommodate possible extraneous variables that may be contributors to experiences and/or behaviors. However, an overwhelming amount of interview data, observation data, and corresponding comments from administrators and teachers shed light on the perceived evolution of instructional practices. The triangulation of data sources accommodated the limitations in the overall structure of the data collection efforts, as best as possible.

Quantitative data were used to support qualitative findings, however, it is imperative they are not overemphasized or reviewed in isolation. In spite of continual program participation data, changes in quantitative ratings were not held constant to particular teachers. Instead, they reflected the coaches’ work with different teachers. Therefore, the quantitative data served as a mere snapshot of the coaches’ work with individual teachers. These data neglect to provide rich detail on the unique starting points or originalities of teachers, and a detailed account for the progress made. This intensifies the need for qualitative data to provide a more comprehensive analysis of the coaches’ work. Quantitative measures were used as a means to triangulate and quantify findings.
Implications

This study adds to existing research on mathematics coaching. Better understanding the impact of coaching efforts, which was brought to light through this study, serves to ultimately benefit districts, the MCP, policy makers, and other coaching programs. The findings of this research provide a voice to coaches, through transferring awareness of common experiences, including the impact on changed practices, accomplishments, challenges, and perceived needs. This information will assist key stakeholders in tailoring their efforts to heighten the need to proactively support coaches in their efforts, and ultimately promote coaching as a viable, necessary means of professional development.

The initial reliance on traditional instructional methods and materials was indicated in this study, and when combined with research, may provide an accurate picture of the current practices in our mathematics classrooms. This highlights the need for districts to carefully examine and consider the need for modifying pedagogical practices to align with what we know about research in mathematics instruction.

When looking toward these changes, districts must carefully consider their options to ensure the economic mileage of their professional development efforts. Funding continues to be a challenge for continuing implementation of change efforts (Duke, 2004), and the often-limited returns of such efforts (Hiebert et al., 2003) are disheartening. As resources become scarce, we must ensure the ongoing nature of our change efforts. The MCP’s design and efforts are unique and enhance the likelihood for a lasting impact, far beyond initial implementation.
One characteristic of successful educational change involves providing ongoing, differentiated professional development support (Duke, 2004). The findings of this and previous studies suggest the job-embedded, day-to-day professional development support from the coach, to be invaluable in supporting the change process. The MCP is not a one shot workshop, but rather provides an ongoing framework, aligned to the HQPD standards, and the individual needs of teachers (ODE, 2007).

Coaches acted as daily resources and supported teachers in planning, modeling, co-teaching, and debriefing efforts. They introduced, modeled, and assisted teachers in providing rich questioning and implementing the Process Standards. Previous research suggests these guided practice opportunities enhance the transfer of knowledge and skills into action (Fullan, 1993; Hattie, 2009; Joyce & Showers, 2002 Loucks-Horsley & Sparks, 1989; McNulty & Besser, 2010), and assist teachers in taking risks (Bruce & Ross, 2008; Darling-Hammond, 2010; Little, 1990). They also build confidence in implementation efforts, which is instrumental to successful, lasting change (Duke, 2004).

Previous research has shown, with continued participation in the MCP, gains in teacher and coach content, pedagogy, and equity in mathematics instruction (Erchick et al., 2007; Erchick & Joseph, 2010) and an increase in student learning and achievement (Brosnan et al., 2010; Brosnan et al., 2011; Coniam, 2010; Coniam et al., 2010; Erchick, 2007; Erchick et al., 2007; MCP, 2010c; McKeny, 2010). In this study, data suggested the modification of instructional practices. Teachers began to focus more on the process involved in problem solving, as opposed to just finding answers. They became listeners
and facilitators of learning, as opposed to providers of knowledge. Expectations of students increased, with students ultimately rising to the occasion.

Both administrators and teachers, recognized, appreciated, and communicated the support of the coach. Duke (2004) suggested sustainability requires ownership from those implementing, and that such efforts would naturally promote “loyalists to lobby on their behalf” (p. 175). In this study, administrators and teachers not only welcomed the coaches’ efforts, but also considered them to be a necessity within their schools. The results obtained through implementation both intensified efforts (McNulty & Besser, 2010; Reeves, 2006; Schmoker, 2001) and led them to advocate for such practices.

In this study, even reluctant teachers jumped on board and became advocates through observing success in implementation. Teachers began to embrace change through observing all students becoming engaged, motivated and ultimately successful in their endeavors. Duke (2004) suggested change efforts become long lasting when they are deemed meaningful and important. This is similar to Franke et al.’s (2001) study of teachers continuing to process and build upon their knowledge from an initial professional development session around student thinking. The teachers experienced first hand the direct impact they could have through using such knowledge to inform practices. The perceived need for continuing forward enhanced the sustainability of the efforts.

This study revealed the structure of support MCP coaches provided, and the impact of such efforts. It will better enable districts the opportunity of making comparisons to their own structure, through identifying successes and failures. Districts
not experiencing this successful transfer of learned knowledge and skills, must carefully consider other methods of investing their resources.

Instructional changes and implementation of practices within this study were dependent upon the ability of the coach to engage in a true co-teaching relationship with the teacher. In this study, coaches stressed the importance of working in one building, and with a small number of willing teachers. They also emphasized the importance of planning and debriefing time with teachers, without which, coaches became as modelers or assistants. This highlights the need for districts to become advocates of mathematics, just as they attended literacy efforts in the past.

In this study, most coaches were provided the necessary support to allow for such structural components; however, a limited number of coachers were not as fortunate. Coaches stressed the importance of administrators in providing a structural backing to promote success in their efforts. Duke (1994) suggested that when an organization lacks structure and support, barriers to educational change arise. It is imperative that districts define boundaries for the work of the coach and uphold them at all costs. In this study, MCP program assurances were used to guide the structure and cultivate support from the district, teachers, coaches, and MCP personnel. In this program, as with any other program, several entities disregarded the implementation of certain assurances. However, on the flip side, we must consider the wonderful impact of the many of who upheld the structure and ask this question: What if there were no structure? In this study, several coaches expressed the importance of having assurances and guidelines, without which they too would be pulled into directions for which they were not originally intended.
Coaches, either supported or not supported by their administrators, discussed the crucial impact their support had upon the success of their efforts. It is increasingly important that responsibilities are established and upheld in an effort to obtain results consistent with MCP findings. Furthermore, the MCP must continually consider how to effectively reach out to the limited schools, needing to realign themselves with the structure, efforts, and results, intended through the program they originally sought to participate in.

This study’s findings also underscored the need for coaches receiving professional development support. Coaches suggested the need for personal professional development experiences in effort to enhance their own understandings and guide their work with teachers. They appreciated the content, pedagogy, and coaching support the MCP provided. The program assisted coaches in uncovering their roles, and becoming more comfortable with the coaching process. Coaches found value in observing the coaching process in action, participating in role-plays, collaborating around the process, and receiving content support. Coaches not only used their professional learning experiences to guide their job-embedded professional development with teachers, but also corresponding formal professional development opportunities. Therefore, the findings throughout this study, stress the need for districts to consider how they will support coaches in their own professional learning.

Though the MCP was designed to support mathematics instruction, the learned principles and practices are easily transferrable. The instructional practices, and pedagogy advocated by the program would benefit the teaching of each subject area. The need to advocate for high expectations, higher-level thinking, and engagement in
problem-solving, communicating, and making connections would benefit all. In addition, students gaining self-confidence and enthusiasm through engaging in such experiences may transfer their thinking to other situations. Therefore, the work of the MCP may expand outside of mathematics in implementation of aligned practices, or pave the way for similarly designed coaching programs to infiltrate other subject areas.

The efforts of the MCP are long lasting, and may be sustained beyond participation in the program. However, we must advocate for the continuation of programs, such as this, to broaden the impact to other teachers and schools. We must not deny teachers the opportunity to refine their instructional practices and have experiences and results similar to those captured within this study.

**Directions for Future Research**

The information gathered from site visits not only assisted the program in informally monitoring implementation, but also, as indicated in this study, served as a summative means for understanding overall program implementation. The continuation of such visits is important, while there is an increasing need to conduct site visits on a more consistent basis, with coaches receiving multiple site visits each year. This would allow for a more comprehensive look into the coaches’ experiences and situations, and better assist the program in providing timely support for their individual needs. In addition, discrepancies among program assurances and implementation efforts may be investigated and supported accordingly.
It may also be beneficial for the program to consider conducting ongoing site visits, in effort to observe the coach working with the same teacher over an extended period of time. While interview and post-observation data are currently used to shed light on the evolution of instructional practices, it would be optimal to have multiple observations to add rich, descriptive data to exemplify such findings.

Other implications for future research include incorporating both pre-conferencing and debriefing during site visits. In doing so, the researcher will gain observational insights of these endeavors and possible evidence of lesson planning, resources used, prior knowledge of students, and how such knowledge will be accommodated or extended during the lesson. In addition, debriefing efforts will assist the researcher in collecting, both the evidence of reflective efforts and implications for future instruction.

Adding to the existing body of research, future endeavors will assist in better understanding and communicating the impact of mathematics coaching, as well as the necessary structures for successful replication. As new research findings surface, and new trends emerge, it is important that we respond. As a nation, we must aspire to be more, and want more for the generations to come. We must embrace, protect, and replicate programs like the MCP, which provides rich and rewarding opportunities to all teachers, and all students. The livelihood of our children and future citizens are at stake. “What’s at stake is nothing less than the American Dream” (Obama, 2009, p.2).
References


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Mathematics Coaching Program (MCP). (2010b). MCP facilitator handbook [PDF]. Columbus, OH: The Ohio State University Mathematics Coaching Program.


Ohio Department of Education (ODE), State Board of Education. (2007). *Standards for Ohio educators* (pp. 60-74). Columbus, OH: Ohio Dept. of Education.


Programme for International Student Assessment (PISA). (n.d.a). *Organisation for Economic Co-operation and Development.* Retrieved from http://www.pisa.oecd.org/pages/0,3417,en_32252351_32235907_1_1_1_1_1,00.html


APPENDIX A

CONCEPTUAL FRAMEWORK
CONCEPTUAL FRAMEWORK

MCP Conceptual Framework

Perspective: Integrated procedural/conceptual

Content: Richly connected

Processes: A framework for understanding

Mathematical Elements

The Learner: Cognition and culture

Learning Environment: Shared authority

Equity, Diversity & Social Justice: Commitment to action

Instructional Decisions: Assessment-based

Assessment: Informative focus

Task selection: Problem-based

Learning Environment Interactions: Learner-Centered

Learner Responsive Mathematics Education LRME

The Ohio State University Mathematics Coaching Program
APPENDIX B

STRUCTURAL DESIGN
APPENDIX C

MATHEMATICS COACH SELECTION GUIDELINES
Mathematics Coach Selection Guidelines

Procedure
1. Recruitment (You may have the perfect person in mind already.)
2. Application (You may want to widen your selection pool.)
3. Documents to solicit from applicants
   a. Resume, Transcripts
   b. Letter of intent, Reference letter(s)
   c. Completed MCP Content and Pedagogy Inventory (Provided and scored by MCP project staff.)
   d. Completed application
4. Interview (suggested questions provided by MCP)
5. Performance Assessment (i.e. video of teaching)

Suggested Qualifications
1. P-6 Mathematics Specialist Endorsement (or some coursework completed toward P6MSE)
2. Degree in mathematics or mathematics education; masters in education
3. Mathematics content knowledge coursework
4. Pedagogical content knowledge in line with current state and national expectations
5. Experience teaching; note grade level, subjects taught
6. A minimum three consecutive years of successful mathematics classroom experience
7. Successful teaching of students who struggle
8. Experience as a teacher leader
9. Experience as a professional development provider
10. Recent professional development as a participant
11. Experience in research data collection and analysis and data based decision making
12. Demonstrated commitment in math professional development
13. Good communication skills
14. Good organizational skills
15. Good personal and professional relation skills
16. Flexibility in collaborative work
17. Willingness to delve into mathematics content
18. Commitment to a five-day summer workshop
19. Commitment to before and after school time to meet with teachers
20. Demonstrate a genuine interest in how students think and a commitment to student understanding

Selection Committee, please try to include one or more of these persons:
1. MCP Principal Investigators or representative(s)
2. ODE Representative(s)
3. SST (School Support Team) Director(s)
4. Teaching Learning Collaborative Director
Criteria for Selection of a Mathematics Coach

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Interview for Selection of a Mathematics Coach

For interview or written responses:

1. What is your philosophy of teaching and learning mathematics?

2. Why do you want to be a mathematics coach?

3. What kinds of expertise do you bring to this position?
MCP Inventory

1. Students sometimes remember only part of a rule. They might say, for instance, “two negatives make a positive.” For each operation listed, decide whether the statement “two negatives make a positive” sometimes works, always works, or never works. (Mark SOMETIMES, ALWAYS, NEVER, or I'M NOT SURE.)

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<th>Sometimes works</th>
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<td>b) Subtraction</td>
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<td>c) Multiplication</td>
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<td>d) Division</td>
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2. Ms. Whitley was surprised when her students wrote many different expressions to represent the area of the figure below. She wanted to make sure that she did not mark any that were actually right. For each of the following expressions, decide whether the expression correctly represents or does not correctly represent the area of the figure. (Mark REPRESENTS, DOES NOT REPRESENT, or I'M NOT SURE for each.)

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<td>b) ((a + 5)^2)</td>
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<td>c) (a^2 + 5a)</td>
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<td>d) ((a + 5)a)</td>
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<td>e) (4a + 10)</td>
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3. You are working individually with Bonny, and you ask her to count out 23 checkers, which she does successfully. You then ask her to show you how many checkers are represented by the 3 in 23, and she counts out 3 checkers. Then you ask her to show you how many checkers are represented by the 2 in 23, and she counts out 2 checkers. What problem is Bonny having here? (Mark ONE answer.)
   a) Bonny doesn’t know how large 23 is.
   b) Bonny thinks that 2 and 20 are the same.
   c) Bonny doesn’t understand the meaning of the places in the numeral 23.
   d) All of the above.

4. Ms. Walker’s class was working on finding patterns on the 100’s chart. A student, LaShantee, noticed an interesting pattern. She said that if you draw a plus sign like the one shown below, the sum of the numbers in the vertical line of the plus sign equals the sum of the numbers in the horizontal line of the plus sign (i.e., $22 + 32 + 42 = 31 + 32 + 33$). Which of the following student explanations shows sufficient understanding of why this is true for all similar plus signs? (Mark YES, NO, or I'M NOT SURE for each one.)

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<td>3</td>
</tr>
</tbody>
</table>
MCP Inventory

5. After a recent student-centered lesson that focused on classifying shapes based on their properties, a third-grade teacher overheard the following verbal exchange between students in her class:

*Spike:* After we’ve been looking at these shapes all week, I think that squares are a whole lot like rectangles.

*Guido:* I don’t think you know what you’re talking about! Everybody knows that rectangles are special types of squares.

a) Explain each student’s thinking.

b) What concepts are they addressing in their conversation?

c) How would you help them develop definitions for squares and rectangles?
6. Mrs. Parker liked to vary the whole amount when teaching fractions, so she used as the whole this picture of two pumpkin pies.

Last Thanksgiving, she baked two pumpkin pies, but only the shaded parts of the pies were eaten. She asked her class what fraction of the whole amount of pie she baked was eaten.

For each student response that follows, indicate if the student was correct or incorrect, and indicate what fraction concept the student’s answer indicated she or he does or doesn’t understand.

a. Frank said it was \(\frac{10}{8}\)
   
   Is his answer correct or incorrect? (circle one)

   Indicate what fraction concept the student’s answer indicated she or he does or doesn’t understand.

b. Sheryl said it was \(\frac{10}{6}\)

   Is her answer correct or incorrect? (circle one)

   Indicate what fraction concept the student’s answer indicated she or he does or doesn’t understand.

c. Katelyn said it was \(\frac{5}{8}\)

   Is her answer correct or incorrect? (circle one)

   Indicate what fraction concept the student’s answer indicated she or he does or doesn’t understand.
APPENDIX D

MATHEMATICS COACHING PROGRAM ASSURANCES
Mathematics Coaching Program
Assurances 2011-12 DRAFT

The following assurances are program specific and are in addition to any assurances from grants and/or programs. By agreeing to participate in the professional development aspect of the Mathematics Coaching Project (MCP), the district agrees to the conditions outlined below.

The following assurances are organized according to job responsibility:

1. **The Field Faculty (Program Directors and Co-Directors) is expected to:**
   - Provide high quality professional development for facilitators and coaches.
   - Obtain University approval of all associated research practices.
   - Provide intervention strategies for teachers of students who struggle learning mathematics.
   - Provide assessment strategies to assist teachers with instruction.
   - Provide detailed data collection procedures.
   - Provide detailed data analysis reports.
   - Honor confidentiality of student and teacher data and documents.
   - Collaborate with advisory board and mathematicians on program implementation.
   - Recruit facilitators, satellite directors, mathematicians, and researchers.
   - Assist districts as needed with selection of coaches.
   - Train facilitators, coordinate activities and conduct regular facilitator meetings.
   - Work with principals to ensure understanding of the MCP.
   - Oversee the evaluation of entire project.
   - Manage program, personnel, evaluation procedures, and communication to ensure oversight of all program components.

2. **The Program Facilitator is expected to:**
   - Conduct regular meetings (twice per month) with coaches to monitor progress and mediate concerns.
   - Provide professional development for coaches on mathematics, pedagogy and coaching.
   - Conduct school visits to assist with program implementation.
   - Complete two site-visit inventories per coach per year.
   - Participate fully in all large group professional development sessions.
   - Attend ALL program facilitator meetings.
   - Invest 32 hours per month on the Mathematics Coaching Program.
   - Submit weekly facilitator reports.
   - Manage data collection procedures from their coaches.
   - Provide support, oversight, and assessment of documentation for program requirements.
   - Be responsible for all assigned coaches’ work and completion of assignments.
   - Communicate and serve as liaison with administration as appropriate.
   - Communicate and serve as liaison with school staff as appropriate.

3. **The Mathematics Coach is expected to:**
   - Provide full-time, on-site, job-embedded professional development for classroom teachers in mathematics.
   - Provide awareness sessions at each school so that all staff members are informed of the project.
   - Assist with student tests, such as OATs, primary grades diagnostics, and problem sets.
   - Conduct diagnostic interviews with selected students.
- Collect student assessment data including achievement tests, classroom assessments, and student work samples.
- Assist in establishment of building goals, strategies, and action steps, based on data analysis and work with staff.
- Document work performed, maintain schedules, collect data, and complete all other program requirements.
- Implement MCP instruction and assessment strategies as presented in the PD sessions.
- Team-teach with 3 or 4 teachers everyday for about 6 weeks, and then select the next 3 or 4 teachers.
- Provide professional development for teachers through pre- and post-lesson conference sessions, team teaching, analysis of student work and assessment data, and discussion of researched-based practices.
- Provide assistance for teachers in learning mathematics content, pedagogy, and assessment strategies to improve student learning and achievement.
- Attend all professional development sessions in their entirety for two days each month.
- Meet twice each month with the facilitator.
- Honor confidentiality of teacher and student data, documents, and communication.

The following assurances are organized according to job responsibility.

1. The Building Administrator is expected to:
   - Attend and participate in sessions designed for administrators, to become familiar with the project’s key components.
   - Provide space, desk, supplies, and access to a computer and Internet connection for the mathematics coach.
   - Designate time on faculty meeting agendas for coaches to share progress.
   - Permit the Field Faculty to conduct program evaluative research that includes mathematics achievement tests, classroom assessments, and sample student work and mathematics teacher inventories.
   - Arrange participating teachers’ scheduled “mathematics time” to be consecutive and not concurrent times.
   - Support scheduling of pre-and post-lesson conferences for teachers and coaches.
   - Provide time for coach to collaborate with teachers scoring pretests and professional development purposes.
   - Support the coach working with 3 (minimum) or 4 (maximum) teachers for about 6 weeks at a time to work in classrooms, as this is not a pull-out program.
   - Assign MCP mathematics coaches no more teacher duties than assigned to any other classroom teacher.
   - Help protect the coaches’ time by not allowing them to work as substitutes, taking on other projects, and limit them in participation in additional PD programs.
   - Honor confidentiality of the teacher/coach relationship.

2. The Building Mathematics Teachers are expected to:
   - Support coaches in their work with team teaching, studying student thinking, facilitating student sharing, reflecting on the process, and collecting data.
   - Schedule mathematics time when coach is available during the 4 to 6 weeks with the coach.
   - Implement specified instructional strategies and assessments and participate in pre- and post-lesson conferences with the coach to plan and analyze instructional decisions at least once per week.
   - Participate in project evaluative research by completing questionnaires, mathematics inventories, and allowing staff to observe and conduct interviews.
• Selected student work to analyze at pre- and post-lesson conferences with the coach.
• Remain in classroom with your coach to collaborate in planning, assessment, teaching, and classroom management each and every day.

3. The District is expected to:
• Work with ODE to resolve all fiscal matters.
• Provide ongoing support for principals in implementing programs and services as designated at the building level. Enable principals’ attendance at MCP meetings.
• Ensure principals conduct regular observations of classroom implementation of the coaching programs and services, and facilitate follow-up conversations with staff regarding observations of coach-teacher teaming.
• Provide the Field Faculty with building and student data, including mathematics achievement tests and value-added reports.

If you agree to the stated Assurances, please sign and return this form to:

Anita E. Jones, Mathematics Consultant
Ohio Department of Education
25 South Front Street, MS 509
Columbus, OH 43215-4183

Retain a copy for your records.

________________________________________________________________________
District Superintendent

________________________________________________________________________
Building Principal

________________________________________________________________________
Union Representative (Optional)

________________________________________________________________________
MCP Project Director

Date
Date
Date
Date
APPENDIX E

MCP DATA COLLECTION
## Evaluation Research

<table>
<thead>
<tr>
<th>Coach Level</th>
<th>Teacher Level</th>
<th>Student Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMT (UM)</td>
<td>LAMP (MCP/OSU)</td>
<td>OATs – Public Record</td>
</tr>
<tr>
<td>LAMP (MCP/OSU)</td>
<td>Coach Reports/1-on-1</td>
<td>OATs – MCP Pre/Post</td>
</tr>
<tr>
<td>Facilitator Reports</td>
<td>Coach Reports/Classroom</td>
<td>Problem Sets</td>
</tr>
<tr>
<td>Coach Reports</td>
<td>In Development - 09-10:</td>
<td>Coach Report/Classroom</td>
</tr>
<tr>
<td>Site visits</td>
<td>Classroom Observation</td>
<td>Primary Grades</td>
</tr>
<tr>
<td>Coach Interviews</td>
<td>Teacher Interviews</td>
<td>In Development - 09-10:</td>
</tr>
<tr>
<td>Scripting/Scenario</td>
<td>Social Justice Implementation</td>
<td>Classroom Observation</td>
</tr>
<tr>
<td>Prompt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Justice: Coach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PD documentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX F

SCORE COMPARISONS
SCORE COMPARISONS

MCP Numbers

Schools: 185
Coaches: 172
Teachers: ~3,328
Students: ~83,200
School Districts: 66
Counties: 34
SCORE COMPARISONS

Mathematics Scores
2006-2007

Percentage at or above Proficient

<table>
<thead>
<tr>
<th>Grade</th>
<th>Non-Coached</th>
<th>Literacy Coached</th>
<th>MCP Coached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td>61</td>
<td>57</td>
<td>68</td>
</tr>
<tr>
<td>Grade 4</td>
<td>46</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>Grade 5</td>
<td>29</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>Grade 6</td>
<td>37</td>
<td>37</td>
<td>50</td>
</tr>
</tbody>
</table>

The Ohio State University
Mathematics Coaching Program
SCORE COMPARISONS

Reading & Writing Scores 2006-2007

Percentage at or above Proficient

Grade 3  Grade 4  Grade 4 W  Grade 5  Grade 6

52  51  59  62  68  72  51  68  45  55  75

- Non-Coached
- Literacy Coached
- MCP Coached

The Ohio State University
Mathematics Teaching Program
APPENDIX G

RESEARCH CONSENT FORM
RESEARCH CONSENT FORM  
(Project Directors’ Consent)

“A Mixed Method Analysis of The Ohio State University’s Mathematics Coaching Program Site Visit Inventories”

Dear Dr. Brosnan and Dr. Erchick:

I am currently pursuing an Ed.D. from Ashland University and I am in the process of beginning my dissertation research. I have been a site visitor for The Ohio State University Mathematics Coaching Program for the past several years. I would like to analyze the collected site visit data as my dissertation.

This study will involve analyzing site visit data collected by Laurie Hunker and myself, from November 2008-May 2010.

• I will analyze approximately 110 MCP Coach Site Visit Inventories to develop emerging themes for first and second year coaches. The site visit inventory documents will be strictly limited to parties who have consented to MCP’s Data Use Memorandum. I will interview Project Directors.

• I will collect related documents. Coach, facilitator, principal district/school names will not in any way be associated with research findings. The information will instead be identified solely through the use of code numbers in all written or presented findings.

• The use of the program’s name and affiliate university will, or will not be used in reporting research findings, as you indicate in the permission form below.

• I will first get this project approved through Ashland University Human Subjects Review Board. The Ohio State University Human Subjects Review Board will approve this research upon receipt of the former.

I greatly appreciate your consideration in this matter. If you would like additional information concerning this study before or after it is completed, or have any issues or concerns, please contact either myself, or Dr. Jane Piirto, my Dissertation Chairperson, by phone or mail.

Sincerely,

Kristi Graves
Graduate Student
(567) 844-0016
64 Independence Dr.
Shelby Ohio 44875

Dr. Jane Piirto
Ed.D. Dissertation Chairperson
247 Dwight Schar College of Education
Ashland University
Ashland, OH 44805
jpiirto@ashland.edu
419-289-5379

************************************************************************
PERMISSION FORM TO USE DATA

We have read and understand the information about "A Mixed Method Analysis of The Ohio State University's Mathematics Coaching Program Site Visit Reports." We give consent for the Mathematics Coaching Program's site visit data to be used, in alignment with the constraints of The Ohio State University and the Ashland University Human Subjects Review Board guidelines. No individual or institution will be identified by name, nor shall the subjects be identified, directly or through identifiers linked to the subjects.

- We [do/ do not] give permission to use the MCP data.
- We [do/ do not] give permission for The Ohio State University affiliation to be used when reporting research findings.

Signature
Patti Brosnan, Project Director

Date
4-8-11

Signature
Diana Erchick, Co-Project Director

Date
4/8/11
APPENDIX H

MCP COACH SITE VISIT INVENTORY
MCP Coach Site Visit Inventory

Date: _______________ Coach: ___________________ Visitor Name: __________
School: ______________ Travel time to site: ______________
Time in: _______ Time out: _______ Travel time to home, campus or next site: _______

<table>
<thead>
<tr>
<th>Category/Question</th>
<th>T – teacher and/or P – principal comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On Being a Coach in Your School</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>How have you built relationships with teachers?</td>
</tr>
<tr>
<td>2.</td>
<td>Tell me about your planning process in being a coach.</td>
</tr>
<tr>
<td>3.</td>
<td>Share information regarding planning.</td>
</tr>
<tr>
<td></td>
<td>• Schedule: Evidence?</td>
</tr>
<tr>
<td></td>
<td>• Describe a day.</td>
</tr>
<tr>
<td></td>
<td>• Lesson plan: Evidence?</td>
</tr>
<tr>
<td></td>
<td>• What is the curriculum in use?</td>
</tr>
<tr>
<td></td>
<td>• How is what you are doing tied to the curriculum? Evidence? (e.g. objectives tied to lesson activities, either in the lesson or in discussion)</td>
</tr>
<tr>
<td><strong>Working With Teachers</strong></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Tell me about your coaching process (collaborative planning, team teaching, debriefing)</td>
</tr>
<tr>
<td></td>
<td>a. Describe your coaching process – what does it look like?</td>
</tr>
<tr>
<td></td>
<td>b. Talk about your debriefing process. What evidence can you point to about your debriefing process?</td>
</tr>
</tbody>
</table>
c. **How comfortable are you in the coaching process?**

d. **What do you find most challenging in the coaching process?**

e. **Describe your greatest coaching accomplishment.**

f. **What is needed to make the coaching process successful?**

### Your Impact as a Coach

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td><strong>How have you impacted your school?</strong></td>
</tr>
<tr>
<td></td>
<td>a. <strong>What do you do that is coaching?</strong> Evidence? How much of your time is spent doing coaching?</td>
</tr>
<tr>
<td></td>
<td>b. <strong>What do you do that is not coaching?</strong> How much of your time is spent doing non-coaching activities?</td>
</tr>
<tr>
<td></td>
<td>c. <strong>How has the coaching process impacted teacher behavior?</strong> Evidence?</td>
</tr>
<tr>
<td></td>
<td>d. <strong>How has your coaching impacted student behavior?</strong> Evidence?</td>
</tr>
<tr>
<td></td>
<td>e. <strong>What obstacles do you have as a coach?</strong></td>
</tr>
<tr>
<td></td>
<td>f. <strong>How do you provide PD to the staff?</strong> What does it look like? Evidence?</td>
</tr>
</tbody>
</table>
MCP Coach Site Visit Checklist

_______ Co-Plan for the day with teachers and select instructional strategies.
_______ Co-teach in at most 4 or at least 3 classes daily for 4 days per week.
_______ Coach the teacher in learning how students think.
_______ Coach the teacher in how to use the mathematical knowledge in the room.
_______ Coach the teacher in questioning techniques.
_______ Coach the teacher in using the process standards regularly.
_______ Coach the teacher in identifying and/or creating rich problems from their curriculum.
_______ Debrief with teachers at least once per week.
_______ Reflect on lesson and day’s work, and then document work into STARS.
_______ Completed Evaluation
_______ Visible presence of mathematics in the building? (Y/N)
_______ Talk with administrator? (Y/N)
_______ Conversation with teacher, without coach? (Y/N)

MCP Scoring sheet
Based on the data from this instrument, use your best judgment to assign a value of 1, 2, or 3 for each of the items below.

1: Does Not Meet Expectation, 2: Meets Expectation, 3: Exceeds Expectation

_______ Co-Plan for the day with teachers and select instructional strategies.
_______ Co-teach in at most 4 or at least 3 classes daily for 4 days per week.
Coach the teacher in learning how students think.
Coach the teacher in how to use the mathematical knowledge in the room.
Coach the teacher in questioning techniques.
Coach the teacher in using the process standards regularly.
Coach the teacher in identifying and/or creating rich problems from their curriculum.
Debrief with teachers at least once per week.
Reflect on lesson and day’s work, and then document work into STARS.

Based on the data from this instrument, use your best judgment to determine where this coach stands in terms of the following:

Please circle your determination.

<table>
<thead>
<tr>
<th>Content</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedagogy</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Coaching</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comfort level with the MCP coaching process</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
</table>

Comments

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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