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The Impact of Common Core Professional Development on Teaching Practices

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COLLEGE OF EDUCATION

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Abstract

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MA, National University, 2005

BSW, James Madison University, 1999

Doctoral Project Study Submitted in Partial Fulfillment

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Abstract

The adoption of the Common Core State Standards (CCSS) in Mathematics represents a challenge for public educators due to the broad scope of required instructional change. This case study investigated the implementation of a professional development (PD) series across 11 elementary schools, designed to address the problem of insufficient teacher preparation in CCSS pedagogical shifts. Grounded in Vygotsky's social learning theory and constructivism, the training was intended to enhance teacher skills through collaborative, inquiry-based learning. The research questions included in the study examined math teaching practices before and after the implementation of the district training. Through questionnaires and interviews, perceptions of site administrators (n = 17) and math coaches (n = 5) were analyzed via inductive coding and identification of emergent themes to determine the impact of the PD in transforming teacher actions. Findings indicated the PD was effective in preparing teachers to execute math lessons emphasizing conceptual understanding and problem-solving. The resulting project, a program evaluation, was an analysis of the PD where strengths, weaknesses, and recommended improvements were identified. This project study is significant because educational leaders may benefit from the identification of successes and shortcomings of one district's CCSS launch, and may choose to replicate the effective programmatic elements. The study has the potential to impart positive social change as it offers solutions to minimize the achievement gap in the area of mathematics, enabling all students to be better prepared to meet the challenges of the 21st century.

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Dedication

I wish to dedicate my project study to public school teachers. I deeply admire the work you do, and your unwavering dedication to our youth. Your ability to evolve and transform your practice on a continuous basis solidifies your commitment to lifelong learning. Teaching is both a science and an art, and for those of you who are masters of your craft, thank you for making a difference.

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Section 1: Introduction to the Problem

The implementation of President Obama's American Recovery and Reinvestment Act (ARRA) of 2009, and its corresponding competitive education grant program, Race to the Top (RTTT), generated the Common Core State Standards (CCSS) to provide a greater emphasis on innovation, long-term reform, and significant improvements in student outcomes (U.S. Department of Education, 2009). The overarching objective of CCSS is to ensure participating states create robust and relevant educational opportunities for all students, designed to reflect the knowledge and skills essential for millennial learners to succeed in both college and career (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). The resulting paradigmatic shift in math education favors conceptual understanding of math topics over procedures and rote memorization. Teachers must assume a more facilitative role in the classroom, using questioning techniques to guide students to formulate responses through critical thinking and analysis, while requiring them to *prove* their answers through evidence-based rich discussion.

Using a qualitative case study, I examined the design and implementation of a CCSS math professional development, built upon the framework of Vygotsky's social constructivist learning theory, at eleven California elementary schools. Local district officials embrace the notion that twenty-first century learners must be able to analyze, problem-solve, communicate, and collaborate with flexibility and autonomy (Wagner, 2008), and trained teachers in fostering these strategies through web conferencing, videotaped lessons, student performance task analysis, demonstration classrooms,

instructional coaching, and structured professional learning communities. The district used Safari Montage interactive web conferencing tools to sync all 500 elementary teachers in the district, offering opportunities for virtual instruction-related discussions across 11 sites, while simultaneously broadcasting consistent information, clear expectations, and common messages across the district. Through questionnaires, interviews, document analysis, and observation, I examined how educational leaders, including site principals, assistant principals, and instructional coaches perceived the impact of district-wide Common Core math professional development on teaching practices.

Definition of the Problem

Green Valley School District, a pseudonym for the research site, serves a diverse and rapidly growing community housing 11,000 elementary students. According to the 2013 District School Accountability Report Card, found on the district website, Green Valley is focused on ensuring all students meet or exceed grade level expectations through effective research-based teaching practices President Obama's RTTT initiative requires school districts to incorporate standards-based reforms to drive improvement, tying teacher and principal quality to evidence that educators are helping students to learn (Manna & Ryan, 2011). RTTT also requires districts to increase teacher effectiveness and turn around underperforming schools using common standards, thereby eradicating the achievement gap (Manna & Ryan, 2011). In order to achieve the president's goal of restoring the United States as the world's leader in college graduates by 2020, educators

must fundamentally transform current instructional practices (U.S. Department of Education, 2013).

In an effort to meet the criteria of RTTT, the Green Valley School District required all teachers at the elementary level to incorporate CCSS in mathematics in August 2013, prior to the formal statewide adoption in 2014. The problem within district elementary sites is that the teaching methods did not align with the national frameworks for mathematics instruction: depth over breadth of knowledge and real-world application (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, U.S. Department of Education, 2013). Many teachers struggled to find the meaning, application, and relevancy of the math they taught, resulting in superficial text-bound instruction that failed to help students develop applied, real-life understanding of mathematics (Burns, 1998; Burton, 2012). Teachers must be highly effective in order to accelerate student learning, eradicate achievement gaps, and build habits of mind that could potentially alter the trajectories of children's lives (Chetty, Friedman, & Rockoff, 2011).

Rationale

Evidence of the Problem at the Local Level

According to Green Valley School's website, the district believes "every student deserves to learn every day." The Green Valley mission statement posted on the website describes the school district as an "innovative and collaborative community, providing an unparalleled educational experience." Every teacher at the elementary level received professional development in the Essential Elements of Instruction, Nancy Fetzer Writing,

and Accelerated Academic Achievement for English Language Learners to ensure quality, consistent instruction via highly-skilled teachers (District Website, 2013). The positive impact of past district professional development is evidenced by steady improvements in standardized test scores between 2007 and 2013, in which 10 of 11 schools surpassed the state's Academic Performance Index benchmark score of 800 (California Department of Education, 2013). The inception of CCSS presented a challenge in that teachers could not utilize the familiar math adoption and corresponding lessons, nor could they rely on procedure-based instructional techniques that were effective in meeting the former state standards of learning (District CCSS Workshop, 2012, Vigdor, 2013). The district superintendent's message states teachers will continue to work collaboratively in analyzing data, planning, adjusting, and implementing strategies to promote high levels of learning for all students.

In the face of new, nationally-normed performance-based assessments in mathematics, prior test scores and past practices are no longer relevant. According to the Green Valley School District Director of Elementary Curriculum, The CCSS presented a challenge within the local district, where the majority of teachers utilized the prescriptive, state-adopted *Harcourt* math curriculum, focusing on instruction of math procedures and algorithms. The Green Valley Director of Elementary Education informed me that:

> The Common Core State Standards represent the greatest challenge to public education in a generation. These changes are necessary to prepare our students for 21st Century learning, and will provide them with the knowledge and skills to become College and Career ready. The transition is both an exciting opportunity

and great challenge for school districts. The new standards require dramatic changes in pedagogy to be successful. Teachers must learn new content at the conceptual level and change their instructional practices in order to provide lessons that increase the rigor, problem-solving, and critical thinking for students.

The Green Valley School District Director of Elementary Curriculum informed me in August 2013 that teachers in Green Valley had not been exposed to strategies for inquiry-based learning in the area of mathematics, essential for successful implementation of the new math practice and college and career readiness standards. Teachers needed specific training in structuring math lessons around problem-solving situations and effective use of concrete and representational manipulatives (Green & Piel, 2012). In order to address the problem of unskilled CCSS math teachers, the Green Valley School District, as stated in the 2013 District CCSS Workshop, turned to professional development to enhance teacher competencies while creating conditions for successful instruction (U.S. Department of Education, 2013). As indicated in the 2013 CCSS Workshop, the district created a 3-year CCSS professional development plan that includes creating new curriculum and providing professional development for every teacher in Green Valley.

The district stated on its 2012 Accountability Report Card, posted on the organization's website, that Green Valley Schools maintains a "PACE Promise" to focus students on college at an early age, prepare students for the rigor of college work, and provide opportunities for all students to pursue higher education, regardless of background or socioeconomic status. In order to ensure this promise is realized by all

students, Green Valley educational leaders shared in a 2013 CCSS Workshop that they must ensure every teacher has the knowledge and tools to create a learning environment that cultivates critical thinking in mathematics, so that learners may discover their own solutions to problems (Burns, 2007). Strong teachers have the potential to boost academic achievement, improve student attitudes, and increase students' capacity to learn (U.S. Department of Education, 2013). The district position regarding the framework and analysis of the new standards, as communicated via personal communication with the Director of Elementary Curriculum in 2013, states, "Preparing teachers is our top priority." District officials recognize it will take time and multiple learning opportunities to ensure all teachers are well-prepared to teacher Common Core mathematics, as expressed in a 2013 District CCSS math PD session.

Global Achievement Gap in Mathematics

The United States continues to struggle with math underperformance among both elementary and secondary students, placing 27th based on international rankings (Program for International Student Assessment, PISA, 2011). An analysis of countries that routinely outperform the United States based on international assessments reveal math education systems built upon a foundation of common standards, as opposed to multiple, disjointed content standards encompassed by the U.S. since the 1990s (McCarthy, 2012). Despite numerous education reforms, including George W. Bush's No Child Left Behind Act of 2002 and its emphasis on high-stakes testing, math performance of U.S. students continues to fall short, especially among minority subgroups and student of poverty (Agodini, Harris, Thomas, 2010; Confer & Ramirez, 2012). Many American students

graduate with minimal conceptual understanding, demonstrating superficial knowledge of facts, but not the ideas supporting numerical operations (Wagner, 2012).

United States Educational Policy: The Common Core State Standards

National education policymakers determined math curriculum needed massive revisions in order to improve math achievement among all students, favoring depth over breadth of knowledge (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). The CCSS were constructed in response to the implementation of President Obama's ARRA of 2009, and its corresponding competitive education grant, RTTT. The main objective of the CCSS is to ensure participating states create robust and relevant educational opportunities for all students, designed to reflect the knowledge and skills essential for millennial learners to succeed in both college and career (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

The goal of the Common Core State Standards is to increase math literacy for all students through instructional activities grounded in critical thinking, communication, and collaboration. Students demonstrating math literacy are better able to analyze and reason while formulating, solving, and interpreting solutions to problems across a variety of situations (PISA, 2011). Mathematical capability, essential in the twenty-first century workplace, is a key indicator of productivity (Vigdor, 2013). As students face "unprecedented challenges and heightened competition" in the global, knowledge-based job market, accelerating college realization is more than educational policy, it is an urgent national pursuit (U.S. Department of Education, 2013).

Local School District Reform Efforts

Green Valley School District stated on the 2012 Accountability Report Card its commitment to closing the achievement gap in mathematics through consistent and effective teaching practices reinforced through research-based professional development. Educational leaders within the organization embraced the notion that all children, including English language learners and children from poverty, can succeed in math (Confer & Ramirez, 2012). According to a 2013 posting on the district website, in order to increase math achievement for all students, and to prepare students for the 2014 full implementation of the new standards and subsequent twenty-first century demands, the district adopted an elementary math focus of operations and algebraic thinking, and number operations in base ten.

The district math curriculum, aligned with Common Core State Standards, embraces a performance-based approach in which students are expected to inductively create meaning from math concepts through collaborative tasks, real-life application, active participation, and student-dominated discussions addressing math reasoning and problem-solving methodology. This paradigmatic shift in math education favors conceptual understanding of math topics over procedures and rote memorization. Teachers have assumed a more facilitative role in the classroom, using questioning techniques to guide students to formulate responses through critical thinking and analysis, while requiring them to prove their answers through evidence-based rich discussion.

The State Department of Education provided grant funds to local districts designated for intensive, prolonged professional development over a period of three

years. District officials were faced with the task of developing and implementing high-quality professional development designed to address the evolving needs of the student population, while fostering lasting change in the instructional practices of the faculty to align with the CCSS. In order to train teachers to implement cohesive strategies for improving conceptual number sense in grades kindergarten through fifth, a district-wide math professional learning community was developed, emphasizing use of teaching operation strategies through number talks in every classroom across the district. Bimonthly hybrid professional development sessions, consisting of a combination of live interactions, video conferences, and teacher-to-teacher tutorial videos, connecting all elementary teachers and administrators, were implemented at all eleven elementary school sites.

Five district math instructional coaches, also known as Teachers On Special Assignment (TOSAs), were also provided to model specific strategies and lessons in demonstration classrooms, and to facilitate meaningful reflections pertaining to observed teaching practices. The objective of the math professional development series was to model and discuss specific methodology to include district-wide math operation strategies, such as branching and decomposition of numbers, through daily classroom number talks to allow students to better collaborate and share mathematical thinking. Teachers no longer followed the current scope and sequence of skills outlined in their math manuals aligned to the present plethora of grade level content standards. Instead, instructors follow the Common Core math standards using non-scripted investigative units of study, emphasizing fewer concepts but much deeper understanding.

District-created units were supplemented by the math curriculum *Investigations* by Pearson Scott Foresman. This math series includes a student-centered approach focusing on understanding of concepts as opposed to correct answers (Agodini et al., 2010). *Investigations* consists of thematic units in which students investigate, discuss, and reason to solve problems and develop strategies (Agodini et al., 2010), in line with the expectations of the Common Core State Standards in mathematics. The shift in math curriculum, instruction, and assessment would ideally assist students to exhibit mental flexibility with numbers, applying new knowledge to real-life scenarios.

Evidence of the Problem from the Professional Literature

To succeed in the workforce, American students must develop competencies to be creative and entrepreneurial, offering new and innovative ideas to address worldwide challenges (Wagner, 2012). In recognition of the new global knowledge economy, school districts across the country face the challenge of shifting their approaches to math instruction to invoke deeper levels of understanding about mathematical concepts, while requiring educators to think about both teaching and learning in more rigorous and complex ways (Marzano et al., 2013). The CCSS, currently adopted by 44 U.S. states, with full implementation slated for Fall 2014, were developed with the intent of narrowing the global achievement gap.

According to Wagner (2008), students graduate from high school and college without the essential skills needed to succeed in the workplace and compete in a global economy. The interest in and ability to generate knowledge to address existing and future problems is the most essential skill graduates must develop (Wagner, 2012). Twenty-first

century learners must be able to analyze, problem-solve, communicate, and collaborate with flexibility and autonomy (Wagner, 2008). Marzano and Heflebower (2012) also identified the ability to address complex problems and issues as crucial for the millennial generation, and added conative skills such as interacting with others and exhibiting self-control as critical components for effective decision making in the twenty-first century. To obtain and maintain gainful, lucrative employment in top organizations, college graduates must possess characteristics associated with innovators. Such attributes include a capacity for design thinking, a willingness to experiment and take risks, and the ability to embrace and learn from failure (Wagner, 2012). Additionally, students must be aware that twenty-first century learning requires independence and accountability extending beyond dispositions or splinter skills (Dweck, 2006).

Definitions

Achievement gap: The difference in the performance between each subgroup within a participating school or school district and the statewide average performance of the state's highest achieving subgroups in reading/language arts and mathematics, as measured by designated assessments (U.S. Department of Education, 2013).

American Recovery and Reinvestment Act (ARRA) of 2009: Law implemented under President Obama to stimulate the economy, boost creation of jobs, and invest in education and other critical sectors (U.S. Department of Education, 2009).

College and career readiness: The ability to be successful in entry level, credit-bearing, academic courses through colleges and universities and in vocational training programs (Rotman, 2012).

College- and career-ready standards: "Content standards for kindergarten through 12th grade that build towards college- and career-ready graduation requirements by the time of high school graduation. A State's college- and career-ready standards must be either (a) standards that are common to a significant number of States; or (b) standards that are approved by a State network of institutions of higher education, which must certify that students who meet the standards will not need remedial course work at the postsecondary level" (U.S. Department of Education, 2013).

Common Core State Standards: Common set of K-12 content standards that define what students must know and be able to do and that are substantially identical across all States in a consortium. A State may supplement the common standards with additional standards, provided that the additional standards do not exceed 15 percent of the State's total standards for that content area (U.S. Department of Education, 2009).

Critical thinking: The act of analyzing the ways of thinking with the intent of improving upon them (McCollister & Sayler, 2010).

Global Achievement Gap: The discrepancy between the skills students possess upon competitive global economy and workplace (Wagner, 2008).

Math Reasoning: An intellectual attempt to solve a problem or respond to a given question based upon evidence (McCollister & Sayler, 2010).

Mathematical Literacy: The ability to analyze, reason, and communicate ideas effectively while posing, formulating, solving, and interpreting solutions to math problems across a variety of situations (PISA, 2011).

Professional Learning Communities: Educators working collaboratively through on-going action research and collective inquiry to achieve improved results for students (DuFour, DuFour, & Eaker, 2008).

Race to the Top (RTTT) Fund: 4.35 billion dollar competitive grant program implemented under the American Recovery and Reinvestment Act (ARRA) designed to reward and encourage states creating programs and policies fostering innovation and reform, including raising student achievement, closing the achievement gap, and ensuring college and career readiness for all students (U.S. Department of Education, 2009).

Significance of the Study

This case study is significant in that educational leaders may benefit from the identification of successes and shortcomings of one district's CCSS launch, and may choose to replicate the programmatic elements identified as being most effective. Districts are currently designing individualized plans as to how they will train staff, develop curriculum, and assess student learning. Currently many teachers are unfamiliar with CCSS, and lack the skills and knowledge to successfully implement the math practice and career and college readiness standards in their classrooms. Without proper preparation, teachers cannot develop collaborative, inquiry-based classrooms grounded in real-life application, to ensure mastery of mathematical concepts outlined in CCSS. The current experimental phase, during early adoption of the new standards, offers an ideal opportunity to examine the practices of the local school district, comparing instructional strategies before and after the implementation of the CCSS and corresponding professional development series.

This study will serve as an evaluation tool, examining the efficacy of the CCSS math professional development series to make improvements prior to the implementation of future PD in Common Core reading and writing. Districts across the country may benefit from the successes and challenges faced by Green Valley teachers in response to this PD model, as millions of educators prepare for the national launch of CCSS. I also address a gap in research as to specific changes in teaching practices resulting from professional learning communities. Many researchers investigate this phenomenon using teacher self-reporting to measure change. I examined the perceptions of administrators and coaches who regularly observe teachers during math instruction and can report on shifts in practices and behaviors before and after district PD and corresponding PLCs.

Research Questions

The research questions that will be explored in this study consist of the following:

RQ1: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development?

RQ2: What are the differences in observed math instructional practices before and after the district CCSS professional development series?

Review of the Literature

Conceptual Framework

The challenge for Green Valley School District, and schools across the nation, is the lack of direction as to how to instruct students in order for them to reach proficiency in the adopted Common Core Standards through an emphasis on creativity and flexibility in the classroom. This structure lends itself to an inquiry-based, social constructivist

framework supported by Vygotsky's theory that development of mind stems from personal interactions in society (Vygotsky, 1978) and instruction that includes facilitating new ways of thinking contributes to the general structure of consciousness (Vygotsky, 1986). Vygotsky argued individuals learn best through collaboration, as each member of a group has the opportunity to learn from one another (Vygotsky, 1978). Vygotsky's framework is applicable to teacher preparation efforts through the PLC model. In this instance, the teachers assume the role of the learner as they navigate the new standards and curriculum while acquiring new instructional strategies. Investigation of effective teaching practices through collective inquiry affords the more knowledgeable teachers the opportunity to teach less capable teachers, as they engage in problem-solving activities to reach a shared goal, benefiting every member of a team (Vygotsky, 1978). This theory applies to Common Core performance-based mathematical tasks, whereas teams of teachers were presented with multifaceted scenarios during structured PLC opportunities. The grade level teams were required to work collaboratively to propose solutions to given math problems and scenarios, in order to experience CCSS math as students themselves. According to Vygotsky (1978), the social interaction component of learning tasks is the basis for cognitive growth and knowledge acquisition. The teachers used the discussion forum, in conjunction with prior knowledge and past experiences, to co-construct new knowledge in mathematics teaching practices (Bofill, 2013).

The methodology Green Valley School District elementary teachers were required to implement in classrooms following targeted professional development in Common Core math instruction was based upon social constructivist and cognitive constructivist

theoretical foundations in order for the teachers to acquire new knowledge via collaborative, problem-based learning. The cognitive constructivist framework considers the teacher-learner an active participant, guiding his own learning processes (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). As opposed to procedural-formalist curriculum, in which traditional instructors present logically and sequentially organized facts and procedures, passively acquired by students and regurgitated to denote mastery (Grady et al., 2012), cognitive and social constructivist educators assume facilitative roles to guide teachers in developing understanding and making meaning of concepts through peer interactions and experiences. Gupta (2008) described constructivism as a self-regulatory process whereby teachers promote collaboration, exploration, and problem solving, and while eliciting multiple point of view. Vygotsky's social constructivism subscribes to the theory of a community of learners working together to develop meaning through interactions, provided one of the participants possesses sufficient knowledge to guide the others in the group (Vygotsky, 1981).

Vygotsky's theory of social learning, combined with the constructivist framework, is essential to successful implementation of Common Core State Standards in mathematics. Teachers, through professional development that is largely based on collegial discussions, peer coaching, and demonstration classrooms, learned to infuse social and cognitive constructivist principles into their instruction. According to the district website, each math lesson begins with an inquiry that explores numerical relationships. Through the district PD, this activity enabled teachers to construct meaning and understanding as the

trainers (instructional coaches) act as facilitators (Pritchard & Woolard, 2010). Throughout the process of professional development, teachers learned to validate and value the cognitive conflict of learners in their classes, encouraging peer interactions to promote stimulus and challenge (Pritchard & Woodard, 2010). In-school learning is relevant to real-word situations, focusing on questioning and explanations (Grady, Watkins, & Montalvo, 2012). Finally, through the district-wide PD, teachers learned to employ constructivist principles to facilitate student reflection involving mathematical concepts, as well as reflecting with colleagues about their own classroom experiences with CCSS in order to focus their energy on the learning (Easton, 2012). This study explores the impact of cognitive and social constructivist methodology on mathematics instruction and teacher performance.

Common Core State Standards

The Common Core State Standards redefined the grade level standards for mathematics to ensure they are rigorous, essential, clear, specific, coherent, and internationally benchmarked (National Governor's Association Center for Best Practices & Council of Chief State School Officers, 2010). The new national standards, for the 44 adopting U.S. states, address the issue of low expectations set by some states as to what students should know and learn in order to be adequately prepared for postsecondary education and the workforce (Rotman, 2012). The Common Core State Standards address the global achievement gap by ensuring students leave school with the ability to apply and articulate deep conceptual understanding to reinforce content skills across a

variety of new situations (National Governor's Association Center for Best Practices & Council of Chief State School Officers, 2010). The most significant shift in the new CCSS versus the previous state content standards is the explicit goal of college and career readiness for all students (Rotman, 2012). The new standards require all math disciplines to encompass conceptual understanding as opposed to rote memorization, problem solving grounded in real world application, the utilization and interpretation of data, and the inclusion of technology to enhance understanding (Conley, 2011, Gordon, 2013, Rotman, 2012). The CCSS in mathematics are comprised of two broad categories of knowledge and skills: content standards (knowledge and skills) and practice standards (abstract skills); (Marzano et al., 2013). The content standards are arranged into clusters for students to study each year at increasing depth, complexity, and sophistication (Marzano et al). Implemented correctly and with fidelity, Common Core standards and corresponding nationally-normed computer-based assessments have the potential to create world-class learning for every student (Conley, 2011).

The constructivist classroom framework affiliated with CCSS is a shift from the traditional, sequential, procedure-based math instruction of the past. The current change in mathematics education stresses competencies over content (Wagner, 2008). The CCSS will be used to help teachers focus on cognitive strategies and competencies over isolated skills (Conley, 2011). Students are expected to develop conceptual understanding in order to absorb and retain the critical information and skills required to succeed at higher levels (Flick & Kuchey, 2010). Common Core instruction will encompass cycling and repeated exposure of mathematical concepts and processes in order to break complex expectations

into realistic learning targets (Marzano, 2013). Critical questioning is incorporated as a means of raising the level of students' thinking, while inquiry-based learning will allow students to build conceptual knowledge through exploration of numerical relationships (McCollister & Sayler, 2010). Students are expected to both determine and interpret mathematical results, culminating in the ability to effectively communicate findings and mathematical reasoning employed (Gordon, 2013). Both the Common Core State Standards and Twenty-First Century learning strategies stress communication, collaboration, creativity, and critical thinking in the classroom to better prepare student for college and career readiness (Wagner, 2008, National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). This philosophy embraces the notion that the goal of school is not just to perform well in school, but to do well in life (Boaler, 2008).

Math instruction should be regarded as an essential component of both thinking and learning (Sarama & Clements, 2009). Making sense of math in this way has the power to change and sustain the culture of a school through quality patterns of teaching (Confer & Ramirez, 2012). The Common Core standards represent an opportunity to promote both equity and excellence in education through elevated expectations aligned to the hard and soft skills students require for postsecondary success (Rotman, 2012). In the area of mathematics, the CCSS requires students to make sense of problems and solve them through a variety of means, employ abstract and quantitative reasoning, construct effective arguments, critique mathematical reasoning of others, strategically utilize given tools to solve given problems, and interpret and incorporate structure and precision

(Conley, 2011). Students engage in performance-based tasks consisting of planning, information management, material manipulation, and extended written and oral responses (Marzano et al., 2013). The constructivist approach to teaching, combined with revised content standards, brings coherence and consistency to math curriculum, previously described as a "mile wide" and an "inch deep" (Davidson & Mitchell, 2008), on a national level.

Paradigmatic Shift in Current U.S. Math Teaching Practices

In today's classrooms some authors have proposed that problem solving serves as the core for all instruction, providing students the opportunity to talk, debate, justify their thinking, explain their reasoning, and ultimately correct their own errors (Confer & Ramirez, 2012; Flick & Kuchey, 2010). Teachers must go "beyond the bubble," looking past students' final responses to given math problems to uncover student understandings and misunderstandings through rich discussions, asking pupils to justify their reasoning (Wickett & Hendrix-Martin, 2011). Wagner (2008) agreed talking is one of the most important classroom resources in order to foster shared knowledge and divergent thinking among students. In order to meet the complex and evolving needs of millennial learners, teachers must be able to present and facilitate conceptual content grounded in real-life issues (McCarthy, 2012). The ritualized- routine, task- completion approach to teaching is no longer appropriate in the new era of instructional accountability in which individual student learning is the focus (Reeves, 2011).

Math curriculum must also shift from the previous rote, procedural, paper and pencil algorithms, to include more interesting problems, student-led investigations,

relevant debates, simulations, presentations, games, and projects that require student engagement (Conley, 2011). Previous math standards favored breadth over depth of knowledge, resulting in superficial, text-bound instruction that limited the ability of the teacher to make math relevant and meaningful to students (Burton, 2012). Elementary students have developed documented, life-long math anxieties as a result of past teaching practices that emphasized memorization of exact procedures of text, requiring students to work alone, instituting timed tests, and only accepting one method of solving a problem (Burton, 2012). Parrish (2010) described the mathematics classroom as an environment that ideally affords students the experience of offering responses for discussion, questioning themselves and peers, and investigating a myriad of problem-solving strategies. Acceptance is based upon the common quest for learning and understanding (Parrish, 2010).

The incorporation of Common Core State Standards requires students to increase depth of knowledge in mathematics, through higher-ordered cognitive tasks such as creating, evaluating, synthesizing, analyzing, applying, understanding, and remembering (Holmes, 2012). The increase in rigor of mathematical tasks serves to stimulate intellectual growth and enhance academic knowledge of elementary students (McCollister & Sayler, 2010). Through their work coaching in classrooms Confer and Ramirez (2012) were able to determine that ultimately, math goals for students should be based on the ability to think and reason effectively, solve problems accurately, flexibly, and with efficiency, communicate mathematical thinking clearly, and demonstrate skills and knowledge on both standardized and performance-based assessments. The teacher

must develop options for students to integrate learning into engaging and interesting performance-based tasks, far from the rote algorithms associated with math textbooks (Wagner, 2008).

Teachers must include both problem-solving and questioning techniques in the context of math instruction in order to elicit critical thinking, analysis and evaluation of sources, and decision-making skills (McCollister & Sayler, 2010). Students need to engage in cognitive activity to expand their existing knowledge bases, as opposed to simply reviewing information they have already acquired (Reeves, 2011). Elementary children should be given activities designed to facilitate the development of creative, unique, and practical solutions to given scenarios (McCollister & Sayler, 2010). Parrish (2010) discovered use of mental computation affords students the opportunity to build upon their understanding of numerical relationships, as opposed to relying on memorized procedures. In order to be effective, educators must pay particular attention to students' learning styles, be able to connect new learning to prior experiences, and actively engage children in hands-on learning, teamwork, experimentation, and discover-based practice (McCarthy, 2012) as opposed to traditional text-based learning.

The non-textbook based approach to teaching is common practice in Japan, an internationally top-ranked country in the field of education. House (2009) investigated relationships between math teaching strategies and fourth grade student achievement in Japan, where the use of real-world examples and independent learning activities were shown to boost test scores. Although Japanese teachers included instruction on specific problem-solving procedures, class sessions were heavily devoted to discussing math

reasoning and examining multiple solutions to given problems (House, 2009). Cooperative learning activities were prevalent, and teachers facilitated discussions in which students discussed solutions with one another (House, 2009). This model aligns with the findings of Zamir and Leikin (2011), who stressed the importance of developing mathematical creativity in every student through motivation and construction of knowledge through daily math activities in order to intensify the learning process.

Boaler (2008) studied the impact of student communication in the classroom in the context of mathematical teaching approaches in urban California high schools. Communication enables students to better grasp the "why" of concepts, and allows students to better make meaning of the learning experience (McCarthy, 2012). Boaler noted opportunities for students to think and learn creatively and analytically, as well as to effectively and respectfully communicate with peers, as effective foundations of math instruction that will prepare students to compete in an increasingly competitive global economy. Skillful communicate encompasses a myriad of essential classroom skills, including the ability to listen and speak clearly, to assess reality, and to engage in meaningful exchanges with others (McCarthy). The introduction of these "number talks" is a pivotal vehicle for the incorporation of flexible, efficient, and accurate comprehension strategies that build upon key foundational concepts of mathematics (Parrish, 2010). Classroom conversations around purposely crafted math problems should occur in every classroom (Parrish, 2010). McCollister and Sayler (2010) asserted using questioning in the learning environment stimulates deeper thinking while promoting inquiry and interest to develop broader understanding. Sarama and Clements (2009)

agreed all children, regardless of background, have the potential to master challenging abstract math through mental reasoning. As in constructivist classrooms, children should be permitted to create their own strategies to solve various types of problems, building new knowledge as result (Sarama & Clemements). Parrish (2010) recommended teachers afford students time to solve math problems individually prior to writing all student responses, correct and incorrect, on the board so that pupils are able to share computation strategies with one another. Robinson and Leikin (2011), in an analysis of effective math lessons, also stressed the importance of active participation and rich, teacher-facilitated discussion in the classroom. Impactful lessons were described as containing both independent and collaborative tasks, in which students were required to explain and defend problem-solving procedures (Robinson & Leikin). Educators should view incorrect student answers as an opportunity to discover misunderstandings, and to foster deeper student thinking to help learn from errors and misconceptions (Parrish, 2010).

In order to be eligible for Race to the Top monies, states were required to demonstrate a commitment to creating data systems to accurately measure student progress, and inform teachers and administrators how to improve instruction (Moors, Robbins, & Weisenburgh-Snyder, 2012). Rubrics are an essential tool for measuring students' level of understanding in mathematics. According to Holmes (2012) the following rubric scores represent hierarchal levels of student depth of knowledge: (a) illustrating basic recall, (b) representing skill or concept thinking, (c) demonstrating strategic thinking, and (d) evidencing extended thinking.

Standards and assessments can be aligned based upon both content category and complexity of knowledge required to solve the given problems.

Professional Learning Communities

Public school educators nation-wide are required to ensure high levels of learning for every student (DuFour, DuFour, Eaker, & Korhanek, 2004). Professional learning communities (PLCs), afford schools a powerful model for transformation, grounded in a shared mission, goals, and values (Buffum et al., 2008; DuFour et al., 2004). Teachers who engage in collaborative learning benefit from the knowledge and experiences of one another, engage in collective inquiry, and develop action-oriented plans to create conditions for perpetual learning (DuFour et al., 2004). Peer collaboration among educators is an essential element of school improvement (Riveros, Newton, & Burgess, 2012). Teachers are found to be more effective in teaching math when given opportunities for reflection, observation of one another, and collaborative planning (Robinson & Leikin, 2011). Easton (2012) concurs effective PLCs are a result of relationships in which teachers have had opportunities to communicate with one another to uncover assumptions and build common ground.

Based upon the observations of Emerling and Gallimore (2013) in 40 school districts across 20 states, the PLC movement has reached a crucial point in which district directives will determine whether learning communities realize their potential or wane as a vehicle for both improved learning and instruction. In order for lasting and substantial change to occur within the nation's schools, on-going, long-term, collaborative, job-

embedded learning for educators must be a priority (Easton, 2012, U.S. Department of Education, 2013). Professional learning communities require substance to succeed, designed around adult learning and what individuals do within the structure of the school (Easton, 2012).The efforts of a PLC should be built upon the tenet of inquiry, and evaluated on the basis of results versus intentions (DuFour et al., 2004). Through action research in the classroom, teachers work together to create new constructions of knowledge that may ultimately transform their practice and disrupt long-held professional views (Cook, 2009).

School and district administrators must pose critical questions to their teams to guide PLCs, including what student are expected to learn, and how teachers will know that they have learned it (DuFour et al., 2004). Professional learning communities must also determine how they will respond when a student has difficulty (DuFour et al., 2004). Principals should also ask their teams what they wish staff could do better on campus and what they find troublesome about the way students learn (Easton, 2012). The questions will drive meaningful and creative solutions, stressing that PLCs are based upon purpose, and are open to opportunities (Easton, 2012). Compliance-driven or workshop-driven PLCs consisting of team meetings that focus upon curriculum training or mandated district initiatives overshadow collaborative learning opportunities by focusing on compliance and accountability (Emerling & Gallimore, 2013). PLC time, though well-intended, too seldom is utilized for improving instruction in terms of daily classroom practices to promote higher levels of learning for all students (Emerling & Gallimore, 2013).

Teaching teams must implement common, formative assessments to accurately measure student proficiency of essential learning (Buffum et al., 2008). The response to lack of student achievement should be based upon timely, systematic, school-wide interventions as opposed to remediation efforts spearheaded by individual teachers (DuFour et al., 2004). Through their observations Emerling and Gallimore (2013) determined that even seemingly high-functioning collaborative teams that routinely devoted time to develop common assessments, analyze student results, and assign interventions, rarely discussed which interventions were most appropriate and how best to improve daily classroom practices to target struggling learners.

In order to ensure effective implementation of professional learning communities, schools must ensure shared purpose, collaboration, collective inquiry, action orientation, commitment to continuous improvement, focus on results, strong site administrators focused on teacher empowerment, and commitment to overcoming adversity (Buffum et al., 2008; DuFour et al., 2004). Successful PLCs allow for shared leadership, enveloping a culture of risk-taking and learning (Buffum et al., 2008). Professional learning communities are based upon relationships built upon trust and respect in which individuals acknowledge a variety of processes and solutions to energize thinking (Easton, 2012). Thomas (2013) recommended districts refrain from jumping into new initiatives every year, instead giving PLCs time to be effective. Multiple sessions should be conducted when implementing professional development, followed-up by coaching, small group discussions in PLCs, and teacher input to drive future training (Thomas, 2013).

Site administrators have the ability to maximize PLC effectiveness thorough anticipation of needs and proactive behaviors, including the creation of an optimistic and purposeful culture based upon respect, trust, and communication (Buffum et al., 2008). Principals should not tell groups of educators what they are expected to accomplish, allowing them to discover for themselves what is needed to improve student learning (Easton, 2012). Administrators should propose to teachers a practice-based focus for PLCs where the main objective of teams is the continuous improvement of student learning (Riveros, Newton, & Burgess, 2012).

A methodology for eliciting deep and meaningful discussion pertaining to teaching and learning is the use of video lesson analysis. According to Knight et al. (2012), filming classroom instruction serves four different functions within PLCs. Viewing self and colleagues via videotaped lessons helps educators to attain objective and accurate depictions of instruction and subsequent practices, propels educators toward improvement and change, fuels realistic goal-setting, and opens dialogue for precise feedback (Knight et al., 2012). As the collaborative learning increases and dialogue deepens, members of a professional learning community can collectively develop a greater understanding of how to improve upon various classroom practices (Knight et al., 2012).

Another effective strategy for acknowledging the strengths and attributes of teachers through the PLC model involves the integration of demonstration classrooms (Grose & Strachan, 2011). The observation of teaching practices of teachers by their colleagues affords districts the opportunity to generate job-embedded personalized

professional learning (Reeves, 2008). Including classroom demonstrations as part of instructional coaching allows for greater focus on what is occurring with the learners, while instituting a culture of quality through collaborative conditions (Grose & Strachan, 2011). Teachers who are engaged in guided observations of peers are primed for collaborative debrief sessions to reflect, ask meaningful questions, and create action plans within specific teaching contexts (Grose & Strachan, 2011). Personal conversations, frequent dialogue, shared responsibilities, and group work fuels authentic trust-building and meaningful, student-centered opportunities among teaching teams (Buffum et al., 2011). The classroom demonstration model, including subsequent reflection and action planning, is meaningful in that PLCs must be relevant to the specific environment. Replication of practices at different school sites is not universally effective in invoking transformative change (Easton, 2012).

The most promising strategy for sustained and substantial improvement in classrooms is the ability of school educational teams to function as effective professional learning communities (DuFour, DuFour, & Eaker, 2008). Ying (2013) shared insights as to how collective learning and collegial behavior altered the mental models of isolated and competitive university professors in China. Through emphasis on social elements of learning, including purposeful discussions, shared resources, and non-evaluative peer observations, educators were able to view themselves as part of a broader profession, resulting in a willingness to consider and attempt new practices in their classrooms (Ying, 2013). Faculty learning communities among science teachers in the United States also proved to be an effective method in increasing teacher awareness and incorporation of

more appropriate pedagogical practices for student-centered learning in large classes (Addis et al., 2013). The PLC model resulted in a true cultural shift among science instructors, many of whom were reluctant to transition from lecture-based teaching to student-centered teaching (Addis et al., 2013). Findings indicated that the most successful PLCs among this group of faculty included specific goals at the outset and enthusiastic participants willing to embrace and incorporate change in practice (Addis et al., 2013).

Pokert (2012) also studied the impact of collaborative professional development in relation to teacher practice, examining the behaviors of 12 teachers in two high-poverty elementary schools. Systematic observations of the participants indicated a positive trend in the teachers' abilities to deliver effective instruction based upon development of higher-ordered thinking skills and cognitive development (Pokert, 2012). Pokert (2012) also observed higher levels of student engagement among those teachers who participated in on-going, teacher-driven PLCs to address cultivation of inquiry-based learning. The effectiveness of this model in transforming teacher behavior and practice stems from the assumption that the expertise of the participants is vital to the process (Buchanan, 2012). PLCs encourage teachers to look beyond a narrow range of competencies, and encourage one another to take risks through the development of trusting, collegial relationships (Buchanan, 2012, Addis et al., 2013, Ying, 2013). A three year study of 200 math teachers in Canada investigating the effects of collaborative, inquiry-based professional learning communities utilizing peer coaching, math content learning, and demonstration classrooms with an emphasis on problem solving determined a positive impact on teaching practices (Bruce & Flynn, 2013). The most beneficial and

lasting elements of the PLC were attributed to coplanning, coteaching, and collective reflection of demonstration lessons (Bruce & Flynn, 2013). Utilization of the PLC model increases the skills, knowledge, and self-efficacy of teachers through a collaborative and collegial forum, benefitting both teachers and their students (Bruce & Flynn, 2013, DuFour et al., 2008, Easton, 2012,).

Professional Development and Support for Teachers

The current shift in teaching resulting from implementation of the CCSS emphasizes student learning and outcomes as opposed to teacher actions and performance (Reeves, 2011). Confer and Ramirez (2012) worked as math instructional coaches in high-poverty Arizona public schools, where they discovered few teachers today learned math on a conceptual level when they were elementary students, resulting in few positive experiences with math as adults. The challenge for educators with the adoption of the Common Core State Standards is that they are being asked to teach math using methodology they never experienced as students (Confer & Ramirez, 2012). The shift for elementary math teachers stems from instruction built upon conceptual knowledge as opposed to solely procedural knowledge (Holmes, 2012). Procedural knowledge embodies information gained through algorithms, procedures, memorization of rules, or symbolic representations, while conceptual knowledge embodies deeper understanding of the relationships among principles and concepts (Holmes, 2012).

The missing element for educators in the twenty-first century is how best to create clear learning goals and objectives to drive instruction and assessment to better identify demonstrated student learning (Reeves, 2011). Bostic and Matney (2013) conducted a

study of 469 elementary teachers to determine how best to support educators in implementation of Common Core math standards. Findings indicated that teachers desired assistance in utilizing instructional strategies designed to foster math reasoning skills and to support students' conceptual development of mathematical skills (Bostic & Matney, 2013). The challenge in embracing the Common Core State Standards and constructivist, inquiry-based learning is shedding the pedagogy of "explain and model" teachers have practiced for years. Tyminiski (2009) explained teachers are naturally inclined to impose their own understanding upon students. However, the expectation for teachers of twenty-first century learners is that instruction will encompass posing problems to students with the intention of actively engaging and interacting with students as they develop their own mathematical constructions (Tyminiski, 2009). The student and learning centered instructional design must focus on the intellectual skills and thinking required of students, with the overarching goal of long-term experiential and learning outcomes (Reeves, 2011). The collaborative problem solving activities accompanying Common Core math lessons encourage the students to take over their own learning (McCarthy, 2012). Educational institutions must learn to foster and promote trial and error and intellectual risk taking among students in order to develop innovators of the future (Wagner, 2012). Staff development in this area provides an opportunity for district leaders and teachers to build relationships through needs anticipation, personal communication, ongoing dialogue, and shared responsibilities (Buffum et al., 2008). In short, teachers must be given what they need to teach.

In seeking to close the global achievement gap, U.S. schools have adopted the Common Core standards, built firmly upon the tenet of inquiry (Marshall, Smart, Lotter, & Sirbu, 2011). According to Douglas and Hortsman (2011), it is understanding the strategies used and defending the justification in reasoning that will provide students with the growth we seek in mathematics, not the answers themselves. It is the responsibility of the teacher to pose insightful math problems, then skillfully probe and facilitate productive group work, speaking "mathematically," in order to enable students to make connections to concepts (Douglas & Hortsman, 2011). Today's instruction should focus on preparing students to produce accurate responses, to choose and implement an appropriate and expedient strategy, and to use numerical relationships in computation without difficulty (Parrish, 2010). Through consistent analysis of what high quality student work looks and sounds like, educators will be able to work smarter, not harder. Wagner (2012) also valued the practice of dissecting the work produced by students in order to determine the effectiveness of instruction and provide clear evidence of skill mastery. Teachers, administrators, and coaches who establish and share common roles and best practices realize what it possible for all children to achieve in the Twenty-First Century (Confer & Ramirez, 2012).

Implications

The implications of the research will assist district leaders in program evaluation, as well as in making decisions pertaining to effective professional development models. Information conveyed through the study may promote new instructional practices based on conclusions pertaining to teacher effectiveness. The emphasis on results highlights

practical implications valuable to educational leaders within the Green Valley School District in order to promote interest and provide meaning. District leaders implemented the math professional development series and curriculum in response to the adoption of the Common Core State Standards, without having any prior experience in this area. A district-wide professional learning community incorporating web conferencing, virtual collaboration, video modeling, classroom demonstrations, and protocol-based performance task analysis has never before been put into practice. I will examine the impact on teaching practices and performance as a result of the mathematics professional development series and accompanying district-wide professional learning community.

The project study includes a PowerPoint Presentation and written analysis of the effects on teaching following the focus on Core-aligned math practices in district classrooms. A presentation and brief report of findings may be suitable for district stakeholders, including school board members, the superintendent and assistant superintendents, principals, teachers, parents, and community members. I may possibly obtain permission to share findings at a district school board meeting, in order for all interested stakeholders to have the opportunity to hear my presentation. Another proposed project is to offer every elementary school site the option of inviting me to present at a school site council meeting, consisting of elected parent and teacher representatives for each individual school in the district. I will ensure my presentation is succinct, highlights the key elements of the new standards, and provides authentic feedback from elementary site principals and math coaches as to how teachers responded to the facilitative, constructivist approach to instruction accompanying the new math

standards. Due to the lack of state standardized test data for the 2013-2014 school year, my qualitative data, presented in narrative form, may serve to fill a void in the area of student progress reporting. Standardized test scores are typically used as a measure of teacher performance. My study has the potential to provide evidence as to whether CCSS implementation improves the teachers' abilities to increase depth of student understanding of mathematical concepts, and to facilitate student skill development in critical thinking, communication, collaboration, and creativity that the previous state standards did not. The information obtained through interviews and questionnaires will provide district leaders with an overview of the perceived effectiveness of the professional development and PLC components of the Common Core training, and afford this group of stakeholders the opportunity to inform future CCSS professional development in order to best meet the needs of elementary teachers.

The findings from this case study have the potential to benefit site administrators, as they have the opportunity to review qualitative data pertaining to perceptions of peers in respect to the impact of the district professional development series. This information will provide a basis for comparison regarding individual experiences of site-based leaders that can be used to influence collaborative discussions and problem-solving sessions at administrative cabinet meetings and site leadership meetings. Information about sites perceived as experiencing significant improvements in teacher practices and subsequent performance could offer insights that sites with less favorable outcomes may adapt. My findings may also influence decisions regarding the adoption of new curriculum and

teacher-created units of study, changes in the role of math instructional coaches, and the frequency of demonstration classroom endeavors.

Principals and assistant principal have the option to communicate findings addressing the impact of the training series on a larger, district-wide scale to their instructional teams and parent community to enhance understanding and broaden perspectives of Common Core math instruction. Teachers will also have the opportunity to utilize results of the study to determine administrators' overall observations of teaching practices due to the shift in standards and instructional roles and methods at eleven different school sites. Communication of such feedback has the potential to improve morale, drive momentum, or provide a clearer picture of the purpose and meaning behind the momentous shift in public education nation-wide. Implications for researchers entail providing one of the first studies of its kind, based upon exploration of Common Core State Standards in practice. As the CCSS become formally adopted and implemented on a national level, the insights provided in this study may provide researchers with valuable accounts of elementary educators' personal experiences and observations of teaching under the new paradigm. Finally, this study has the potential to impart positive social change, as it offers solutions to minimize the achievement gap in the area of mathematics, enabling all students to be prepared for the challenges of the twenty-first century.

Summary

Math performance of U.S. students continues to fall short, especially among minority subgroups and student of poverty (Agodini et al., 2010; Confer & Ramirez, 2012). Many students in the U.S. graduate with little conceptual understanding,

demonstrating solely knowledge of facts, but not ideas supporting numerical operations (Wagner, 2012). National education policymakers determined math curriculum needed massive revisions in order to improve math achievement among all students, favoring depth over breadth of knowledge (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). The main objective of the CCSS is to ensure participating states create robust and relevant educational opportunities for all students, designed to reflect the knowledge and skills essential for millennial learners to succeed in both college and career (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

The national goal is for every student to complete high school adequately prepared for postsecondary study and participation in the workforce (U.S. Department of Education, 2013). Students who graduate with essential skills and knowledge are afforded a multitude of opportunities, while those who fail discover few paths to success (Buffum et al., 2008). In order to achieve these goals, it is imperative that effective, masterful instructors guide student learning in collaborative and innovative learning environments (U.S. Department of Education, 2013).

The State Department of Education provided Race to the Top grant funds to local districts designated for intense, extended professional development in Common Core State Standards over a period of three years. Professional development provides the opportunity to invoke transformative change, continuous growth, passion, and purpose, while energizing thinking (Easton, 2012, U.S. Department of Education, 2013). District officials were faced with the challenge of designing and implementing meaningful

professional development to address the instructional practices of the faculty in alignment with the CCSS. In order to train teachers to implement research-based strategies for improving conceptual number sense in grades kindergarten through fifth, a district-wide math professional learning community was developed, emphasizing use of teaching operation strategies through daily number talks in every classroom. Bimonthly hybrid professional development sessions, consisting of a combination of live interactions, video conferences, and teacher-to-teacher tutorial videos, connecting all elementary teachers and administrators, were implemented at all eleven elementary school sites.

Five district math instructional coaches were also hired to observe teachers, model lessons in the classroom, provide additional grade-specific CCSS resources for immediate use in the classroom, and facilitate meaningful reflections and self-analysis among teachers. The objective of the math professional development series was to provide teachers with specific teaching strategies, rich, collaborative discussions, supplementary curriculum, and protocols for analysis of student work to implement shared and consistent approaches and practices in mathematics across the school district.

I examined the design and implementation of a Common Core State Standards-aligned math professional development series at 11 U.S. elementary schools. Through questionnaires and interviews, I determined how educational leaders, including site principals, assistant principals, and instructional coaches perceived the effectiveness of district-wide Common Core math professional development on teaching practices and performance. The perceived success or failure of the CCSS series was measured by instructional leaders' feedback pertaining to mathematics classroom observations

following the PD. In the next sections, I describe the specific methodology designed to answer the research questions and provide a rich description of the experiences of one school district.

Section 2: Methodology

Research Design and Approach

The qualitative research design entails developing a deep and detailed understanding of a phenomenon through exploration of a problem (Creswell, 2012). Unlike quantitative studies, qualitative studies involve data collection based on words, from a small number of participants, in order to explore individuals' points of view related to the broad research problem (Creswell, 2012). The qualitative case study design was appropriate for this study in that the overarching goal was to acquire and analyze the perceptions of individual site principals, assistant principals, and instructional coaches regarding the impact of internal math training on teaching practices.

Site administrators and instructional coaches attended the district-wide training alongside the teachers, and were able to see the implementation of Common Core practices through ongoing formal and informal teacher observations and classroom walkthroughs. The principals, assistant principals, and math coaches were able to compare teaching across grade levels, viewing the behaviors and performance of kindergarten through fifth grade instructors before and after the district trainings. In interviewing and issuing open-ended questionnaires to this population, I gained insights as to the observed teaching practices in mathematics and the relationship between district PD and teacher behaviors.

Principals were responsible for disseminating site performance information to district leaders six times throughout the year, as the main source of data as to how well instructors demonstrate understanding and mastery of teaching the new standards. In the

absence of standardized testing, this information, combined with qualitative principal feedback, served as the basis for evaluating the effectiveness of the district professional development series in transforming teaching practices to competently incorporate the CCSS in mathematics. I accessed the expertise of the site administrators, comparing their observations and evaluations across district elementary sites to determine commonalities and differences in math teaching practices and teacher behaviors attributed to the CCSS professional development series and corresponding PLC model.

Using a qualitative case study design, I focused on 11 elementary sites within the Green Valley School District. Each site employs approximately 35 classroom teachers in Grades first through fifth, two site administrators (principal and assistant principal), and one math instructional coach for every two to three schools (five coaches). The rationale for conducting an observational case study was to focus on a particular organization, the Green Valley School District. The case study design allowed for the study and analysis of a particular aspect within the organization, a district-wide math professional development, and its perceived impact on teaching. By conducting a case study, a detailed examination of 11 school settings was conducted and compared for emergent themes. Case studies can be helpful when evaluating programs within a school setting, while using a small population allows for a deeper interpretation of results (Merriam, 2009). I determined whether the district math professional development was effective in preparing teachers to incorporate CCSS practices.

The research questions that were explored in this study consist of the following:

RQ1: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development?

RQ2: What are the differences in observed math instructional practices before and after the district CCSS professional development series?

Population and Sampling

The setting for this qualitative case study was Green Valley School District, a public school district. The district encompasses 11 elementary schools, Grades K-5, housing approximately 13,000 students cumulatively. The target sample for this study was all 22 elementary school site administrators, and all five elementary math instructional coaches employed by the district. Both the administrators and instructional coaches were selected for this study because of their specialized knowledge and expertise in the area of instructional leadership, as indicated in the district job descriptions outlining prerequisites for the positions. Although 22 administrators and five instructional coaches were invited to participate in the study, the actual sample size was determined by the number of individuals from this group who agreed to voluntarily participate in the study ($N = 20$). My goal was to discover, understand, and gain insight in the area of math instruction, and I selected a group of participants from which much can be learned. The sample for this study consisted of seasoned instructional leaders who regularly observe math teaching and learning, and represented diverse groups of students and teachers within the district. In keeping my sample small, I engaged in deeper inquiry with each individual.

Access was obtained to this particular group of administrators through membership in the same organization: the Green Valley School District. The participants and I work together on a regular basis as colleagues serving as fellow administrators. I have a regular working relationship with the assistant principals within the organization, and have interacted with the principals on five to ten occasions at structured district events. I have briefly met three of five instructional coaches during site visits and district trainings, but do not have an established relationship with them.

Prior to initiation of data collection, I obtained a letter of cooperation from the research site and received approval from Walden University's Institutional Review Board, approval number 03-18-14-0291220. I then solicited participants for the study via mass e-mail to the target population, obtained from my district internal address book, including as attachments informed consent protocols and letters directed toward both the instructional coaches and site administrators explaining the study (see Appendices E-H). I stated in the letters the nature and purpose of the study, and stressed that individuals were under no obligation to participate. I used the standardized letters sent via e-mail in order to ensure my personal and collegial relationships did not yield undue influence over potential participants.

Informed consent regarding the questionnaire portion of my study was acknowledged through the completion of the online questionnaire, in order to preserve participant confidentiality. Nine of 11 elementary principals, six of 11 elementary assistant principals, and five of five instructional coaches completed the online questionnaire. The interview portion of the study began by establishing communication

with volunteer participants who responded to the standardized letter sent via e-mail to all elementary site administrators (see Appendix E). Four site principals and one site assistant principal responded to the researcher, via e-mail, that they volunteered to be interviewed. Upon obtaining informed consent from this group of five participants, including communication of data collection procedures and the participants' roles in the study, I worked to establish a researcher-participant relationship in order to ensure all individuals felt comfortable sharing their perceptions and viewpoints with me.

The identity of the participants, as well as any identifying factors, was kept confidential. The data were not accessible to any additional individuals, and were stored on a password-protected computer. There were no projected risks associated with participation in the study, and vulnerable participants not included. My role in the organization of study may have directly or indirectly influenced my interpretation of participants' responses, as I also have access to daily math instruction through regular walkthroughs and observations, and I took measures to routinely self-evaluate and minimize personal bias.

Data Collection

According to Merriam (2009), qualitative data consists of interview-based direct quotations, opinions, knowledge, and feelings, observation-based descriptions of actions and behaviors, and document-based passages and excerpts. In the field of education, interviewing is the most common form of data collection (Merriam, 2009). The data for this study consisted of one-to-one interviews with five selected site administrators, supplemented with multiple choice and open-ended participant questionnaires for 20

designated site instructional leaders, and post-hoc observations of three district math web conferences.

The interviews were semi-structured, guided by an established list of questions that did not adhere to a specific order (Merriam, 2009). The interviews (see Appendix B) took place over one face-to-face session with one of the participants, and four individual telephone interviews with the remaining participants, occurring at mutually convenient, pre-arranged dates and times over the course of two weeks. Questions were primarily opinion and value-based, as participants were asked how they perceived teaching and learning has been impacted by the district math training. In conducting my interviews, I maintained ethical standards and minimized researcher bias through explaining the purpose of the study and the interviewee's role in it, ensuring informed consent and confidentiality, evaluating my relationship to the interviewee, and transcribing and/or recording all responses (Merriam, 2009).

Participants were reassured that all names and identifying details will be kept confidential in order to protect anonymity and elicit honest responses. I informed participants that they were able to discontinue the study at any time, without repercussions. I included these procedures to ensure all interviewees felt comfortable throughout the duration of my research, and to create clear definitions in my role as the interviewer, versus my role as a work colleague.

I avoided leading questions, and triangulated my findings through incorporation of multiple data sources by cross-referencing responses with questionnaire data to ensure all questions asked during the interview were relevant to the study. I ensured reliability

and validity through member checking and peer examination (Merriam, 2009) by providing written transcripts of interviews to participants to review for accuracy. The transcripts were also cross-referenced with audio recordings of each interview. I also thoroughly explained in my study how all data was collected in order to create an audit trail. In terms of the structure of my questions, I asked open-ended questions that were void of leading terms (i.e., "Don't you think?"). I also avoided yes or no questions, as they yield almost no useful information (Merriam). The majority of my questions were values and opinion based or experience and behavior questions, all of which are acceptable types of interview questions for qualitative research.

The goal of this study was to determine district instructional leaders' perceptions about school district math training and its impact on teaching. I developed questions that pertained to the viewpoint of the participants, and was careful not to impart my own opinions or values into my questions, probes, or responses. I recorded and transcribed all interviews to ensure accuracy. I then reviewed and coded interview transcripts to identify common key ideas and terms to later analyze as potential major and minor themes. I utilized SurveyMonkey to enter, categorize, and store data. I accessed the stored data following each new interview in order to assist me in the identification of emergent themes as they developed, using inductive research practices to determine the categories I further analyzed and disseminated.

Interviews were supplemented with a primarily open-ended questionnaire (see Appendix C) completed by 15 site administrators (principals and assistant principals) and five instructional coaches. Open-ended questions are questions in which the researcher

does not provide the participants with options for responses (Creswell, 2012). This format was beneficial in that participants were permitted to develop individualized responses within their unique experiences, as opposed to those of the researcher (Creswell, 2012). In developing the instructional leader questionnaires pertaining to perceptions of the district math training in the areas of teaching and learning, I ensured the questions were simple and straightforward, so that the participants were able to provide meaningful responses. I pilot tested the questions prior to beginning the interview process, in order to edit any questions deemed confusing or unclear. Upon initiating the interview process, I provided participants with questions in verbal format, clarifying for understanding as needed.

According to Creswell (2012), good questions are clear and unambiguous, while being sensitive to class, cultural, and gender differences. While the questionnaire was distributed to my entire target population of instructional leaders within the district, participation was voluntary, and findings were impacted by the rate of return. Prior to electronically mailing the anonymous questionnaires, the questions were pilot tested by two colleagues. Pilot testing is a procedure in which a researcher amends an instrument based upon feedback from a limited number of participants (Creswell, 2012). I edited and revised my questions based upon verbal feedback from the pilot test. I also create two versions of a cover letter, one for instructional coaches and one for site administrators (see Appendices E-F) to accompany the anonymous questionnaire, explaining the purpose of the study and participant assurances.

In addition to interviews and questionnaires, I conducted post-hoc observations of three, 60 minute, recorded district-wide math trainings, in which professional development sessions were observed in a collaborative webinar forum as new math strategies were addressed. According to Creswell (2012), observation is the process of collecting firsthand information through observing individuals at a research site. In this case, a post-hoc recorded interactive webinar afforded me the opportunity to listen to discussions that took place across the district-wide virtual PLC, and read the discussion questions and responses provided by the participants via the chat feature of the webinars.

In the case of observing participants at district math trainings, I adopted the role of the participant observer. A participant observer has the advantage of seeing experiences through the eyes of participants, as the researcher actually takes part in the observed activities, while simultaneously recording information. Observations were recorded on an observational protocol (Appendix D), in which I recorded notes about the content of the PD. These notes were included in a qualitative database to corroborate interview data and cross-reference themes.

An additional form of data collection consisted of documents. Documents include public and private records obtained about a site or participants in a study (Creswell, 2012). For purposes of this study, documents included copies of PowerPoint slides used in district math trainings, and copies of math units and rubrics developed by the district and incorporated into the classrooms. The final form of data included within the study was audiovisual materials. Audiovisual materials consist of images or sounds included to help researchers better understand the central phenomenon being studied (Creswell,

2012). Videotapes of math lessons included as a component of the district math trainings were viewed and analyzed in order to provide information that addressed the teacher practices and behaviors related to math instruction, and to augment the data collected through interviews and observations. The videos were be shot by a district-level administrator, then embedded within the PowerPoint slides, where they were viewed by the staff collectively during math training sessions to provide scenarios of real-life application of the new strategies reviewed. The lesson videos provided further evidence of the impact on teaching as a result of the Common Core math professional development.

Data Analysis

According to Creswell (2012), hand analysis of qualitative data entails reading the data, marking it, dividing it into parts, and coding it. Coding is an inductive process used to formulate descriptions and themes from text (Creswell, 2012). In analyzing the questionnaire, observation, and interview data from this study, coding categories recommended by Bogdan and Biklen (2007) were implemented in order to provide some initial direction and help to identify themes by category. The categories that were explored include: setting and context codes, definition of the situation codes, perspectives held by subjects' codes, and subjects' ways of thinking about people and object codes (Bogdan & Biklen). These codes were appropriate and relevant to the research question and corresponded to interview questions addressing teaching practices in response to the district math training. Codes included reference to specific teaching behaviors and practices before the implementation of CCSS and after the launch of the new standards

and corresponding professional development. Interview and questionnaire responses were broken down by specific teacher actions or strategies (i.e. modeling of rote algorithms or conceptual understanding), and tally marks were added with each subsequent participant's reference to identical or similar terms. Related practices were then categorized. For example, student talk, partner sharing, and classroom math talks were combined to create the category discussion, collaboration, and math discourse. The categories with the greatest number of tally marks, indicating a large number of participants shared perspectives and observations on classroom math instruction, evolved into emergent themes designed to address the overarching research questions. These themes were then confirmed via post-hoc observations of district PD sessions, in which explicit instructional strategies and techniques were presented and practiced by elementary teachers.

To make the coding process more efficient, the observation protocols, questionnaire data and interview transcripts were reviewed several times in order to identify the emerging themes placed under specific codes. By first gathering, then combing through the data, major and minor themes emerged organically through this inductive process. Notes and reflections were then added under each theme. Documents and videos were then analyzed in order to augment and support emergent themes from interviews and observations.

As analysis of qualitative data is more subjective than analysis of quantitative data, personal interpretations of interview and observation data impacted the findings of the study. In this instance, shared membership in the same organization (Green Valley

School District), and regular access to classroom math instruction across my own school site, influenced my interpretations of teacher actions and behaviors pertaining to math instruction. I also had prior notions of teachers' feelings and beliefs pertaining to the CCSS and subsequent district PD due to my own conversations with teachers on site, and my participation in the math workshops alongside elementary educators at my school. In identifying themes and analyzing data to answer the research questions driving the study, I engaged in member checking with 25% of the participants in order to ensure my interpretations of the information collected were aligned with their perspectives.

According to Creswell (2012), interpretation of findings involves making sense of the data, including a review of major findings, answering the research questions, writing personal reflections and comparing personal views with current literature, citing limitations of the study, and making suggestions for future research. Qualitative researchers typically avoid use of the term *bias*, instead referencing the *interpretative* nature of this type of research (Creswell, 2012). In order to avoid personal bias and ensure interpretations were trustworthy, self-reflection, exploration of researcher roles, and examination of how the collegial relationship between researcher and participants may have influenced findings were taken into account to address credibility. I engaged in this process through utilization of data analysis software, including Surveymonkey and IBM SPSS, to serve as a complement to my personal analysis of information. I also compared interview and questionnaire data to the video model lessons to present a more comprehensive interpretation of the case studied.

Interview transcripts were validated by incorporating member checking, wherein participants had the opportunity to review their responses. Triangulation was implemented by comparing all five interview transcripts and three staff training observations to ensure findings are validated and confirmed through multiple sources of data. After completing a narrative draft of my findings, I shared my analysis with a participant group representing 25% of the sample to ensure my interpretations were consistent with their perspectives. In the event of discrepant cases, an external auditor not involved in the research would have been employed in order to ensure inferences were logical and themes were appropriate. There were no instances of discrepant cases in this study.

Findings

Sample

The sample for this study consisted of 20 instructional leaders employed by the Green Valley School District. Twenty individuals completed an online questionnaire, while five participants completed both the online questionnaire and one-to-one interviews. The individuals completing the questionnaire were employed in the following positions: 45% were principals, 30% were principals, and 25% were math instructional coaches, known within the district as Teachers on Special Assignment (TOSAs). The 20 participants were asked to state how long they had been employed in their current role and 30% indicated they had served in their current position for less than one year, which is aligned with the first year of hiring full-time instructional coaches within the district. Twenty-five percent of respondents indicated that they had been employed in their

current roles for one to three years, 25% stated four to six years in current positions, and 20% indicated 11-15 years served in current professional roles. The sample consisted of participants in a variety of instructional leadership roles (Figure 1) with a range of experience.

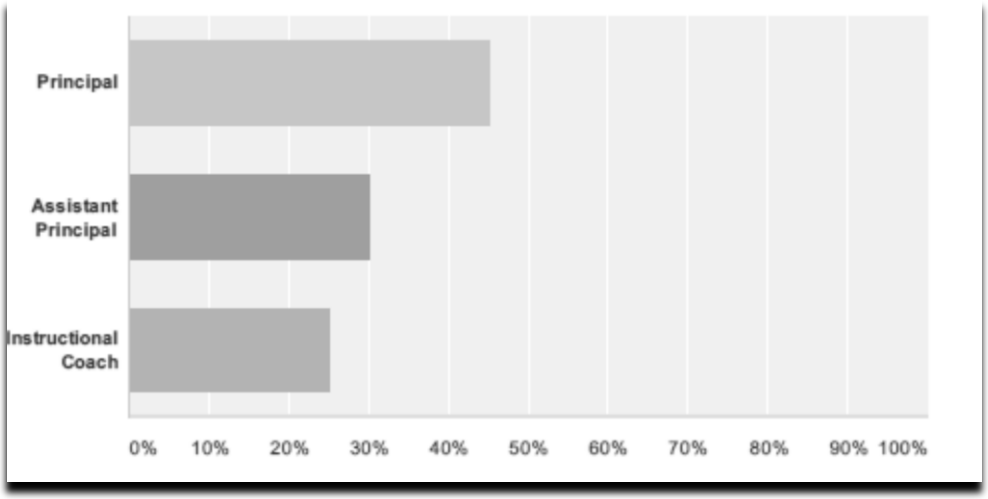

Figure 1. Professional roles of participants

Participants were also asked to share their level of exposure to Common Core math professional development and PLCs in the form of principal's cabinet, instructional demonstrations or web conferences, as well as exposure to math instruction through formal classroom observations and informal observations in the form of walkthroughs. The level of participant experience regarding math observations may have impacted perceptions regarding Common Core instructional shifts following district PD. In response to the question inquiring how many observations or walkthroughs the instructional leaders conducted on a monthly basis, 30% of respondents indicated 0-5,

35% of respondents indicated 6-10, 5% indicated 11-15, 10% indicated 16-20, 10% indicated 21-25, 5% indicated 31-40, and 5% indicated completion of over 40 observations and walkthroughs of classroom math instruction on a monthly basis. In response to the number of professional development sessions, math instructional coaching demonstrations, or math-specific PLCs attended thus far, 10% of respondents indicated 4-6, 40% stated 7-10, 25% indicated 11-15, 5% stated 16-20, and 20% responded they had attended over 20 Common Core math-specific PD and PLC sessions thus far. This information provided me with additional insights into my participant group, namely that they had a range of exposure both to CCSS professional development, and to seeing the new math practices in action in elementary classrooms at their sites.

Questionnaire

The following summary depicts results from the Common Core Professional Development Questionnaire (see Appendix C), completed by 20 instructional leaders within the Green Valley School District. The questions consisted of a mix of demographic information, multiple response questions with opportunities for elaboration or addition comments, and open-ended responses. This format allowed me to better identify trends in instructional leaders' perceptions pertaining to the Common Core professional development series.

Participants described observed overall math instruction at their sites prior to the implementation of district Common Core professional development. Seventy percent of respondents indicated that math instruction was observed to be primarily teacher-led, using the math manual, while 30% stated they observed a combination of teacher-led and

student-centered learning prior to CCSS professional development. None of the respondents shared their observations of primarily student-centered, hands-on learning. Three instructional leaders added comments, sharing observations. Participant A indicated that prior to the CCSS professional development series, "Teachers were dependent on the TE, passing out a lot of worksheets, assessing understanding through timed math facts tests." Participant B shared, "Students were working on pages in a book," and "Our site was greatly influenced by staff members who work for Math Solutions." Responses overwhelmingly depicted primarily teacher-led instruction, reliant on procedural math manuals prior to the implementation of CCSS math practice and content standard PD.

Instructional leaders were asked to describe teachers' attitudes and beliefs toward Common Core State Standards math practices and expectations at the beginning of the 2013-2014 school year. Participants were permitted to select from the following options and directed to check all descriptors that applied: apprehensive, excited, resistant, confident, indifferent, and overwhelmed. The top two descriptors included *overwhelmed*, with 80% of leaders selecting this option, and *apprehensive*, with 70% of participants choosing this descriptor of teachers' attitudes and beliefs in the beginning of the academic year. Two additional choices, *excited* and *resistant*, were also selected by 40% of respondents. The final selections, *confident* and *indifferent*, were not chosen by any participants. Eight respondents chose to elaborate on their selections through additional comments. Participant C stated:

> I think many people were excited yet apprehensive about the shift. I do think

> most people did not feel confident. A lack of resources and materials as well as little PD about the new standards had people not sure. This added to increasing workload, and led some people to be frustrated.

Additional insights from Participant D in response to the questionnaire included:

> At the beginning of the school year, teachers were met with the reality of having to teach new content standards in a very different way without enough direction or understanding. This definitely led teachers to feel more apprehensive and unsure about the instructional decisions they were making. The greatest area of concern for teachers seemed to be that they no longer had a teaching manual to follow and a curriculum resource to guide them. While most teachers saw meaning and purpose in the shift, they were still unclear about how best to teach the content.

These perceptions were supported by other respondents, Participants E and F, who cited "Teachers are overwhelmed in the sense that they are unsure of themselves and their ability to teach differently," and "Teachers were apprehensive and overwhelmed by changes in instruction and assessment."

Participants completing the online questionnaire reported how they viewed teachers' attitudes and beliefs towards CCSS math practices and expectations after attending the district-wide PD. Respondents were to select all applicable characteristics from the following list: apprehensive, excited, resistant, confident, indifferent, and overwhelmed. In this instance, 75% of respondents selected *excited* to describe perceived teachers' attitudes, 60% selected *overwhelmed*, 50% selected *apprehensive*, 45% selected

confident, 15% selected *resistant*, and 10% selected *indifferent*. A comparison of instructional leaders' perceptions of teachers' attitudes and beliefs before and after attending the district CCSS professional development series are illustrated in Figures 2 and 3.

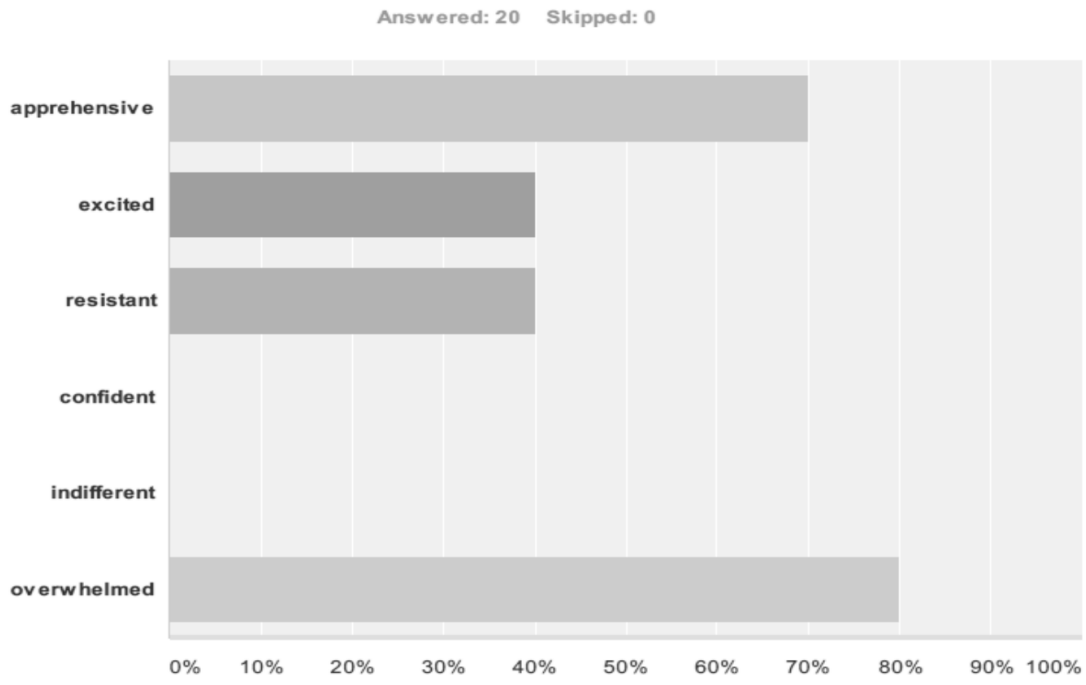

Figure 2: Teacher attitudes prior to district PD

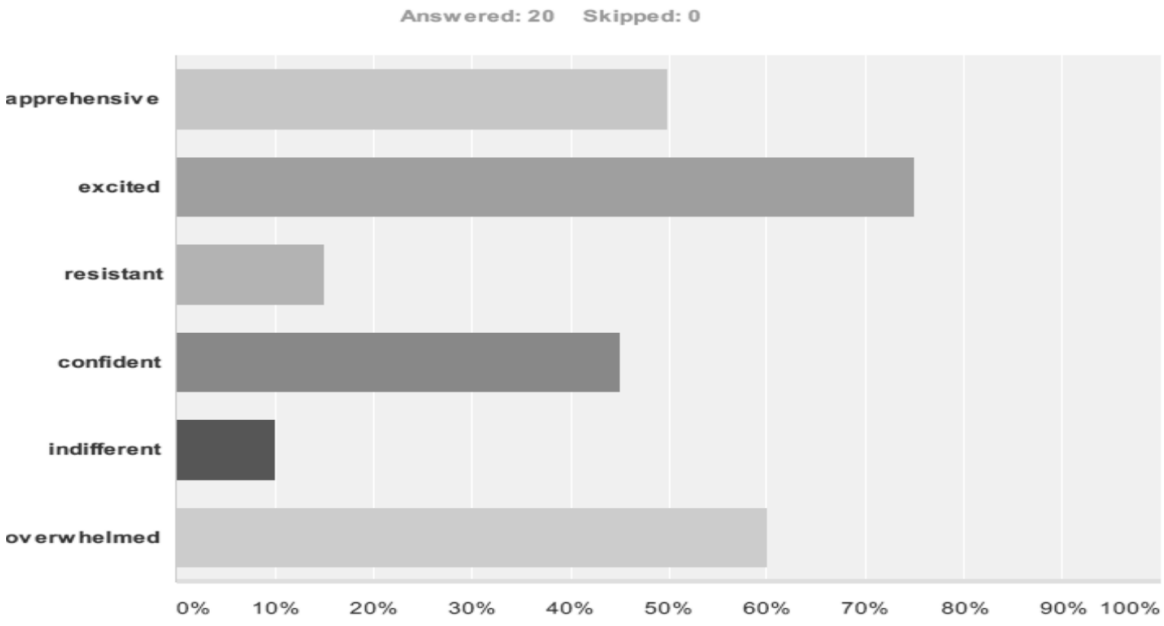

Figure 3: Teacher attitudes following district PD

Additional comments provided rationale for the shift following the PD. Remarks from Participant E included,

> I think as the year has gone on, and more PD sessions have been attended, people are starting to feel more confident about their math instruction. I think what math instruction looks like in the classroom is beginning to change, and teachers are starting to embrace the Common Core.

Remarks from Participant C included:

> The success of CCSS in math depends on a teacher's personal knowledge of mathematics and their understanding of how to teach conceptual understanding. For most teachers at the elementary level mathematics is a weak area and they have

traditionally relied on the textbook to guide their instruction. The CCSS in math require teachers to have a deeper level of mathematical understanding. That being said, I do believe many teachers are excited by what they see their students doing and understanding in math.

These statements were supported by additional participants' comments, including Participant F's response "[The teachers are] still apprehensive and excited, but gaining more confidence every day," and Participant G's statement, "While their attitude has changed, they are still not to the point where they are confident about their knowledge of the standards and the best way to instruct them."

Instructional leaders rated the effectiveness of the district math PD in preparing staff to teach to the Common Core standards. Respondents were asked to select one choice from the following options: highly effective, somewhat effective, neither effective nor ineffective, somewhat ineffective, and highly ineffective. 65% of participants rated the PD as *somewhat effective*, while the remaining 35% selected *highly effective*. Five leaders added additional comments to elaborate on their responses Participant A stated, "It says directly in the framework that that student understanding and success is directly linked to teacher understanding. There is a tremendous need for greater and on-going professional development." Participant C commented, "Our district is ahead of most districts in the area of professional development. However, it's not enough. You can't expect teachers to deepen their mathematical understanding without consistent and significant professional development." Comments from Participant D included, "The professional development is quite effective, but needs supplemental support curriculum

to be more effective." Participant G stated, "I think teachers understood the content, but were not prepared for the change in their teaching practices."

One of the guiding research questions in this study was What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development? Participants were asked to report on observed teacher practices following the implementation of the CCSS PD. Instructional leaders were asked to select from the following choices: primarily teacher-led, using math manual, primarily student-centered (hands-on learning, inquiry-based, teacher as facilitator), or combination of teacher-led and student-centered learning. 65% of leaders chose *combination of teacher-led and student-centered learning* (versus 30% prior to the math PD), 35% of respondents selected *primarily student-centered*, (versus none of the participants prior to PD), and no respondents selected *primarily teacher-led*, (versus 70% prior to CCSS professional development). Figure 4 and Figure 5 depict a comparison of observed math instruction descriptions before and after the implementation of the district-wide math PD in order to address the second guiding research question: What are the differences in observed teaching practices following the district-wide math professional development?

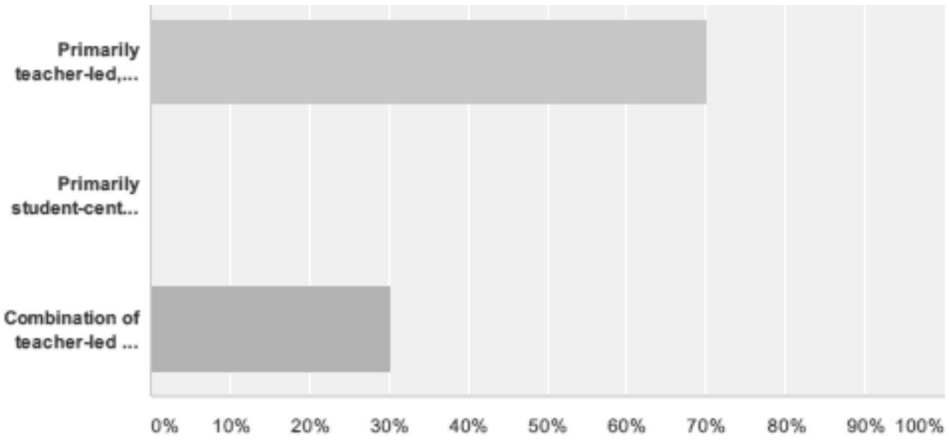

Figure 4: Observed overall math instruction prior to CCSS professional development

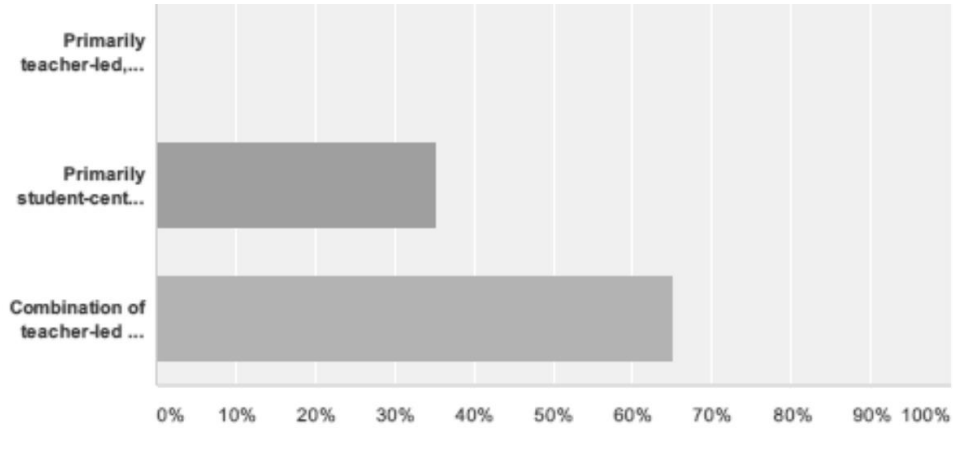

Figure 5: Observed overall math instruction following CCSS professional development

Two instructional leaders elaborated on their responses, explaining the shift in attitudes. Participant H stated:

> The Mathematical Practices are the soul of CCSS in math. Teachers have not been given enough opportunities to really see for themselves how a

> mathematically rich classroom looks or feels. They see the value of being a facilitator and the importance of student-centered classrooms, but so many teachers are still unsure of how to make that happen in their classroom on a daily basis.

In an additional statement, Participant B expressed, "Some teachers still rely on teacher-led lessons from time to time, but most are making the changes."

In order to further delve into the study's guiding research question addressing the differences in observed mathematics teaching practices post-PD, participants completing the online questionnaire were presented with a directive to explain, based on their observations, the greatest changes in teaching practice following the implementation of the district-wide PD. Instructional leaders' responses included a comment from Participant J: "My teachers are very student centered. I have observed more discussion/collaboration with students and grade level teams." Participant K responded:

> I think math has become more of a hands-on and discovery time for students. Teachers are using manipulatives and allowing students to use multiple strategies to solve problems. Students are involved in math games. Math has become louder, involving students in class discussions and allowing for math discourse. Another change is that students are reasoning more in math and being able to explain their thinking orally and in writing.

Additional observations included, “A focus on the mathematical practices... getting students to persevere in problem solving and getting them to explain their thinking,” “teachers are asking many more questions,” “greater focus on concept development and less on procedures,” and “The students are thinking and learning to respond as required by the standards for math practices.”

Based on participant responses regarding greatest changes in observed teaching practices following the district-wide CCSS professional development series, the following instructional shifts occurred:

1. Increase in discussion, collaboration, and math discourse
2. Students are asked to explain their reasoning and thinking in oral and written format
3. Increase in inquiry-based learning through use of math games and manipulatives
4. Increased emphasis on problem solving, using a variety of strategies
5. Greater focus on conceptual understanding versus mathematical procedures

In order to gain a broad perspective regarding the shifts in math instruction following CCSS professional development, instructional leaders reported how they believed the district PD changed overall math teaching practices at their sites. Participants completing the questionnaire were asked to select from the following three choices: PD has not resulted in change in practice, PD has resulted in minimal change in practice, PD has resulted in significant change in practice. 80% of respondents selected *PD has resulted in significant change in practice,* while the remaining 20% chose *PD has*

resulted in minimal change in practice. None of the respondents indicated that *PD did not result in any change in practice*.

In order to determine the specific elements of the PD responsible for the teachers' instructional changes, respondents shared the two elements of the PD that they believed were most essential in changing the math practices of their teachers. The participants were asked to select from the following options: district-wide PLC/web-conference, demonstration classrooms (videos of teachers in practice and observations of coaches), common planning time, instructional resources, debrief/reflections with math coaches, and analysis of student work protocols. 80% of leaders selected *common planning time*, 50% selected *demonstration classrooms*, 50% chose *debrief/reflections with math coaches*, 35% selected *district-wide PLC/web conferences*, 20% chose *instructional resources*, and 15% selected *analysis of student work protocols*.

Despite observed changes in practice overall, participants reported some challenges in incorporating CCSS-aligned strategies. These challenges may have been contributing factors to the nature of observed math instructional techniques following the PD. Instructional leaders were asked to share the greatest challenges in incorporating CCSS math practices at their sites. Examples of responses provided by principals, assistant principals, and instructional coaches are listed below:

1. My teachers' pace continues to reflect past practice. Trying to have them slow down and take more time with the practices and standards. Having students reflect at the end of lessons on what practices were used is a challenge also (Participant A).

2. I think District-wide our challenge has been finding and using meaningful resources. Teachers were left to sort through lists of a variety of resources, which was time consuming and frustrating. The next biggest challenge I believe is really implementing the Math Practice Standards into daily instruction. This is a huge instructional shift and I think some teachers are still unaware of what those practices would look like in action and how important it is to be implementing them daily. Another concern is lack of content PD for teachers about their specific standards. The quote "you can't teach what you don't know" is so true. Teachers need time and PD to unwrap their standards so that they feel confident during their instruction and can anticipate student responses (Participant G).
3. Keeping the staff motivated lack of true instructional materials time to plan (Participant T)
4. Turning the new district math curriculum guides into a sequence of instruction for teachers (Participant N)
5. Lack of support materials, curriculum, and pacing guides (Participant L)
6. Time, resources, and opportunities for teachers to understand and see how different CCSS math looks and feels (Participant D).
7. The greatest challenge has been not having enough time to coach teachers systematically. Only working with them in guided planning twice a year is not enough (Participant O).

8. Allowing for feelings of confusion. It takes time to learn something new, yet we all want to just know how to do the right thing right now (Participant E).
9. Teachers aren't confident in teaching a student centered math class (Participant S).
10. Resistance to change. Some teachers are resistant to shift the cognitive load to their students because it is more difficult to manage the classroom. Need for professional development. The teachers have been working with the Standards for Mathematical practice for almost two years now, but still need the "meaning". Why are the SMP's important and what do they look like in a math classroom. We will hopefully continue to work with this" (Participant B).

Based on participant responses, the following represent the most prevalent challenges in incorporating Common Core math practices at elementary sites:

1. Time
2. Resources/curriculum
3. Mindset of teachers

The questionnaire data provided me with a strong overview of principals', assistant principals', and instructional coaches' observed math teaching practices following the implementation of the district CCSS professional development series, as well as the differences in teaching practices before and after Common Core PD. In order to supplement the questionnaire data with rich, in-depth narrative data, I conducted five one-to-one interviews with site administrators (four elementary principals, one elementary assistant principal). The questions were semi-structured, and some questions

were omitted in instances when the interviewee spoke about the target topic in a previous question. This allowed for a more natural flow of conversation, and reduced redundancy. The interview questions and responses supported the overarching research questions and corroborated the inductive themes gleaned from the questionnaire responses. This section further describes the emergent themes that developed through analysis of interview data.

Interview Data

Transcripts from one-to-one interviews were reviewed to obtain background information pertaining to pre-Common Core math teaching practices. Common phrases, words, and messages among the administrators' responses addressing observed activities, teaching strategies, and methodologies in elementary math lessons prior to the implementation of the district CCSS PD were coded and categorized. Common responses among participants included references to instruction of algorithms and procedures. The codes applied to this question included: algorithms/procedures, paper/pencil work, teacher-led instruction/modeling, sequential instruction from math teachers' manual, and independent practice. The codes were categorized to embody the following themes:

Theme 1: Teachers Utilizing Math Steps/Algorithms

Administrator A reported observing, "[Teachers] getting the children to just keep practicing the algorithm, and the steps and the steps, but not really teaching the concept behind it," and "showing students on the board how to do a problem and kids practicing those kinds of problems. I may have seen kids solving problems with algorithms on whiteboards and then showing them to their teacher." Other interviewees corroborated this data. Administrator B shared," I think the biggest trend was the actual teaching of the

algorithm. There was very little in terms of ongoing teaching of number sense and the deeper, complex understanding of math. I really think if I would say a trend it would be procedural math."

Theme 2: Teacher-directed Math Lessons

Responses relevant to Theme 2 included Administrator C's comment:

> I think that you would have seen more teacher-directed lessons and less facilitation or exploration of any sort. It depends on the teacher, there may have been a few good ones who were doing the lesson that was more collaborative or more hands-on, but for the most part, you would see diving fractions page 42, and that's what they would be working from. We saw a lot of the students with their math books.

Additional insights pertaining to the theme of teacher-directed math lessons included Administrator D's comment, "In terms of day to day standards, I think most of it was the typical stand in front of the class and do a couple problems together, then go off to guided practice, then off to independent practice."

In terms of observed teaching practices in mathematics prior to the launch of Common Core State Standards and corresponding PD, the participants overwhelmingly reported systematic, sequential math instruction in which the teacher demonstrated how to perform specific algorithms and procedures. Students were expected to master the computational steps, and demonstrate understanding through independent, paper and pencil based tasks using worksheets or problems from the math textbook.

Teacher Reactions to the Common Core PD

In order to capture teachers' attitudes pertaining to the launch of CCSS and the shift in instructional expectations conveyed via district-wide professional development, administrators were asked to share their perceptions of teacher reactions to the Common Core math standards adoption at the beginning of the 2012-2013 and 2013-2014 academic years**.** Interview transcripts were reviewed to identify common phrases, words, and messages among the administrators' responses addressing perceptions pertaining to teachers' attitudes and behaviors in response to Common Core implementation in August 2012 versus August 2013. The responses were coded and placed into the following categories:

Beginning of 2012-2013 Academic Year:

1. Anxious/Worried
2. Teachers assumed the role of learners
3. Overwhelmed
4. Challenged
5. Excited to try something new/positive
6. Apprehensive/Hesitant

Beginning of the 2013-2014 Academic Year:

1. Supported (addition of instructional coaches)
2. Anxious/Uncomfortable
3. Lack of confidence
4. Frustrated by lack of curriculum

The categories addressing teacher attitudes related to the launch of CCSS and district expectations pertaining to implementation of the new standards were consolidated to reveal the following themes:

Theme 3: Negative Emotions

Negative emotions included anxiety, discomfort, frustration, and apprehension. Participant responses related to Theme 1 were fairly consistent with one another. Insights from site leaders included Administrator D's comment:

> Everybody was really anxious teaching the different strategies, changing the way they taught math all these years, learning the different strategies themselves, because all of the teachers were taught the algorithm, and have always taught the algorithm, so teaching them to see themselves as a facilitator, and asking the kids leading questions to make the kids come to the solution of problems was very different and challenging. There was a lot of angst and anxiousness and people feeling overwhelmed.

Administrator B reported:

> There was a little disbelief, and then a lot of worry, because [the teachers] had never had to gather materials and resources before. That was a challenge for them, plus they were in the middle of two programs, so it was like they had their feet in both because we were still giving CST. So we were still giving CST but we were saying 'Don't worry about CST, don't worry about the fact that we have no benchmarks to know how they're doing.' They didn't really believe all of that. They were

> apprehensive at first, and I think as the year went on they realized we really meant it, that it was okay to take the risk and do these things, because we needed them to change their practice.

Theme 3: Negative Emotions, Feedback, and Attitudes

In previous sections Theme 3 was identified as "negative emotions." Through inductive analysis, further support for Theme 3 emerged through additional exploration of teacher behaviors. Negative feedback and attitudes on the part of the teachers included observed expressions of frustration, and ill-preparedness. Although in the minority, there were some less favorable responses to the PD on the part of teachers shared by site administrators. Examples of such responses included Administrator E's statement, "As far as the professional development, I think the professional development gave teachers the big ideas, not necessarily what to do every day." Other interviewees reported teachers feeling frustrated by the lack of the lack of time to plan how to implement new strategies in their classrooms as a function of the PD, as well as a lack of resources to effectively carry out the new expectations in practice. The outlier in response to the question pertaining teacher reactions to TOSA support arose from a leader who worked closely with the instructional coaches across all 11 elementary sites. Administrator E provided some unique observations of the evolution of the coaching program, including:

> In the beginning I don't think they knew what to look for. Some teachers wouldn't even stay in the room, or they would answer e-mails. That was frustrating in the beginning. Now they're doing their second round with some grade levels, they're really feeling like it's taking hold, people really want to have

> them in their classrooms. In the beginning it was about forming the relationships, and inviting ourselves in. People weren't really sure about accepting that type of support.

Despite some negative feedback from teachers in regards to the effectiveness of the district PD series in preparing them to teach to Common Core math standards, the individuals interviewed stated the majority of teachers viewed the support and trainings offered across all 11 elementary sites as impactful and beneficial.

Theme 4: Positive Emotions

Positive emotions included feeling excited and confident. Although a smaller number of administrators reported teachers expressing positive reactions to the launch of the CCSS, there were references to receptive behaviors regarding the new standards. An example of such an observation by Administrator A was:

> I think initially, if we were to go back to 2012, there was a level of excitement to do something different. I think that they were interested and eager and on board in the sense of the transition, as we rolled out the first strategy and the number talks, and the first year of that, there was really a level of excitement to transitioning to the Common Core.

Overall, site leaders stated that prior to the implementation of the Common Core professional development series, teachers felt overwhelmed, anxious, and uncomfortable with the radical changes in education that were unfolding.

In order to address the local problem of lack of teacher preparation and knowledge related to Common Core State Standards in Mathematics, the district designed bimonthly professional development web conferences, linking teachers across the district in an interactive and virtual professional learning community. The teachers assumed the roles of the learners, utilizing social learning principles and constructivist principles to make meaning from the new knowledge that accompanied the new math standards. The teachers worked collaboratively in teams to solve sample problems and learn instructional strategies first as the student, then through practicing these techniques on colleagues. Teachers were also given the opportunity to engage in lesson analysis after viewing classroom demonstration videos, and were asked to devote time to reflection and development of an action plan to incorporate into their own classrooms. As a follow-up to the web conferences, math instructional coaches, or TOSAs, devoted three sessions to every grade level at every site to provide model lessons, resources, and support for teachers. In order to effectively address the research questions pertaining to the observed teaching practices following the implementation of the CCSS PD, and the greatest changes in math instruction as a result of the district training, I addressed teacher reactions to the professional development series. These perceived reactions, as reported by site administrators, included attitudes and beliefs specific to the web conferences, instructional coaches, and feelings of preparedness to execute unfamiliar practices with their elementary students.

Common phrases, words, and messages among the administrators' responses addressing perceptions pertaining to teachers' attitudes, beliefs, and behaviors regarding

district-wide CCSS web conferences and feelings of preparedness to teach new math standards based on the district PD were coded to encompass the following categories:

1. Engaged
2. Positive/Embraced the trainings
3. Enthusiastic to try new learning
4. Frustrated by technology and lack of time
5. Insufficient time to develop team action plans following sessions
6. Cohesive/common message
7. Prepared to take initial first steps in teaching CCSS math/comfortable to initiate new learning
8. Unsure due to release of algorithms
9. Gave teachers the big ideas, but not what to do everyday

Common phrases, words, and messages among the administrators' responses addressing teachers' responses to instructional coaches and demonstration classrooms were also coded and categorized to display the following commonalities:

1. Modeling of lessons is hugely beneficial, powerful to see live teaching
2. Good, rich, deep discussions
3. Coaching piece is vital
4. Most impactful part of the professional development
5. Unsure about accepting support I the beginning, but have since embraced it

The categories were then combined based on similar attributes to reveal the following themes:

Theme 4 (Final): Positive Emotions, Attitudes, and Behaviors

In the above section Theme Four was identified as "positive emotions." This section further supports Theme Four through inclusion of additional data addressing teacher behavior. Positive attitudes and behaviors included teachers' expressions of (engagement, optimism and enthusiasm. Administrator responses were generally positive in nature when reporting their observations of teachers' responses to the district PD. Examples of insights included Administrator C's statement, "[They] loved them, loved them, loved them, because it showed them what to do. They were like fish out of water; they had no clue what to do." Administrator B shared:

> It's been really good. I walk out after web conferences, and walk classrooms, and the staff really has embraced the training. I typically see the new learning in the next couple of days going on in the classrooms. I think overall the web conferences have been positive and well received here in terms of at least those initial steps in trying to implement new learning.

Another observation from Administrator D was, "I think they are most successful when there's an immediate takeaway, where the teacher is like, 'That makes sense to me, I get it, I can do that." Feedback from teachers, as reported by administrators, was generally positive in nature. Administrator B shared:

> They are doing what they see. So when learn how to do a number talk, or they learn a new strategy, or even the number strings, or the talk moves, I've already

> seen those things back in the classroom, so I think they're understanding that all of the staff development they have been getting is an expectation.

Reactions to the math instructional coaches (TOSAs) were also favorable, as reported by administrators. Participants observed overwhelming positive feedback to the math coaches, who provided both real-time and videotaped demonstration lessons. Insights from participants included Administrator D's statement :

> They love it. I've sat in on four or five sessions so far and it is beneficial, good, rich, deep discussions, and I think that's getting at a deeper level of instruction for the teachers than the webinars. I think the webinars are more like a surface, general kind of thing for everybody, but I think when the TOSAs come out, and they meet with them, it gets a little bit deeper."

This perspective was shared by Administrator D, who expressed "I think that's probably been the most impactful part of this entire professional development. Seeing it in action.

Changes in Observed Teaching Practices Following PD:

Teachers used the techniques acquired through social learning and constructivism, practiced via web conferences and district-wide virtual PLCs, in addition to the modeling and instructional supports offered by the TOSAs, to create learning environments grounded in problem-solving, math discourse, and reasoning. The overarching theme that emerged after combing through interview transcripts involved a radical shift in teaching following the district PD and launch of the new standards. Common phrases, words, and messages among the administrators' responses addressing observed activities, teaching strategies, and methodologies in elementary math lessons following the implementation

of the district CCSS PD, as addressed in interview questions eight and nine (see Appendix H) were coded and categorized as follows:

1. Risk-taking
2. K-W-C charts
3. Increased use of manipulatives
4. Number talks
5. Application of numerous strategies
6. Congruency among classrooms
7. Increase in higher-level math vocabulary
8. Math practices: explaining reasoning, persevering in problem-solving critiquing reasoning of others
9. Release of algorithms
10. Emphasis on problem-solving

The categories were consolidated into emergent themes based upon the shared insights of the administrators. The identified themes are described below.

Theme 5: Evidence of Math Practices

Evidence of math practices includes reasoning, problem-solving, and critiquing the reasoning of others. Administrators reported observing strategies commonly referred to as the "math practices," encompassing eliciting student reasoning, using problem-solving as the basis for instruction, and fostering students' abilities to critique the reasoning of peers. Teachers communicated to students that there was more than one way to arrive at a correct solution, and asked them to explain their thinking in written and

verbal form. Students engaged in risk-taking, persevering in problem-solving, and working collaboratively with others to apply numerous strategies to problems grounded in real-life application. Teachers led number talks to elicit deeper understanding of mathematical concepts. Specific responses from interviewees supporting Theme 5 included Administrator A's comment, "I've seen a lot more use of manipulatives. I've seen a lot more use of each of the strategies." Administrator D provided an additional statement:

> What I'm starting to see now is that now that they've had a chance to practice those strategies and work with the students, and work with each other, that you're now finally starting to hear the correct use of vocabulary, interweaving the math practice standards into how they're asking questions, and what they are looking for in responses from students.

Further perspectives from Administrator C included:

> I think we see number talks on a daily basis, in all grades, in all rooms. We also really see the KWCs being used, again in all grade levels, and I think the biggest thing we see that we didn't see before is those math practices, explaining your thinking persevering in problem-solving, critiquing the reasoning of others, using the correct tools to answer questions. I think we are seeing those math strategies pervasive in all grade levels.

Theme 5 (Final): Evidence of Math Practices Through Increase in Expectations for Student Engagement

Theme 5 was identified in previous sections as "evidence of math practices." A component of math practices included a shift in student engagement levels. Insights from participants further supported Theme 5 through discussion of teacher expectations for students in CCSS-aligned math classrooms. The district professional development series included the common message that students should be engaged in inquiry-based, hands-on learning in order to develop true understanding of math concepts. Through collaborative and engaging tasks based on problem-solving with real-life application, students were required to be active learners. Following the training, teachers no longer accepted passive pupils who simply observed modeled methodologies. Prior to the PD, teachers gradually released responsibility to learners. After participation in the PD, teachers expected active learners from the outset of every lesson, most of which began with a group math talk. Statements in support of the theme of increased expectations for student engagement included, included Administrator A's comment, "You are actually now seeing students doing math, and being engaged in math, as opposed to the teacher doing math and being engaged in the math lesson." Administrator E added, "The teachers intuitively want to teach kids how to think and that's the greatest."

Theme 6: Release of the Standard Algorithm

The district-wide professional development series introduced teachers to a number of different mathematical strategies aside from utilizing the standard algorithm to arrive at an answer. Such strategies include branching, decomposing, open number lines, partial sums, and compensation. These techniques elicit student understanding on a conceptual level and allow them to think flexibly and fluently with numbers. Students are able to grasp when and why to apply an appropriate strategy, and to understand what the numbers represent, as opposed to memorizing an arbitrary procedure that carries little to no meaning. Through the professional development series, including intensive work with the math TOSAs in grade level teams, teachers had to assume the role of the learner, releasing prior knowledge regarding determining solutions to math problems. They learned the new strategies, and practiced applying them to a variety of problems grounded in real-life scenarios prior to introducing the conceptual techniques to their students. Statements from administrators supporting the observed release of the standards algorithm as the sole means to an end in elementary classrooms included Administrator A's comment, "They are using all the different strategies, no one is using the algorithms anymore which is huge, because that's the way we all learned math." A final theme was identified to support shifts in teacher behaviors following the CCSS PD. This theme addressed the transition from reliance on an adopted math curriculum, set pacing guides, and relying on rote worksheets during classroom instruction, to taking risks in the area of teaching mathematics.

Theme 6 (Final): Release of the Standard Algorithm through Facilitative Teaching

In the above sections Theme 6 was identified as "release of the standard algorithm." In subsequent inductive analyses, further support for Theme 6 emerged through participant identification of facilitative teaching practices. Administrators were in agreement that the role of the teacher during classroom math instruction transformed as a result of the CCSS professional development series. Statements in support of this theme included Administrator B's comment, "The shift has been from a stand and deliver, to more of an inquiry, almost like a math coach with kids." Administrator C remarked, "Teachers are not teaching algorithms, they are trying to be more of the facilitator."

Theme 7: Risk-taking

Following the implementation of CCSS math practice and content standards, teachers were unable to rely on a manual emphasizing procedures, repetition, and teacher modeling. Teachers were expected to move away from direct instruction of isolated skills, and assume the role of the facilitator as student persevered to devise their own solutions to given math word problems. Teachers were trained in "talk moves," designed to elicit deeper levels of thinking and understanding through questioning techniques. Instructors were required to release their previous methodology and become risk-takers in the classroom, allowing the daily math discourse to drive instruction. Instead of weekly summative quizzes, teachers were required to assess student learning through observational data and performance tasks in addition to pre and post-tests. Interview data that supported Theme Three included statements such as Administrator E's comment:

> The greatest benefits have been risk-taking. We've conveyed since Day 1: This is our year to learn, we're just digging deep, you can't get it wrong, you can't be wrong, unless you just don't do it. If you don't do content standards or math practice standards in your classroom, that's unacceptable. Anybody who's doing it or trying it and putting the standards in front of kids, and using the standards for math practices, consistently, and using math discourse, and just the balance of the conceptual understanding, and the procedures, and the problem-solving. We're very up-front with everybody: This is the year, take a risk. And they have.

Based on administrator input, district teachers learned to embrace taking risks by releasing traditional math instructional practices. Despite lack of familiarity with the new math practice and content standards, teachers showed their students the benefits of taking chances and finding new ways to look at solving math problems. Misunderstandings and failures were regarded as important learning tools, encouraging teachers and students to take risks with mathematics.

Changes in PLC Model

Along with teacher instructional practices within the confines of their classrooms, it was important to document the changes in teacher professional learning communities following the incorporation of the district CCSS math professional development series. The staff interactions within the PLCS directly impacted their actions within the classroom, as teams engaged in meaningful math discourse, analysis of student work, and

development on action plans. Administrators reported shifts in collaboration and communication following teacher participation in the district-wide math PLC, establishing shared goals and a common purpose across all 11 elementary sites. Prior to the district math CCSS series, principals and assistant principals reported variance in levels of collaboration from one site to the next (see Appendix H). However, following the series, instructional leaders shared observations of greater cohesion across grade level teams at their schools. Common phrases, words, and messages among the administrators' responses addressing perceived changes in communication and collaboration among grade level teams at site-wide following CCSS PD were coded and categorized to reveal the following observed trends:

1. Increased math conversations/discussions
2. Shift from what to teach to how to teach
3. Common planning time (facilitated by instructional coaches)
4. Analysis of student work
5. New leaders have emerged to assist teammates

The overarching theme that emerged from the identified trends was based upon the big idea of teachers discussing how to teach in lieu of simply what to teach.

Theme 8: Student-Centered Planning through Increased Collaboration and Communication

Instructional teams devoted the 2013-2014 instructional year to discussing and analyzing student work and best practices for facilitation of deep and meaningful mathematical understanding in their classrooms. As opposed to focusing on content

alone, teachers conversed about how to teach the new math practice standards through engaging, rigorous, and collaborative learning activities. As a byproduct of the new learning, teams relied on one another to make meaning of the new standards and facilitative approach to teaching, increasing the frequency and duration of communication and collaboration. Examples of interviewee responses in support of the identified theme of student-centered teaching through PLCs included Administrator D's comment:

> Since the training there's just a lot more conversation, and dedication spent on math planning than there was before, especially with the TOSA [instructional coaches] support, and the webinars, and then the Jo Boaler, when we learned about KWCs, they all came back and really launched into that. So, I've seen more collaboration and more discussions around math than we have had before.

Administrator C reported, "The one area where we do see a lot more collaboration, is that there is more communication in looking at the student work protocol. That is happening, where it wasn't happening before." Another insight shared by Administrator D was "Different people have stepped up in different ways. New leaders have emerged. People whose skills sets weren't utilized when we were killing and drilling, are saying 'I know how to use this method, let me show you.'"

Changes in Instruction and Teacher Behavior Following Professional Development

In order to identify the true impact of the district PD on all aspects of math teaching practices, it was important to identify the greatest changes in instruction and teacher behavior. Common phrases, words, and messages among the administrators'

responses addressing the greatest successes and impact associated with CCSS in math classrooms in relation to teaching were coded and categorized to unveil the following trends:

1. Teachers are more facilitative
2. Teachers ensure students are engaged in learning
3. Teachers are providing conceptual background information and rationale when teaching math

The trends revealed emergent themes regarding impact of the math PD on teaching.

Theme 9: Conceptual Understanding

Site leaders shared a collective shift in teaching favoring conceptual understanding over procedures in mathematics. Students were asked to work flexibly with numbers, and to "wrap their arms around the problem." Mental math and manipulation of numbers replaced rote computations, and students were asked to explain their reasoning to demonstrate understanding versus showing a final numerical answer alone. Remarks from interviewees in support of Theme 9 included Administrator B's comment "[There is] an overall understanding and belief that there truly is the need for a conceptual understanding in math." Administrator D also cited the shift to conceptual shift, but referenced it as a continued challenge for educators. According to this interviewee, "The challenge of [CCSS is] our teachers truly guiding students through this conceptual understanding in terms of their ability to ask the right types of questions."

Site administrators were in agreement that the CCSS PD resulted in a shift in teaching practices. Despite challenges associated with the training series and

corresponding launch of Common Core math practice and content standards including assessments, data interpretation, guiding students through conceptual understanding, and acquisition of appropriate resources and support materials, the response to the district PD was overwhelming positive. As early adopters of the Common Core State Standards, Green Valley School District site leaders had insights and recommendations for districts across the nation addressing development of teacher PD. Areas in which districts need give careful consideration when designing and implementing CCSS professional development are time: sufficient time to train staff, time for planning, time to adjust to change; provision of purposeful resources, having a clear idea and understanding of assessments for progress monitoring, and clear and consistent communication to staff and parents.

Recommendations for Future PD

Responses from interviewees as to recommendations for future PD included ensuring, "uniformity," per Administrator D," and "being sure the teachers really understand how to teach math without an algorithm," per Administrator E. Administrator A recommended "Affording teachers the time to actually learn what it is that makes the Common Core math now, like the practices, different than what we were doing before," and "looking at the enormity of the change and really have a true understanding of how large of a shift this actually is." Additional feedback from Administrator C included, "Be purposeful about what types of resources you're going to provide the teachers knowing that there are challenges with those resources." Administrator B advised, "Make sure that

the parents have a clear understanding of what you're doing as a district," and "roll it out slowly, as we have done." A final piece of advice offered by Administrator D was:

> Have a common message, have a common objective, communicate it clearly, let people know that it's hard, and it takes time, and it takes risks, communicate to parents clearly, know you're not going to get it right away, and go slow.

The interview data was consistent with the questionnaire data in identifying common trends and themes regarding the impact of the district Common Core math professional development series on teaching. Participants provided insights into how the PD transformed teacher actions in relation to teaching of mathematics across all grade levels and all eleven elementary sites. The observed teaching practices both prior and following the PD were identified and compared to examine the shift in instructional techniques and methodologies. Teachers across the district were trained in Core practices simultaneously via interactive web conferences through a hybrid virtual and face-to-face professional learning community. Teachers assumed the role of the learner, as they acquired new strategies aside from traditional algorithms to solve math problems. Through social learning and constructivism, teachers worked collaboratively to persevere in problem solving, explain and defend reasoning, and develop conceptual understanding of numbers. Instructional coaches modeled and supported new learning through demonstration classrooms, videotaped lessons, and facilitated team planning. In order to develop deeper understanding of the teachers' training and the subsequent changes in

mathematics education, I observed three district web conferences to further supplement my data.

Observation Data:

Three 60-90 minute post-hoc observations of recorded district-wide Common Core math web conferences (see Appendices J-L) were conducted to support the data obtained through questionnaires and interviews. The web conferences occurred at three different points throughout the 2013-2014 school year: August, January, and March to depict the progression of the professional development series. I summarized the content of the web conferences in order to provide an overview of the trainings attended by 500 elementary teachers district-wide.

The first CCSS math web conference of the year occurred in August. The context of this session was a welcome back session for 2013-2014 school year. District leaders provided an explanation of timelines, and district roll-out plan for Common Core Standards, as well as introduction to supports: TOSAs (instructional coaches). Teachers were given *Investigations* curriculum, and teacher-created units of study in addition to pre/post-tests, and performance tasks. Teachers were led through contents of *Investigations* curriculum: including assessments, Common-Core alignment, and how to use *Investigations* as a resource to support conceptual knowledge in mathematics.

The focus of this session was to covey to teachers that district was in a state of imbalance, instability, uncertainty, and flux. Common message across the district was that the 2013-2014 year would be a year to take risks, try new lessons, stretch lessons,

communicate, collaborate, think critically, pursue challenge, reflect, and revise. The Director of Elementary Curriculum provided an introduction to the math instructional coaches and their responsibilities and roles: developing Common Core math lessons, guided planning with teams, modeling lessons, professional development, researching best practices, and developing resources for teachers.

Participants listened to the overview and timeline plan broadcast via webcast. Teachers were guided through use of *Investigations* materials by a consultant, then given some time to "explore" the materials on their own. Teachers were given the math unit "suggested progression and resources." Teachers had the opportunity to ask questions prior to being a copy of each grade level's "Focus for Mathematics" to read silently before they were given time to collaborate with their grade level teams.

Participants had the opportunity to ask questions via the chat feature of the web conference. The Director of Elementary Curriculum remotely responded to each question upon receipt. Questions included the following:

1. Will we be given additional resources other than Investigations?
2. Can we use our old math materials?
3. Will we be given days for planning?
4. How will have enough time to grade each individual performance task?
5. How strict are the district timelines?
6. How do we handle grades on the report cards? Will they align to these new assessments?

Based upon my observations, teachers seemed overwhelmed by the new units and the timelines. They seemed concerned about the assessments and performance tasks, as they were multi-faceted and looked different from the previous assessments. Teachers appeared to collaborate within their teams to determine next steps for launching the units at the beginning of the school year. The technology cut in and out quite a bit, which frustrated the participants.

The second professional development session I observed occurred in January 2014 and addressed the topic of providing balanced instruction in mathematics: conceptual understanding, application, flexibility, and procedural fluency. During this session teachers watched videos of math lessons in district classrooms which included math talks, and K-W-C (problem solving graphic organizer) charts taught in math classrooms. Teachers were given K-W-C charts to complete and sample problems to solve collaboratively. Teachers were asked to reflect upon demonstration lessons and were given discussion questions. Teachers then learned how to complete a graphic organizer addressing conceptual understanding, application, flexibility, and procedural fluency by using math problem/numerical expression, picture/visual model, and computation/procedure. They were directed to explain why their answers made sense. Teachers solved additional sample problems, then collaborated and reflected. Goals were broadcast by Director of Elementary Curriculum and included use of Number Talks and K-W-C strategies.

The focus of the session included clarification of both short and long-term goals in mathematics instruction across the district. The long term objective shared was that

teachers would provide mathematics instruction that was balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards. The stated objectives of the day's PD Session were as follows: We [would] view lessons incorporating the KWC strategy and determine the teacher actions that helped the students comprehend math problems. Teachers [would] select components of the lessons to implement in their instruction.

During the course of the training participants listened to the objectives (long and short term) introduced by the Director of Elementary Education. Teachers then listened as the Director of Elementary Education shared reflections from last PD session led by Jo Boaler. Reflections included: Students with growth mindset persist longer on problems, relish challenges, and learn from mistakes, and all students can achieve at the highest levels of math. Additional insights were: math should never be associated with speed, what is important is to deeply understand things and their relationship to one another, and if we are serious about encouraging students to develop growth mindsets we need to provide open tasks that have the space within them for learning (low floor/high ceiling), not short tasks that students are meant to get right or wrong. A final reflection was that each learning experience changes a student's abilities.

Participant questions and feedback were captured by the interactive webinar dialogue/chat feature. Statements included the following: A)The K-W-C charts have been successful in helping students to "wrap their arms around the problem" B) Using K-W-C charts and number talks means slower pacing. It's tough to stay within the timelines when devoting an entire class period to one or two problems. C) It's been challenging to

find enough resources to teach math in this way D) Timed tests are not recommended by Jo Boaler, but if students can't complete basic facts in timely manner, are they really fluent?

Overall, my observations of the session enabled me to witness teachers as learners. They were given problems to solve, but were able to utilize a number of strategies. I also noted that teachers were asked to collaborate with colleagues and explain their thinking. Teachers shared experiences regarding their ability to simulate students in the classroom, and were able to see strategies in action through videotaped demonstration lessons.

The final interactive web conference I observed occurred in March 2014. During this session, the Director of Elementary Curriculum provided overview of the PD, including long-term objectives and the objective of the day's PD session. The Director of Elementary Curriculum stated new learning to be acquired via the day's PD session. Teachers were then directed to read Chapter 2 from *Classroom Discussions*, to learn the tools of classroom talk and talk moves. Teachers highlighted the purpose of each talk move, then watched videos of teachers using talk moves in the classroom. Teachers were give discussion time in small groups to identify connections of talk moves to Essential Elements of Instruction. Teachers were taught how to apply number talks to single problems and number strings, applying strategies to subsequent problems to identify patterns/relationships. Teachers watched a video of a number talk for 6 x7. Teachers were then asked to discuss the lesson they viewed, and were given questions to address. Teachers were asked to select a number string i.e. 49+8, 49+23, 49+37, 49+51 and

discuss within their teams possible strategies and how they might record them. They were then asked to discuss what questions they could ask to help students make connections without directly teaching them the strategy.

Teachers viewed a second video of teachers using talk moves: revoicing, repeating, reasoning, adding on, and wait time, using a multiplication string for 4 X 24. To close the web conference, the Director of Elementary Curriculum restated the long-term objective for the district: Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning. The Director then shared that the district would spend two months piloting the *Dreambox* math software beginning the following month to supplement classroom instruction and activities. Participant questions and feedback were captured using the interactive chat feature of the wen conferencing software, Safari Montage. Participants questions included the following: Will we be given more to plan with our team throughout the school year via release time? Will we be able to observe the TOSAs (instructional coaches) enacting these moves in the classroom? Based on my observations, teachers were engaged throughout the session, and discussed how they would implement these strategies in their own classrooms. The teachers seemed less apprehensive about trying the new strategies, but still discussed the need for resources and planning time.

1. Observation data pertaining to the district-wide PD was analyzed, categorized, and coded to determine emergent themes in regards to expected shifts in instructional practices at the district level, following implementation of the

Common Core math professional develop series. The following themes pertaining to CCSS teaching were uncovered:

2. Teachers are encouraged to take risks, experiment with new lessons, teach outside of their comfort zones.
3. Teachers no longer have a math manual to rely upon. The *Investigations* text should be used as an instructional supplement. The district will provide units of study, pre/post-tests, and performance tasks for each unit.
4. Teachers are to use structured collaboration time to analyze student working, using the Analysis of Student Work Protocol.
5. Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards. Objective of PD Session
6. Teachers will assume facilitative roles in the classroom, incorporating strategies such as Talk Moves, Number Talks, and K-W-C charts to foster math discourse and student perseverance in problem solving
7. Teachers will deviate from showing students solely algorithms to solve problems, teaching several different strategies (branching, decomposing, open number lines, partial sums, etc.) to build mental flexibility with numbers and deepen conceptual understanding of mathematical concepts.

Observations of district math web conferences complemented my questionnaire and interview data in that I was able to view introduction and application of the specific math strategies, such as branching, decomposing, number talks, and K-W-C charts, referenced

by participants. I was also able to view videos of demonstration classrooms across the district in order to compare the teacher behaviors reported by administrators and instructional coaches, to the practices executed in the videos. Overall, I found the data obtained through completion of observation protocols (Appendices I-K) to support the trends and themes developed through analysis of questionnaires and interview transcripts. Upon completion of the observation protocols and examination of corresponding audiovisual analysis of Powerpoint slides and videos included as part of the webinars, I was able to provide thorough responses to my overarching research questions. The following section provides cohesive narrative responses to the two questions driving my study investigating instructional leaders' perceived impact of the district CCSS professional development series on teaching.

Research Question Responses

The first research question included in the study was: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development? Based upon data analysis from interviews, questionnaires, document and audiovisual analysis, and observations of professional development sessions, the main teaching practices implemented in elementary mathematics lessons include discussion, collaboration, and math discourse. Students are asked to explain their reasoning and thinking in oral and written format, through use of multiple strategies. Teachers employ inquiry-based learning through use of math games and manipulatives. Problem-solving is the backbone of math instruction, as opposed to procedural practice utilizing algorithms.

Site instructional leaders reported observations of teachers practicing risk-taking, utilization of K-W-C (Know-Want to Know-Constraints) charts, number talks, and use of manipulatives to foster inquiry-based learning in mathematics. Administrators also witnessed use of higher-level math vocabulary, application of numerous strategies, and congruency among classrooms following the implementation of the district-wide CCSS professional development series. Finally, reported teaching practices after PD included instruction in the CCSS math practices, namely assuming a facilitative, as opposed to directive role, in which teachers required students to persevere in problem-solving, and critique the reasoning of others.

The second research question included in the study was: What are the differences in observed math instructional practices before and after the district CCSS professional development series? Based on data obtained through instructional leader interviews, questionnaires, audiovisual and document analysis, and observations of district web conferences, the shifts in observed instructional practices following CCSS math PD changed from math instruction that was primarily teacher-led, using the math manual, to primarily student-centered, hands-on learning. Instructional leaders reported teachers are more facilitative, ensure students are engaged in learning, and are providing background information and rationale when teaching math. As Administrator A shared, "I think that their shift has been from a stand and deliver, to more of an inquiry, almost like a math coach with kids." Administrator C stated:

> The teachers are not teaching algorithms, they are trying to be more of the facilitator. The teachers are more open, more willing to collaborate. You are

actually now seeing students doing math, and being engaged in math, as opposed to the teacher doing math and being engaged in the math lesson.

The observed math teaching practices following the CCSS professional development series are consistent across the district, and align with the long term objective communicated via web conference stating teachers will provide mathematics instruction that is balanced in conceptual and procedural learning. Additional expectations for teachers outlined in the PD sessions were observed by site instructional leaders as they conducted classroom visits. These practices included teachers taking risks, experimenting with new lessons, and teaching outside of their comfort zones. The changes in teaching practices following the PD were grounded in teachers assuming facilitative roles in the classroom, incorporating strategies such as Talk Moves, Number Talks, and K-W-C charts to foster math discourse and student perseverance in problem solving. The shifts in practice following Common Core adoption were accompanied by teachers' perceived feelings of anxiety, apprehension, resistance and being overwhelmed. As PD continues, and teachers become more familiar with and skilled in using the new practices, those emotions have gradually transitioned to excitement in applying increased depth of knowledge in the classroom.

Limitations and Delimitations

The limitations associated with this study stem from the confines of a qualitative case study. A qualitative case study focuses solely on the bounded case itself (Creswell, 2012), though multiple realities may present themselves through the various perspectives of district instructional leaders. In this instance, findings were applicable to the teaching

practices within the Green Valley School District alone. However, findings from this case study may be applicable and generalizable for similar cases with similar boundaries (Yin, 2008).

An additional limitation of the study is based on the sample size. The small number of individuals interviewed may not reflect the opinions and viewpoints of the population as a whole. The participants' experiences are assumed to be valid sources of data, though their individual backgrounds, training, and depth and breadth of knowledge may have directly or indirectly influenced their responses both on questionnaires and in interviews. As is characteristic in qualitative data, both participant and researcher bias may influence responses, analysis of data, and overall findings. In this study, as is typical in qualitative research, I served as the primary instrument of data collection, potentially compromising the reliability and validity of the findings presented. My intention was to provide a rich, holistic account of the Common Core teaching phenomenon, in order to offer insights and illuminate meanings to benefit the intended audience of local educational leaders and policymakers.

Delimitations associated with this study included time constraints and participant selection. In order to complete the case study within one academic year, data was collected within a seven month time frame, including post-hoc observations. A longitudinal case study may better explore long-term implications of the professional development series on classroom practices and student performance, but will not provide information regarding the immediate shift in teaching as a result of CCSS math professional development and implementation. Participants included in the study were

selected based on criteria pertaining to professional role within the local school district. In order to be selected, participants were employed as either a site principal or assistant principal within a district elementary school, or mathematics instructional coach serving one of the eleven profiled elementary schools. This criterion was selected for participants based on their training in Core math practice and content standards, expertise in analyzing student work, and access to classrooms for frequent and ongoing observations of mathematics teaching and learning both before and after implementation of the district professional development series. Finally, as is characteristic of case studies, the participants and data were be bound by association with only the eleven elementary schools housed in the local school district in order to provide a detailed account of the experiences within this individual organization.

Summary

A qualitative case study design was appropriate to address my research problem in that the overarching goal was to acquire and analyze the perceptions of individual site principals, assistant principals, and instructional coaches regarding the impact of district math training on teaching. In conducting a case study, a detailed examination of 11 school settings allowed for comparison of emergent themes. According to Merriam (2009), case studies can be helpful when evaluating programs within a school setting, while using a small population allows for a deeper interpretation of results. The sample for this study consisted of experienced instructional leaders who routinely observed math instruction in practice, and represented diverse student populations. The data collection methods included individual interviews with a representative sample of site-level

administrators, online questionnaires completed by 20 of 27 elementary principals, assistant principals, and math coaches within the organization, document and video analysis of lessons utilized as components of district math trainings, and post-hoc observations of three installments of the Common Core math professional development series occurring at various points throughout the school year.

Data were analyzed through coding in order to explore emergent themes and develop a rich, detailed, narrative analysis and explanation of the teaching in response to the new standards, curriculum, instructional practices, performance tasks, and analysis of student work protocols communicated via district professional development. Through creation of a positive working relationship with all participants, I elicited honest feedback and perceptions. The participant responses, combined with observation, document, and multi-media analysis determined whether the district-wide PLC was effective in preparing teachers to launch CCSS math practices and math content standards in elementary classrooms. My intention was to provide a rich, holistic account of the Common Core teaching case, in order to offer insights and illuminate meanings to benefit the intended audience of local educational leaders and policymakers. This study serves as an in-depth examination of the new math standards in practice, and has the potential to serve as a valuable source to researchers in the field of education.

Conclusion

This section addressed the guiding research questions associated with the study: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development? What are the

differences in observed math instructional practices before and after the district CCSS professional development series? Qualitative data from questionnaires, interviews, observations, and audiovisual and document analysis was analyzed and coded to inductively determine emergent themes to identify the teaching practices occurring after the CCSS professional development series, as well as the greatest shifts in math instructional practices following the training.

Teachers were observed to transform their classrooms from primarily teacher-led environments to more student-centered, hands-on, inquiry-based learning communities. Teachers released the "stand and deliver" model, wherein they would model a series of algorithms on the board, using the math textbook as a guide, then release responsibility to the students for independent practice. In its place, instructors assumed a facilitative role, fostering math discourse through collaborative problem-solving, whereby students were asked to explain and justify their reasoning, employing a variety of different strategies before arriving at a solution.

Math instruction went from being systematic and procedural, orderly and hushed, to being constructivist in nature, noisy and messy, and students worked with peers to explore problems grounded in real-life application, using manipulatives, words, and visuals to explain and defend reasoning. Procedures were replaced by conceptual understanding and mental flexibility with numbers. The instructional shifts associated with the district Common Core professional development series did not occur seamlessly.

The momentous change in teaching of mathematics was met with apprehension, anxiety, and even resistance, as teachers worked to deepen their own conceptual

understanding. The web conferences and support of instructional coaches allowed teachers to assume the role of the learner, as they worked collaboratively with colleagues to solve word problems using alternative strategies, releasing the traditional algorithm as they discussed and critiqued one another's reasoning and mathematical thinking. The main challenges identified across the district were associated with lack of sufficient time and resources for teachers to feel competent and fully prepared to launch CCSS math practices and content standards in their classrooms. Teachers continue to feel unsure about their ability to effectively prepare students for rigorous new assessments, and to use questioning techniques, rather than modeling and direct instruction to elicit student understanding of mathematical concepts.

The following section will describe the project, a program evaluation, designed to communicate findings regarding the instructional leaders' perceptions of the impact of the district Common Core professional development series on teaching practices. Lodico, Spaulding, and Voegtle (2010) state program evaluation is used to determine whether or not a program is actually improving teaching practices. Evaluations are tools for key stakeholders to use when continuing and making changes to existing programs, or deciding to eliminate programs, based upon findings. This formative program evaluation will include insights as to greatest challenges and successes associated with launching a district-wide PD series of this magnitude, and will offer recommendations to drive improvements for upcoming additional CCSS implementation initiatives. The project will include an evaluation report and accompanying PowerPoint presentation directed toward district stakeholders and policymakers who have not had the opportunity to

witness teaching practices associated with Common Core math. The findings included within the program evaluation will also address the challenges and on-going needs of the teachers to support the implementation of the new standards, and to inform future professional development planning in CCSS math, reading, and writing in the 2014-2015 school year.

Section 3: The Project

Introduction

The implementation of President Obama's American Recovery and Reinvestment Act of 2009, and its corresponding competitive education grant program, Race to the Top, generated the Common Core State Standards to provide a greater emphasis on innovation, long-term reform, and significant improvements in student outcomes (U.S. Department of Education, 2009). The resulting paradigmatic shift in math education favors conceptual understanding of math topics over procedures and rote memorization. Teachers are expected to assume a more facilitative role in the classroom, using questioning techniques to guide students to formulate responses through critical thinking and analysis, while requiring them to *prove* their answers through evidence-based rich discussion.

The project study, a qualitative case study examining the impact of a district-wide professional development math PD on observed teaching practices, found that Green Valley educators did transform their instruction in math following participation in the training. Teachers assumed facilitative versus directive roles in the classroom, through such widespread activities as leading math talks, and using questioning techniques to engage students in productive struggle in problem solving, versus telling them the correct response. One of the greatest shifts in math teaching practices identified through the study was an emphasis on fostering student conceptual understanding, versus demonstration and memorization of rote algorithms. Findings from the project study prompted me to go deeper in my analysis of the Green Valley PD series in order to

determine which specific aspects of the program were most successful, which areas were weak, and to make specific recommendations for improvements in future sessions with teachers. Through pinpointing the exact elements that had the greatest impact of preparing teachers to launch the CCSS, I would be able to produce a project that would benefit the local district leaders and guide them in the design of the next teacher development series to maximize overall effectiveness and further elevate district-wide instructional practices.

Using a program evaluation logic model, I examined the design and implementation of the CCSS math professional development, built upon the framework of Vygotsky's social constructivist learning theory, at eleven California elementary schools. Local district officials embrace the notion that twenty-first century learners must be able to analyze, problem-solve, communicate, and collaborate with flexibility and autonomy (Wagner, 2008), and trained teachers in fostering these strategies through web conferencing, videotaped lessons, student performance task analysis, demonstration classrooms, instructional coaching, and structured professional learning communities. The district utilized Safari Montage interactive web conferencing tools to sync all 500 elementary teachers in the district, offering opportunities for virtual instruction-related discussions across 11 sites, while simultaneously broadcasting consistent information, clear expectations, and common messages across the district. Through questionnaires, interviews, document analysis, and observation, I examined how educational leaders, including site principals, assistant principals, and instructional coaches perceived the

impact of district-wide Common Core math professional development on teaching practices.

The research questions driving the evaluation include:

RQ1: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development?

RQ2: What are the differences in observed math instructional practices before and after the district CCSS professional development?

The logic model components included in the program evaluation encompass the activities/events associated with the district PD, the outputs of the activities, and the intermediate outcomes (Spaulding, 2008). The activities section of the evaluation will determine whether the events associated with the training served their intended purpose, and met the defined goals and objectives of the district. The outputs of the activities will document the changes in teacher beliefs and opinions that occurred as a result of participation in the math PD activities. Finally, the intermediate outcomes will identify the changes in teacher practice and behaviors that occurred as a result of participation in the district-wide professional learning opportunities. The end outcome will not be included at this time, as the final results will take 4 to 6 years to emerge following the math training series (Spaulding, 2008). This evaluation will be formative in nature, in that teacher Common Core PD is ongoing.

The current experimental phase, during early adoption of the new standards, offered an ideal opportunity to examine the practices of the local school district, comparing instructional strategies before and after the implementation of the CCSS and

corresponding professional development series. The state superintendent published quality professional learning standards to promote quality teacher development and learning. The seven interdependent standards include: data, content, and pedagogy, equity, design and structure, collaboration and shared accountability, resources, and alignment and coherence (California Department of Education, 2013).

My program evaluation will determine whether the Green Valley PD adhered to the professional learning standards when training teachers in new math practices. This project serves as an evaluation of the Common Core math PD in relation to the administrators' and instructional coaches' perceived impact on teaching practices. Lodico, Spaulding, and Voegtle (2010) state program evaluation is used to determine whether or not a program is actually improving teaching practices. Evaluations are tools for key stakeholders to use when continuing and making changes to existing programs, or deciding to eliminate programs, based upon findings. This formative program evaluation will include insights as to greatest challenges and successes associated with launching a district-wide PD series of this magnitude, and will offer recommendations to drive improvements for upcoming additional CCSS implementation initiatives. The doctoral project describes, based on the perceptions of instructional leaders, how the CCSS professional development transformed teacher practices in mathematics instruction, as well as attitudes and beliefs pertaining to teaching the new math practice and math content standards. Areas of perceived weakness will be addressed in order to provide district stakeholders with the tools to make informed planning decisions designed to further improve teacher training and support related to the new practice and content

standards. Reforms in this area must seek to further elevate teaching, learning, and equity through increasing the cohesion and coherence of the education system (Kornhaber, Griffith, & Tyler, 2014). Success in preparing teachers for CCSS instruction will generate equality among all student groups through provision of intangible resources, including consistent standards and expectations, as well as opportunities for learning (Kornhabler et al., 2014). My doctoral project has the potential to impart positive social change, as it offers solutions to minimize the achievement gap in the area of mathematics, enabling all students to be prepared for the challenges of the 21st century.

This section will describe the capstone project resulting from the doctoral study. The project, a program evaluation, was conducted to focus on a particular organization, the Green Valley School District. Spaulding (2008) states program evaluated is conducted for decision- making purposes to determine the overall worth of a program and make recommendations for refinement to further success. In conducting a program evaluation, I determined whether the district math professional development was effective in preparing teachers to incorporate CCSS practices and made recommendations for improvement.

The doctoral project has the capacity to drive future teacher training and educational reform efforts by ensuring the observed teaching practices following PD implementation enacted a paradigmatic shift in math instruction. Teachers were expected to align classroom practices with the new math practice and math content standards, resulting in deeper conceptual understanding as well as increasing the communication, collaboration, problem-solving, creativity, and critical thinking components of math

lessons and corresponding activities. The insights and observations of district site principals, assistant principals, and instructional coaches provided crucial information pertaining to the successes and shortcomings of the Common Core math implementation in transforming teaching. Recommendations for improvement will be offered to district stakeholders based upon the feedback of the educational leaders witnessing CCSS math teaching in action on a regular basis across eleven elementary sites.

Description and Goals

The purpose of the doctoral project was to provide an analysis, through program evaluation, of the impact of a district-wide, multi-faceted professional development series designed to prepare teachers to effectively teach the Common Core math practice and math content standards in elementary classrooms. To date, much of the professional development implemented in California schools has been poorly planned and implemented, resulting in insufficient outcomes (California Department of Education, 2013). Few PD activities have addressed systematic goals and teacher practice, resulting in lasting and meaningful transformation of instruction (California Department of Education). Spaulding (2008) states program evaluation is appropriate when the desired outcome through dissemination of results to a particular organization, pertaining to a specific program, is the intent of enacting swift change. An evaluation report addressed to district leaders has the potential to result in immediate changes in development of future teacher PD.

Through this project, I determined that the district math professional development was effective in preparing teachers to incorporate CCSS practices. The overarching

problem addressed through the study was that the teaching methods employed by local district staff did not align with the national frameworks for mathematics instruction: depth over breadth of knowledge and real-world application (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, U.S. Department of Education, 2013). Teachers must be highly effective in order to accelerate student learning, eradicate achievement gaps, and build habits of mind that could potentially alter the trajectories of children's lives (Chetty, Friedman, & Rockoff, 2011).

The inception of CCSS presented a challenge in that teachers could not utilize the familiar math adoption and corresponding lessons, nor could they rely on procedure-based instructional techniques that were effective in meeting the former state standards of learning (District CCSS Workshop, 2012, Vigdor, 2013). In the face of new, nationally-normed, performance-based assessments in mathematics, prior test scores and past practices are no longer relevant. According to the Green Valley Director of Elementary Curriculum, the CCSS presented a challenge within the local district, where the majority of teachers utilized the prescriptive, state-adopted *Harcourt* math curriculum, focusing on instruction of math procedures and algorithms.

The Director of Elementary Curriculm expressed, via personal communication, that teachers in Green Valley had not been exposed to strategies for inquiry-based learning in the area of mathematics, essential for successful implementation of the new math practice and college and career readiness standards. Teachers needed specific training in structuring math lessons around problem-solving situations and effective use

of concrete and representational manipulatives (Green & Piel, 2012). As stated in the 2013 district workshop, in order to address the problem of unskilled CCSS math teachers, the Green Valley School District turned to professional development to enhance teacher competencies while creating conditions for successful instruction (U.S. Department of Education, 2013). Well-designed, research-based PD has the potential to elevate teacher practice when it considers educator needs, focuses on pedagogy and content, ensures equitable outcomes, is job-embedded, intensive, and continuous, emphasizes collaboration and shared accountability, provides relevant resources, and is standards-aligned (California Department of Education, 2013). As communicated in a 2013 CCSS Workshop, the district created a three-year CCSS professional development plan that includes creating new curriculum and providing professional development for every teacher in Green Valley.

The goals for the doctoral project were to analyze, through completion of a program evaluation, the impact of the professional development series addressing Common Core math implementation and instruction on classroom teaching practices. The question that drove the evaluation was: What was the impact of CCSS math professional development on teaching? The research questions included: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development? What are the differences in observed math instructional practices before and after the district CCSS professional development series? In the field of education, interviewing is the most common form of data collection (Merriam, 2009). The data for this project consisted of one-to-one interviews with five

selected site administrators, supplemented with multiple choice and open-ended participant questionnaires for 20 designated site instructional leaders, and post-hoc observations of three district math web conferences.

This project addresses the problem of lack of teacher preparedness to launch Common Core math in that the goal was to discover, understand, and gain insight in the area of math instruction. The project study allowed me to gather insights, beliefs, and perceptions regarding the shift in teaching from site leaders via interviews and questionnaires in order to conduct a subsequent program evaluation to benefit the local school district. In order to complete my project, I selected a group of participants, principals, assistant principals, and math coaches, from which much can be learned. The sample consisted of seasoned instructional leaders who regularly observed math teaching and learning, and represented diverse groups of students and teachers within the district. In keeping my sample small, I engaged in deeper inquiry with each individual. In the absence of standardized testing, qualitative feedback, served as the basis for evaluating the effectiveness of the district professional development series in transforming teaching practices to competently incorporate the CCSS in mathematics. Through my research, I accessed the expertise of the site administrators, comparing their observations and evaluations across district elementary sites to determine commonalities and differences in math teaching practices and teacher behaviors attributed to the CCSS professional development series.

My intention was to provide a rich evaluation of the Common Core teaching PD, in order to offer insights and illuminate meanings to benefit the intended audience of

local educational leaders and policymakers. This project serves as one of the first in-depth examinations of the new math standards in practice, and has the potential to serve as a valuable source to researchers in the field of education. The purpose of the evaluation is to facilitate the development, implementation, and improvement of the PD through examination of its processes and outcomes (Cellante & Donne, 2013). The observations shared by 20 instructional leaders within the Green Valley School District serve as a cohesive measure of the impact of the PD on classroom practices. The evaluation report addresses the problem by determining whether the district-wide PLC model, instructional coaching, web-conferencing, and videotaped demonstration lessons, were effective in preparing teacher for the launch of CCSS math practices and standards. The evaluation also helped me to identify benefits and drawbacks of the PD series across the district, and illuminated consistent successes and challenges in Green Valley elementary math classrooms.

I completed the evaluation report by first including a description of the program, timeline and expectations of the PD, and main goals and objectives associated with the teacher development series. I also included a description of my evaluation, a program evaluation model, consisting primarily of an examination of the activities, outputs, and intermediate outcomes. One of the key components of my evaluation report included an analysis of the professional development series to determine whether the state quality teacher learning standards were met. The standards outlined by the state superintendent address data, content, pedagogy, equity, design and structures, collaboration and shared accountability, resources, and alignment and coherence (California Department of

Education, 2013). I reviewed my data pertaining to the structure and execution of the district PD to determine whether each of these elements was present, and whether the professional learning standards were addressed with proficiency.

The information conveyed through the project will help key stakeholders within the local district to identify additional areas of support to supplement the current PD, and to design additional trainings for future CCSS areas, to best meet the needs of the teachers. Staff development in this area provides an opportunity for district leaders and teachers to build relationships through needs anticipation, personal communication, ongoing dialogue, and shared responsibilities (Buffum et al., 2008). In short, teachers must be given what they need to teach. This program evaluation and subsequent evaluation report identifies whether teachers in the local district were provided with the tools they needed in order to be successful in launching CCSS, and in enacting meaningful and sustainable changes in practice.

Rationale

The project, a program evaluation, addressed the problem of Common Core teacher preparedness and implementation by analyzing the instructional practices of teachers in mathematics both before and after the district professional development. Numerous policy reports and some laws require professional development to include an evaluation of whether it was effective in meeting the needs of teachers (National Institute for Effective Teaching, 2012). Despite the widespread emphasis on teacher professional learning opportunities as a critical component of educational reform efforts, educators have minimal information to contribute to the quality assessment or determination of

impact of PD on teaching and learning (Haslam, 2010). The purpose of my evaluation and corresponding evaluation research is to determine the value of the district PD in meeting the needs of the teacher-learners (Cellante & Donne, 2013). The evaluation of professional learning allows policymakers to make data-based decisions about the program in question. If the evaluation is executed well, all stakeholders will benefit. The most successful evaluations are grounded in a desire to improve a program and its results (Killion, 2008).

One key dimension of program evaluation entails the assessment of learner acquisition in order to accurately determine whether the learning objectives of the training were addressed and met (McNeil, 2011). Insights as to whether the learners, in this instance the Green Valley elementary-level teachers, acquired and demonstrated new learning following PD participation were gathered from site administrators and instructional coaches. This group of individuals was able to routinely visit classrooms during math instruction and report on the teacher practices and behaviors they observed, providing more accurate evidence of new learning than teacher self-reporting of implementing new learning. Had administrators reported an overwhelming lack of new teaching methodologies in site classrooms, the program would not have met its learning objectives addressing the paradigmatic shift in math instruction.

The group of instructional leaders also offered a unique perspective in that they were able to report on particular successes and challenges at their sites in response to the launch of CCSS, to further improve future PD in this area. Haviland, Shin, and Turley (2010) stated that all too seldom do faculty take the time to collectively analyze and

examine data pertaining to a staff development program. Frequently there is little information available on the return on the investment to convince decision makers to continue targeted teacher education programs (Haslam, 2010). This evaluation serves as a tool for district stakeholders to further explore the common goal of shifting math instructional practices in elementary classrooms, and how to best support staff in enacting lasting and meaningful change to meet the needs of all learners.

Evaluation research attempts to determine the value of a targeted initiative (Cellante & Donne, 2013). Zohrabi (2011) states program evaluation is essential to determine whether teaching and corresponding instructional strategies are relevant, materials and resources are accessible and useful, and knowledge acquisition takes place. Practical use of outcomes-based program evaluation techniques provides stakeholders with specific and precise data, obtained through multiple sources, explaining the effects of the program and improvements needed (Brown & Woods, 2012; Young-Lyun, 2011). Each evaluation of a professional development series requires a unique logic model, encompassing key components, goals, assumptions, and outcomes (Haslam, 2010, Spaulding, 2008). Program evaluation typically assumes the form of an inquiry, designed to assess and describe the success of a given program, while including concrete recommendations for further development (Cellante & Doone, 2013; Zohrabi, 2011). This type of evaluation may occur at the macro level, to study large-scale reforms, or the micro level, to investigate small-scale programs (Tokmak, Batuuray, & Fadde, 2013). Educational programs can be evaluated via quantitative data, such as student test scores, or qualitative data, such as stakeholder perceptions regarding program strengths and

weaknesses (Young-Lyun, 2011). In this instance, I conducted a micro level, qualitative program evaluation to gather information on the impact and overall effectiveness of math PD within the local school district. This method is useful in assisting stakeholders to make decisions regarding not only the quality of a teacher-training program, but in holding the architects of such programs responsible for the learning of educators in attendance (Schaffer, 2014). Although the ultimate goal of educator professional learning is to improve levels of student learning and achievement, the more immediate goal is enhanced knowledge, expanded skillsets, and improved practice of teachers (Haslam, 2010).

The effectiveness of the Green Valley CCSS math professional development will ultimately be measured by a collective decision made by the district leadership team (Young-Lyun, 2011). The purpose of my project is to provide this group of administrators with a comprehensive, research-based tool to complement and enhance existing feedback pertaining to the training, in order to help inform next steps and future practices in the area of teacher development. Spaulding (2008) states schools must regularly evaluate educational practice and programs in order to grasp their ultimate worth and determine areas of reinforcement and refinement. Numerous current approaches in PD evaluation entail the involvement of staff/participants, as opposed to relying on external evaluators with no personal connection to the learning community (Walker, Clancy, & Cheng, 2013). The inclusion of staff members in determining whether a program has met its intended goals leads to meaningful and practical recommendations for changes that typically include a personalized action plan as to how

to carry out those changes within the local setting (Walker et al.) In conducting my project study I focused on the perceptions of site level administrators and instructional coaches in order to thoroughly examine the observed impact of the PD series on teaching practices across district elementary schools, as seen through their eyes.

The resulting product supporting the doctoral project study consists of an evaluation report outlining the impact of the CCSS professional development on teaching of mathematics (see Appendix A). The report provides a summary of findings from the project, as well as offers suggestions for district stakeholders to take into consideration when designing the next PD series to be launched in the beginning of the following school year. The evaluation report is accompanied by a PowerPoint presentation, highlighting key findings as to the trends in math instruction both before and after the CCSS implementation, as well as shifts in teacher attitudes and behaviors throughout the course of the 2-year Common Core math roll out.

The presentation will include a list of the greatest challenges and success affiliated with the PD, as well as recommendations for additional support needed to ensure sustainable changes in teacher mindset and actions pertaining to math instruction. An evaluation of the CCSS PD will provide district leaders with valuable information as to the strengths and weaknesses of the program, so that they make enact swift changes in subsequent teacher professional learning opportunities to promote further improvements in teacher practices.

Review of the Literature

A review of the literature relevant to the problem of lack of teacher preparation to enact instructional strategies aligned to Common Core math practice and math content standards in elementary classrooms resulted in a Boolean search in five main areas: *Common Core State Standards teaching, math professional development, web-conferencing, mindset,* and *instructional coaching*. In conducting a program evaluation to determine whether the Green Valley PD series met the goal of transforming teacher practices to align with the constructivist, inquiry-based classrooms essential for alignment to the new, rigorous standards, it was essential to further exhaust literature addressing effective practices and programs in place to boost teacher competence in a lasting and sustainable manner. I researched each component of the district training series to determine the value of each element in isolation and as well as in conjunction with other elements of the program. I utilized the Walden University Library database to access current peer-reviewed articles from *ERIC, ProQuest, and SAGE*. I also accessed additional articles online through membership in ACSD and National Council for Teachers of Mathematics (NCTM) to supplement my literature review. Finally, I accessed professional text provided by the Green Valley District to support and enhance the PD learning experiences. Findings from my review of literature confirmed that the launch of CCSS in mathematics necessitates a change in teacher practices and an increase in ongoing, meaningful professional learning opportunities. Current research supports the use of techniques employed by the district to create meaningful learning for teachers, including instructional coaching, interactive web conferencing, and initiating a change in

mindset. Additionally, current literature indicates a need for more systematic, formative evaluations of current professional development in order to assess whether the trainings are effective in enhancing teachers' skills, and to implement changes to further bolster observable results.

Math Teaching Practices Aligned to Common Core State Standards

Despite 5 decades of discussion regarding the most effective methodology for math instruction, teachers continue to struggle between constructivist and procedural approaches (Fancella, 2010). The introduction of the CCSS emphasized a need for educators to effectively teach for conceptual understanding (Common Core State Standards Initiative, 2010; Youngs, 2011). Teachers across the United States struggled to determine what this new teaching paradigm looks like in actual practice (Jaeger, 2014). The current change in mathematics education stresses competencies over content (Wagner, 2008) Educators must possess the requisite skills to teach for understanding to ensure students are able to think and act flexibly with a variety of mathematical concepts and topics (Van de Walle et al., 2014). Procedural proficiency, while still essential for math success, must be integrated skills emphasizing understanding in order for students to efficiently justify why their answers make sense (Van de Walle et al., 2014; Wiggins & McTighe, 2005).

The constructivist learning environment has been investigated as one way to assist students in achieving greater success in the area of mathematics, although few studies have reported on the differences in teaching and learning following implementation of constructivist principles in elementary classrooms (Singh, Yager, & Yutakon, 2011).

Constructivist classrooms facilitate the connection of existing ideas to new ideas through reflective listening and thinking (Van de Walle et al., 2014). The shift from traditional instructional approaches focused on memorization of procedures and standard algorithms, to more constructivist approaches emphasizing student conceptual understanding, has been shown to increase student learning (NCTM, 2009). As opposed to procedural-formalist curriculum, in which traditional instructors present logically and sequentially organized facts and procedures, passively acquired by students and regurgitated to denote mastery (Grady et al., 2012), cognitive and social constructivist educators assume facilitative roles to guide students in developing understanding and making meaning of concepts through peer interactions and experiences. Constructivist teaching focuses on the process of productive struggle to enable students to mentally modify and replace existing schema to deepen understanding (Van de Walle et al., 2014)

Active participation in a social learning environment is essential to engage all students in developing meaning of mathematical concepts through use of problem-solving grounded in rigorous academic content (Singh et al., 2011; Youngs, 2011). Math students need instructors capable of moving beyond the traditional role of dispensing information, modeling great curiosity, passion, and an ability to take risks with mathematical content (Greenes, Teusher, & Regis, 2010). Teachers must be encouraged to allow students to grapple with mathematical concepts through participation on rich tasks during instructional periods (NCTM, 2014). This struggle becomes an essential part of the learning, during which time the instruction focuses less on the teacher and more about the students' actions and though processes (Van de Walle et al., 2014). In order to

enable students to reach success under the new Core standards, teachers must ask students to offer ideas, explain thinking, and defend reasoning, while refraining from jumping in and providing answers (NCTM, 2014). Teachers should utilize the strategy of asking probing questions to elicit deeper understanding among their students (Franke, Webb, Chann, et al., 2009). Teachers must cease the "stand and deliver" model of instruction, instead selecting appropriate classroom tasks that appropriately challenge all students in the area of math through nurturing reasoning and thinking processes (Gellert, 2013). Teachers should adopt an "upside-down" approach to traditional math teaching, wherein problems are presented to the class in the beginning on the lesson to allow skills to emerge organically through the process of making sense of the problem and arriving at a viable solution (Van de Walle et al., 2014). The act of allowing students to solve problems in non-prescribed, individualized ways enables them to structure and model mathematics in a manner relevant to their own worlds (Fosnot & Jacob, 2007). In order to fully grasp teaching principles aligned with CCSS, teachers should, themselves be members of intentional communities of practice, in order to engage in social learning supported via common goals and collegial social interactions (Gellert, 2013).

Vygotsky (1978) stressed the importance of social interactions in the processes of learning, reflecting, and changing. In designing constructivist, social learning environments for students to develop mathematics competencies, teachers should also ensure similar opportunities for learnings with colleagues through ongoing professional learning, lesson observations, facilitated discussions, and opportunities for group reflection (Gellert, 2013). Social learning positions the learner as an active seeker of

meaning, assisted by working collaboratively with peers possessing various levels of knowledge and experiences with the content (Van de Walle et al., 2014). Teachers should communicate to students the importance of assuming the role of co-learners, allowing students to take the lead in explaining understanding of various concepts, thereby facilitating student-teacher border crossing (Bahou, 2012). In order to enable students to become proficient in the new math content and practice standards, teachers must learn to validate and value the cognitive conflict of learners in their classes, encouraging peer interactions to promote stimulus and challenge (Pritchard & Woodard, 2010). In order to infuse a high level of cognitive demand into classroom instruction, teachers should infuse the use of procedures solely for the purpose of developing deeper levels of understanding, while simultaneously emphasizing connections to underlying ideas and solving problems in multiple ways (Van de Walle, 2014).

The Green Valley School District promoted constructivist, social learning principles in training teachers to implement new facilitative teaching methodologies in elementary mathematics classrooms. Teachers first assumed the role of the learners, grappling through word problems grounded in real-life application via collaborative efforts with colleagues. Teachers were presented with example problems that contained multiple entry and exit points to ensure different degrees of challenge, and could be solved in a variety ways using strategies that resonated with the individual learners. Through use of questioning techniques, instructional coaches led teachers to elicit deeper levels of thinking and understanding that they were then able to transfer to their own classrooms. Strategies such as number talks and talk moves were explicitly taught in

order to guide teachers in implementing math discourse and inquiry-based learning into their math lessons. Teachers were directed to release the standard algorithm as the sole means of solving a problem, and to apply numerous strategies in arriving at solutions to given problems. Teachers were taught each new strategy or skill through word problems, using a three phase lesson format in which the coaches first activated prior knowledge and established clear expectations, then "let go" and observed teachers' thinking, and, finally, summarized the main ideas and actively listened to the rationale of the community of teacher-learners. All strategies were introduced to students one at a time, in order to provide students with a repertoire of math strategies from which to pull when solving word problems.

Professional Development for Teachers of Mathematics

The United States spends up to $14 billion on teacher education, yet little has been done to effectively elevate instructional practices in our nation's schools (NIET, 2012). Continuous professional learning opportunities are critical for the success of reforms in education designed to improve teaching and learning (Akiba, 2012, Torff & Byrnes, 2011). Teachers require continuous opportunities to cultivate and refine their teaching practices, while building upon their existing knowledge bases, in order to ignite and inspire learning among their mathematics students (NCTM, 2014). Many districts and states are overwhelmed by the scope of teacher training required to launch the new content standards (Killion, 2013). Despite the identification of PD as a central feature of improvements in public education, the majority of programs have been criticized as low in quality (Torff & Byrnes, 2011). The widely held view of teacher professional growth

efforts as lacking in connections and research base, resulting in minimal teacher involvement and sustained change demonstrates the need for power and specific learning capable of altering the culture of the classroom (Torff & Byrnes). Infrequent teacher workshops encompassing a myriad of unrelated topics do not result in substantial growth (NCTM, 2014).

Professional development must enact lasting change in educators. In order for shifts in practice to go beyond one-day changes, districts need to ensure follow-up and evaluation of the new teaching and the PD itself (Fancella, 2010). In lieu of one-shot workshops or isolated conferences, teachers should learn on the job, through collaborative, job-embedded, sustained PD (National Institute for Excellence in Teaching, 2012). Effective teacher training should contain elements of collegiality within the learning environment, as well as support throughout the implementation phase (Esqueda, 2008). Math teachers need to be afforded ample opportunities for collaboration with other teachers in the analysis of student work, identification of student mathematical reasoning, and discussion and reflection of instructional methodologies aimed to promote student understanding (Akiba, 2011, NIET, 2012). Professional growth takes place when instructors come together on a continuous basis to examine student learning and the impact of their own methodology (NCTM, 2014). Singh et al. (2011) identified successful math PD as less focused on the individual, and more focused on collaborative group learning. Additional components of effective teacher learning opportunities included long-term over short term, more emphasis on the teacher as a producer of knowledge versus consumer, and active learning versus passive knowledge acquisition

(Singh et al.) The National Institute for Excellence in Teaching (2012) stated the determining factor of professional learning effectiveness is not the PD itself, but "the conditions under which it was delivered."

Although there is a lack of consensus as to which elements of PD are most essential for improving teaching practices, researchers agree there are a multitude of essential factors that must be incorporated in order for professional growth to occur and to positively affect student achievement (Dever & Lash, 2013). Professional development is often regarded as most effective when the emphasis is on the impact of teaching practices within the context of actual student learning in existing classrooms (Akiba, 2011, NCTM, 2014, NIET, 2012). School districts are moving away from passive participation-based workshops to active, job-embedded, group learning aimed at direct application and individualized application (Dever & Lash, 2013). Torff and Byrnes (2011) also found that programs were awarded higher ratings when sustained, focused, intensive, meaningfully integrated into school culture, and containing hands-on, active learning activities for teachers. It is through active participation that program learning goals can be met (Singh et al., 2011). Schools should be regarded as environments where teachers learn in conjunction with their students (NCTM, 2014). Teacher training should help educators to acquire pedagogical knowledge and content area knowledge through analysis of examples, representations, and explanations related to student thinking, understanding, and misunderstandings (Youngs, 2011). PD should include time for teachers to meet in collaborative teams in order to focus on specific student needs over a

sustained period in order to collectively determine the instructional solutions that will provide measurable growth in student learning and achievement (NIET, 2012).

In an era of shrinking budgets for PD, the incorporation of technology can help teachers to access learning opportunities virtually anytime and anywhere, provided it includes the essential elements of personalization and collaboration (Killion, 2013). Through participation in intentionally created communities of practice, virtual or face-to-face, teachers are able to connect to math in new ways through discussion, analysis, observation, and reflection (Gellert, 2013). It is through communities of practice that elementary school educators develop more positive mathematics identities, socially constructing feelings of competence that release feelings of discomfort pertaining to teaching math at deeper levels as well as their own negative experiences with math. (Confer & Ramirez, 2012, Gellert, 2013). Teachers are challenged by the new CCSS in that they are being asked to teach using math methodology they never experienced as students (Confer & Ramirez, 2012). Through group discussions, math teachers should identify given concepts, then ask themselves: What should students know and be able to do? (Kornhaber et al, 2014). Michalec (2013) cautions districts to ensure teacher training does not limit the professional autonomy of teachers through prescriptive instruction. Rather, teachers participating in PD should have time to talk through areas of frustration as well as successful experiences with various instructional practices (Michalec). Teachers must have the opportunity to actually witness the impact of recommended new teaching methods on student learning in order to become personally vested in transforming classroom behaviors and practices (NIET, 2012).

One of the most common obstacles to sustained professional growth is the lack of time. Common planning time among grade level teams is essential for the integration of focused, ongoing professional conversations focused on improving student understanding of math concepts through targeted teaching (Dever & Lash, 2013). Wagner (2012) also valued the practice of dissecting work produced by students in order to determine the effectiveness of instruction, and to provide clear evidence of skill mastery. Math professional development should encompass establishing and sharing best practices in a collaborative and collegial environment in order to determine what is needed for all students to achieve in the Twenty-First Century (Confer & Ramirez, 2012). Teachers should be provided with specific protocols for these collegial teacher meetings in order to impart the critical shift from simply attempting new strategies to determining effective solutions (NIET, 2012). Protocols enable schools to guide teams through the essential process of identifying and understanding student learning, choosing appropriate instructional strategies, analyzing student work, and refining methodologies in order to achieve desired results (NIET).

Teachers in the Green Valley School District were given access to ongoing professional growth specific to Common Core math practices through district-wide PLCs implemented via interactive webinars, instructional coaching through teachers on special assignment, weekly structured collaboration time to analyze student work using a district-provided protocol, videos of demonstration classes, and provision of district-created units of study. Overall, the changes in teaching practices following the PD were grounded in teachers assuming facilitative roles in the classroom, incorporating strategies to foster

math discourse and student perseverance in problem solving. The shifts in practice following Common Core adoption were accompanied by teachers' perceived feelings of anxiety, apprehension, resistance and being overwhelmed. As PD continued, and teachers became more familiar with and skilled in using the new practices, those emotions gradually transitioned to excitement in applying increased depth of knowledge in the classroom. One of the most successful elements of the PD, as reported by participants, was the cohesive and systematic nature in which all eleven sites were brought together via web conferencing and consistent instructional coaching to receive common messages and shared objectives at the district level regarding expectations for teachers. Another effective component of the PD series involved fostering a community of learners, wherein teachers first learned the math strategies, and worked in collaborative teams to solve given problems using a variety of methods.

Web Conferencing to Support Professional Learning

Bower (2011) completed a research study examining teaching and learning conducted via web conferencing software. Findings indicated that web-conferencing systems were beneficial in promoting active distance learning through use of functions including online presentations, videos, screen sharing, polling, and chat features (Bower). Virtual interfaces provided opportunities for participant engagement and collaboration that promoted meaningful and lasting learning experiences. Dvorak and Roessger (2012) examined the impact of web conferencing training for college-aged peer tutors. This training infused trainer modeling and guided practice, projected onto a large screen using a web conference platform. At the end of each session, questions were posed to

participants in order to promote dialogue. Findings indicated that learners are increasing in comfort levels pertaining to participation in online collaboration opportunities (Dvorak & Roessger, 2012). Discussion also included information stressing the importance of participant attitude. Learners who perceived the online learning environment as useful showed noticeable improvements in the areas of flexibility and attitude specific to the content presented (Dvorak & Roessger). Tokmak, Baturay, and Faddie (2013) concur that online learning has the capacity to promote lifelong learning through their analysis of an online master's degree program. Based on input from student surveys, questionnaires, and focus groups, findings showed the need for inclusion of face-to-face interactions to complement the virtual learning. Students believed the addition of live discussions would reinforce session content and allow more opportunities to ask clarifying questions. Finally, participants indicated the need for more examples and real-life application of the subject matter in order to better generalize the content (Tokmak, Baturay, & Faddie, 2013). The Green Valley District infused interactive web conferencing and video modeling with live discussions and teamwork opportunities in order to promote collaborative inquiry and deepen levels of understanding through peer discussion and hands-on learning tasks.

Instructional Coaching

Coaching has emerged as one of the most successful professional learning components for educators (Williamson, 2012). An instructional coach is loosely defined as an individual who works cooperatively with a teacher with the goal of improving practice and content knowledge to increase student achievement (Yopp, Burroughs,

Luebeck, et al., 2011). Instructional coaching has the potential to be a highly effective school-wide intervention, as its focus is on identified instructional needs and improvement of practice in a supportive and collaborative environment (Williamson, 2011). Biancarosa, Dexter, and Dryk (2010), conducted a four-year longitudinal study evidencing the positive impact of instructional coaching on student learning. After three years of working with a coach, teachers demonstrated a 32% increase in student learning gains school-wide (Biancarosa et al.). Knight (2011) conducted twenty years of research though the Kansas Coaching Project, where he concluded how teachers regard their coaches greatly impacts the success of the partnership.

The conditions for success in a coaching situation include assumption of positive intentions, identification of a focus, listening and reflecting in a non-judgmental manner, questioning for understanding, and emphasis on data collection (Williamson, 2012). Instructional coaching should refrain from directive practices, instead emphasizing reflective conversations and targeted feedback (Knight, 2011, Yopp et al., 2011). Knight (2011) states that if teachers "feel someone who is helping [them] thinks he/she is better than [them], [they] will resist their help." When instructional leaders hear and respect teachers' voices, they regularly elicit teachers' opinions (Knight). The supportive, non-evaluative approach to coaching encompasses the partnership principles of equality, choice, reflection, dialogue, praxis, and reciprocity (Knight). Coaches must be prepared to model strategies in real-time, jumping into a lesson as opposed to merely observing the teacher instruct (NIET, 2012). Teachers must also assume an active role in the coaching process, communicating needs and expectations on an ongoing basis in order to benefit

most from the support (Yopp et al., 2011). Teachers must be given opportunities to engage in meaningful reflection and dialogue with their coaches in order to ensure true learning is taking place (Knight, 2011).

The Green Valley District incorporated the use of instructional coaching through employment of five teachers on special assignment (TOSAs), acting as full-time math coaches. The TOSAs were responsible for researching best practices, attending professional development and web conferences pertaining to effective math instruction, designing and implementing district-wide PD, creating math units and lessons for teachers, facilitating collaborative planning time with instructors, observing teachers during math lessons, and modeling best practices via videotaped demonstration classrooms and live demonstrations at each site. The math coaches began the year by developing professional relationships with teachers in order to earn their trust, followed by non-evaluative classroom visits, and participation in team planning days. The TOSAs offered resources and supports to teachers struggling to implement the new standards, and invited staff members to watch them as they modeled lessons to reduce feelings of anxiety and uncertainty. Over the span of the 2013-2014 school year, the math coaches established themselves as competent, trustworthy, and valuable commodities within the Green Valley community.

Mindset

Learning involves change. It addresses the acquisition of attitudes, habits, and knowledge (Knowles, Holton, & Swanson, 2011). Attitudes and perceptions greatly influence the experiences of adult learners. Mindset is a specific cognitive orientation that

impacts behavior (Mahoney, 2008). Individuals have a tendency to employ the same mentality and tools due to comfort and an underlying fear of taking risks (Van de Walle et al., 2014). Rarely do adults re-examine and update their mindsets, resulting in utilization of past mindsets, resulting in resistance to change (Mahoney, 2008). Mindsets can be changed, and resiliency can be developed, regardless of a person's age (Yeager & Dweck, 2012). When individuals attempt to implement change, they are altering automatic behaviors, and subsequently exhausting self-control (Heath & Heath, 2010). This exhaustion of self-control results in fatigue of the muscles required to focus, think creatively, and persevere in the face of failure (Heath & Heath). Adult learners are required to make both personal and social adjustments in response to the experiences with which they are presented (Knowles et al., 2011).

People who appear lazy, or resistant to change, are likely exhausted and responding to a lack of clarity (Heath & Heath, 2010). Adults need to fully grasp why they need to learn new information, and maintain responsibility to entering the educational experience in order to benefit from it (Knowles at al., 2011). Teachers have a tendency to hold onto instructional strategies they utilized as school-aged students, due to long-held insecurities about their own mathematical abilities (Boaler, 2008). Adults' brains are malleable, and math ability is not rigidified in childhood (Yeager & Dweck, 2012). Teachers need to change their mindsets in order to develop the confidence to effectively implement the CCSS teaching practices that bear little resemblance to the rote algorithms of their student and teacher pasts (Boaler, 2008).

In order for a district to enact lasting change through PD, leaders must ensure that the new knowledge is accompanied by practice. In order to receive buy-in from staff following a major shift, as with the new math standards, leaders must provide clear directions, motivation to engage individuals' emotional sides, (though not to the point of exhaustion), and a clear path (Heath & Heath, 2010). When the road is uncertain, adults tend to default to old patterns and behaviors as the default method, in order to avoid the anxiety that often accompanies unfamiliarity (Heath & Heath). Resilience is essential for students of all ages, and adult learners must find a method for coping with challenges in teaching. Learners who believe that intellectual abilities can be developed tend to show greater adjustment and higher achievement across difficult school transitions (Yeager & Dweck, 2012). The adoption of an innovation, such as the new standards, can be precarious, and buy-in from students is essential for a launch to be successful (Mahoney, 2009). Districts can ensure this success by acknowledging that change requires time, effort and commitment. It should be regarded as a process as opposed to a singular event (Mahoney).

The Green Valley District addressed the mindset of teachers through allowing time for teams to engage in meaningful discussions about their perceptions, attitudes, fears, and reservations regarding the shift in teaching methodology. At the beginning of each PD session, the Director of Elementary Curriculum acknowledged the difficulty of change, and the understanding that the adoption of the standards would be a three-year process. No one was expected to completely transform their existing practices overnight. District leaders worked to shift the mindset of teachers by asking them to try the new

strategies, as learners themselves, when presented with sample math problems. The teacher-learners were not asked to fully abandon their tried-and-true familiar strategies initially, but instead were asked to utilize both their favorite strategy and the new strategy that had been introduced in each session. Gradually teachers were able to grasp that they could learn math in this "new" manner, and that math-phobia could be overcome as adults after all. Change can be difficult, and the Green Valley teachers experienced a range of emotions in response to the instructional shift. Over time, and with patience, collaboration, practice, and on-going dialogue, they began to embrace and welcome the changes in math instruction.

Implementation

Upon completing the project, and receiving approval from Walden University, I will follow up by scheduling a meeting with district cabinet members, including the superintendent, assistant superintendent, elementary directors, instructional coaches, and site principals to share my evaluation report and corresponding PowerPoint presentation (Appendix A). The report contains a summary of findings from my study in the form of an evaluation of the effectiveness of the district-wide PD series in preparing teachers to launch the CCSS math practice and content standards in their classrooms. In essence, the evaluation report contains specific information as to how the training transformed math teaching practices based on the feedback from district principals, assistant principals, and math coaches. The evaluation report also contains recommendations for improvement that can immediately be implemented prior to the release of the next phase of Common Core professional development. During a meeting with cabinet members, I would share

my report and ideally facilitate a professional discussion from the team as to how the Green Valley District can continue to further enhance teaching practices in alignment with the rigorous expectations set forth by the new standards, in order to ensure high levels of achievement and college and career readiness for all students.

Pending the permission of the district superintendent, I will also share my evaluation report and complementary PowerPoint presentation with members of the Green Valley Board of Trustees and community members at a regular school board meeting. Members of the board are not typically privy to the specific impacts of district PD, and will likely be interested to learn how use of district resources and funds allotted to teacher professional growth actually changed current practice in elementary classrooms across the district. I will again offer recommendations for program improvement in the hopes that trustees will continue to prioritize professional development for teachers when allocating future resources.

Potential Resources and Existing Supports

Many of the resources and existing supports for my program evaluation recommendations are accessible, but will require additional time and funding to implement. In working towards further improvement of the district math PD, quickly approaching its third and final year of implementation, the greatest supports in place are personnel, more specifically the math instructional coaches (TOSAs). Findings from my research indicated the need for more time to work in grade level teams with the TOSAs, and to continue more real-time demonstration classes at all elementary sites. Extended time with the TOSAs would require additional funding, as principals would need to hire

substitutes in order to release teachers from their classrooms. Another valuable commodity, as indicated in my program evaluation, is more time within grade level teams to reflect upon district-wide web conference content, and to develop collaborative action plans as to how best to implement the strategies taught in PD sessions. Additionally, teachers relayed to site principals and assistant principals that they required more time to reflect on the successes and shortcomings in their own math teaching practices, in order to problem-solve with colleagues, and to determine student understandings and misunderstandings of various concepts. The analysis of student work component of the PD required much more time than allotted in order to gain deep understanding of student reasoning and mathematical knowledge, and the study participants reported teachers were barely able to scratch the surface of the level of student competencies pertaining to various math performance tasks. In order to remedy this area of need, more time must be provided at the end of each web conference. However, in order to stick to the union-mandated hours for trainings, the district is restricted to 60 minutes for each PD session. In order to provide sufficient time for collaborative professional discussions and reflection, more training sessions would need to be added to allow time for content and discussion.

Potential Barriers

The potential barriers facing my program evaluation are typical of many public school districts: time and money. The time needed for teachers to truly grasp the paradigmatic shift in math instructional practices, observe and analyze the strategies in practice, engage in reflective problem solving and planning with grade level teams

through sessions facilitated by instructional coaches, and examine student work using standardized protocols to determine student understandings and misunderstandings is greater than what is currently being allotted. Bimonthly 60 minute web conferences allow time for introduction of a new strategy, but not time to truly reflect upon the impact of teaching practices and students' gains in knowledge as a direct result of implementation of various constructivist methodologies. Due to the timetable implemented by the federal government, districts adopting the Core standards are expected to implement the new standards in math, writing, and reading by the 2014-2015 school year. Due to the need for specific coaching and training in three content areas next year, it may not be realistic to expect the district to allot more time for math coaching and follow-up. Teachers are already overwhelmed by the magnitude and pace of the changes accompanying the new standards, and are already devoting instructional time (release days) and after school learning time to professional development. However, time may be acquired through conducting workshops during scheduled school breaks (summer vacation and winter vacation) with the incentive of additional pay for teachers.

The second barrier, lack of funding, is an issue many public schools face when developing and implementing teacher training. The district purchased Safari Montage video conferencing software in an effort to save time and money, by allowing all elementary teachers within the district to virtually access the same PD, without leaving their respective sites, at the same time. The issue of additional release time for instructional coaching opportunities within site-specific grade level teams, as well as funding summer/winter break CCSS workshops, would require substantial additional

funding. The district has been allotted federal monies to use towards meaningful CCSS-aligned professional development, but must ensure those funds sufficiently train teachers in the areas of reading, writing, and math. The district may wish to consider additional videotaped web conferencing options, so that teachers may access additional training during non-instructional hours, as an option to those who wish to further their practice at no additional cost to the district. Instructional coaches, already paid as full-time staff members, may also look at reallocating their time by visiting individual classrooms and offering specific and immediate feedback to teachers during weekly structured teacher collaboration time.

Proposal for Implementation and Timetable

Upon completion of this doctoral study and receipt of formal acceptance from Walden University, I will present my evaluation report to the district leadership team of Green Valley School District. I would like to provide this report to district instructional leaders by Fall 2014, in order to allow time to discuss and determine feasibility of suggested recommendations prior to the launch of the next round of CCSS professional development slated for September 2014. The timetable, through brief, will allow those involved in planning and implementing district PD time to evaluate and discuss the report in order to implement desired changes for the 2014-2015 academic year.

The district has already created a timetable for teacher professional development in the areas of CCSS reading, writing, and math for next year, so it would be more a matter of tweaking the sessions already scheduled. Despite my evaluation of district math PD the suggestions for refinement are applicable to any subject area. Teachers will

receive 60 minutes monthly of CCSS training across reading, writing, and math, as well as two release days next year with the math TOSAs. It is essential that the district utilize every moment of time with the teachers in PD sessions in such a manner that maximizes opportunities for lasting change. Should the district apply my recommendation of filming examples of various PD strategies in use, and providing facilitated grade level meeting opportunities with the math coaches, as well as more informal classroom coaching opportunities, my recommendation would be that each of those components occur on a bimonthly basis in order to sufficiently reach all elementary teachers.

Roles and Responsibilities of Student and Others

My main role will be to present the findings to the district leadership team, consisting of the Superintendent, Assistant Superintendent, Director of Elementary Curriculum, Principal on Special Assignment (overseeing the math coaches), elementary principals and assistant principals, and math instructional coaches (TOSAs). It is my intention that my evaluation will help to bring about further improvements to the district CCSS professional development series, in order to promote even greater increases in teacher competencies to benefit all learners. Many of the principals, assistant principals, and instructional coaches provided insights and feedback as to their perceptions of the effectiveness of the district trainings in preparing teachers to launch Common Core standards, and will likely be interested to see if their beliefs were aligned with those expressed by their colleagues. The district office cabinet members must analyze and discuss my evaluation report in order to determine the elements of the PD that have been identified as most effective, as well as decide whether any of the recommendations for

improvement are feasible. Should district leaders decide to implement changes, such as increasing teacher collaboration time with the TOSAs, or developing additional recorded webinars, it will fall on the math coaches to develop the content and schedule the sessions. Should district policymakers decide to approve additional release days for teachers to engage in team planning and analysis of student work days, funding will need to be allocated from designated professional development monies.

Project Evaluation

The project for this doctoral study is an evaluation report addressing the impact of a district-wide elementary CCSS math professional development series on teaching practices within the Green Valley School District in California. The professional development series addressed the teaching paradigm shift necessary for successful implementation of the CCSS math practice and content standards in order to ensure students develop conceptual understanding of math through critical thinking, collaboration, creativity, communication, and problem solving during instruction over the course of the 2013-2014 school year. I will present my evaluation report and corresponding PowerPoint presentation to district officials in order to provide evidence of the effectiveness of the PD in transforming the practices of elementary math teachers and to make recommendations for further improvements. I will also offer to present my findings to the Board of Trustees during a regular school board meeting upon request of the superintendent. I will follow up with the district Director of Elementary Curriculum, as she oversees the development and implementation of all elementary professional growth opportunities, to determine the changes and improvements that have occurred.

The report is formative in nature. The district PD is ongoing, and data obtained through the project study can be applied to future CCSS training for the 2014-2015 school year. In collecting qualitative data via interviews, questionnaires, observations, and document analysis, I am able to share that the district PD has been effective, overall, in changing the teaching practices in elementary math classrooms to encompass constructivist principles and active engagement, in which the students are creating their own meaning through collective inquiry, versus the rote, procedure-based, algorithm-heavy teacher-directed classrooms of the past. The case study program evaluation was well-suited to evaluate the overall quality of the district professional development series. In developing a program evaluation, I was able to glean a deeper understanding of the impact of the PD, and to identify the areas for improvement. Program evaluation provides the opportunity for key stakeholders to examine data, determine the next steps to take given the findings, and to determine what changes need to be implemented in order to ensure the program meets its intended goals and adequately addresses the needs of those involved (Lodico et al., 2010).

It is my goal to offer constructive feedback regarding the impact of the district math series. District-level leaders rarely have the opportunity to visit classrooms and see the changes enacted by teacher trainings. In collecting qualitative data from 20 district leaders, I am able to offer perceptions from individuals who were able to regularly observe the desired instructional strategies in practice on a regular basis. In conducting a program evaluation, I hope to communicate to district leaders the successes and refinements for teacher CCSS professional development, in order to ultimately improve

the quality of instruction in mathematics. The key stakeholders included in this program evaluation are teachers, site principals, site assistant principals, math instructional coaches, and district-level administrators (superintendents and directors) employed by the Green Valley School District.

Implications Including Social Change

The goal for all Walden University doctoral candidates is to impart positive social change. Throughout my enrollment at Walden, the promotion of social change has been a recurring theme throughout all of my education courses. It is only fitting that my doctoral project study address the concept of social change through strive to improve teacher instructional practices in order to ultimately eradicate the achievement gap in mathematics, and ensure college and career readiness is an achievable goal for all students. It is my intent to continue to strive for positive social change in all of my professional and scholarly endeavors.

Local Community

The launch of the Common Core State Standards presented an enormous shift for educators within the Green Valley School District. The Director of Elementary Education stated:

> The Common Core State Standards represent the greatest challenge to public education in a generation. These changes are necessary to prepare our students for 21st Century learning, and will provide them with the knowledge and skills to become College and Career ready. The transition is both an exciting opportunity and great challenge for school districts. The new standards require dramatic

> changes in pedagogy to be successful. Teachers must learn new content at the conceptual level and change their instructional practices in order to provide lessons that increase the rigor, problem-solving, and critical thinking for students (personal communication, January 30, 2014).

Teachers must have capacity to develop critical thinking, communication, collaboration, creativity, and problem-solving skills among their students in order to prepare every child to compete in the Twenty-First century global knowledge economy (Wagner, 2008). Without proper training in the development of facilitative, student-inquiry based mathematics classrooms highlighting social-constructivist principles, teachers will ultimately fail to prepare their students for the rigorous, national standards.

In providing teachers in the Green Valley District with effective, meaningful, sustained, engaging, and sustained professional development in CCSS math practice and content standards, students will develop deeper, conceptual understanding of mathematics, and demonstrate competence in applying math to everyday scenarios. Teachers well-versed in the strategies and high expectations associated with the new standards will foster depth of knowledge and the ability to solve problems flexibly and collaboratively among elementary students. These skills will prepare students for both higher education and the workforce, ensuring children in Green Valley will have a multitude of opportunities available to them. The shift from teacher-directed to teacher-facilitated classrooms will result in the ability of students to take ownership of their own learning, applying critical thinking strategies that will be applicable to real-world scenarios throughout their academic careers and beyond. Green Valley students will have

the essential tools to become tomorrow's innovators and leaders, benefitting the local community for years to come.

Far-Reaching

To date, no published studies are available evaluating the impact of CCSS professional development on teaching practices in mathematics. To obtain and maintain gainful, lucrative employment in top organizations, college graduates must possess characteristics associated with innovators. Such attributes include a capacity for design thinking, a willingness to experiment and take risks, and the ability to embrace and learn from failure (Wagner, 2012). The Green Valley District designed PD for teachers with these long-terms goals in mind. Districts across the country may gain valuable insights as to how best to prepare teachers to embrace the paradigm shift necessary for successful implementation of the Common Core State Standards. Effective teaching fosters deeper and more meaningful learning that will prepare all learners to meet the demands of the new millennium.

Conclusion

Findings conveyed that following the district PD, consisting of district-wide PLCs implemented via interactive webinars, instructional coaching through teachers on special assignment, weekly structured collaboration time to analyze student work using a district-provided protocol, videos of demonstration classes, and provision of district-created units of study, teaching practices were significantly changed. Instructional leaders reported that prior to the CCSS training, math classrooms were primarily teacher-centered, focusing on

rote algorithms and procedures to solve problems. Teachers typically modeled a particular strategy, then released responsibility to students to independently practice targeted skills using their adopted math curriculum workbooks. Teachers followed the district scope and sequence, typically covering one chapter in the math text per week, assessing the targeted content, then moving on to the next set of standards. Math education favored breadth over depth of knowledge, and students had little understanding of why they were applying given procedures to solve math problems or generalizing knowledge to real-life scenarios.

Following the Common Core launch and subsequent teacher PD, site administrators and math coaches reported such observations as "My teachers are very student centered. I have observed more discussion/collaboration with students and grade level teams," "Math has become louder, involving students in class discussions and allowing for math discourse," and " Students are reasoning more in math and being able to explain their thinking orally and in writing." Participants also reported witnessing "greater focus on concept development and less on procedures," "teachers showing students math strategies to help them become more flexible in their understanding," and "more manipulatives in evidence, more questions generated during math, more math process charts around the room." Overall, the changes in teaching practices following the PD were grounded in teachers assuming facilitative roles in the classroom, incorporating strategies to foster math discourse and student perseverance in problem solving. The shifts in practice following Common Core adoption were accompanied by teachers' perceived feelings of anxiety, apprehension, resistance and being overwhelmed. As PD

continued, and teachers became more familiar with and skilled in using the new practices, those emotions gradually transitioned to excitement in applying increased depth of knowledge in the classroom. One of the most successful elements of the PD, as reported by participants, was the cohesive and systematic nature in which all eleven sites were brought together via web conferencing and consistent instructional coaching to receive common messages and shared objectives at the district level regarding expectations for teachers. Another effective component of the PD series involved fostering a community of learners, wherein teachers first learned the math strategies, and worked in collaborative teams to solve given problems using a variety of methods. Teams of teacher, both through live interactions and web interfacing. As one participant reported, "The greatest success is that you are actually now seeing students doing math, and being engaged in math, as opposed to the teacher doing math and being engaged in the math lesson. I would look at is as the engagement component as the greatest success."

The Common Core launch in the Green Valley District was not without its challenges. Common responses from interviews and questionnaire data, coupled with post-hoc web conference observations indicated teachers feeling rushed to implement monumental changes in practices before they had sufficient resources and realistic timelines. Instructional leaders reported that teachers did not have adequate time in their PLCs to digest new information and make action plans to put into practices the new math practice and math content standards. The topic of assessments being too numerous and too rigorous was a concern shared by educators across the district. Advice from instructional leaders as to how to successfully implement a CCSS professional

development series encompass the following elements: ” Have a common message, have a common objective, communicate it clearly, let people know that it’s hard, and it takes time, and it takes risks, communicate to parents clearly, know you’re not going to get it right away, and go slow.”

Recommendations for improvement in future CCSS PD include more time at the end of sessions for teachers to discuss, reflect, and create actions plans to generalize the new learning to their classrooms. Additional recommendations include funding an extra release day for teachers to engage in collaborative planning time facilitated by a math instructional coach. Another way to improve the retention and practice of strategies acquired through district trainings includes more informal coaching opportunities in classrooms across the elementary sites. The provision of specific and immediate feedback during real-time teaching has the potential to ensure teachers are confident in using questioning techniques to facilitate conceptual understanding. An additional area for improvement is in the provision of CCSS-aligned resources and developed lessons. Site administrators reported teachers devoting excessive amounts of time to searching for tools to use in the classroom in the absence of a cohesive, standard curriculum. Finally, due to the lack of time to gather teachers for additional PD, district leaders may wish to consider filming short refresher videos, showing practices in action using students and teachers, for teachers to access on their own time or during weekly structured teacher collaboration time in order to maintain professional growth in mathematics on an ongoing, and more frequent basis. The benefits of using technology to enhance teacher training include the convenience of accessing information virtually anytime, anywhere.

The more comfortable and competent teachers become with the new teaching practices aligned with CCSS, the greater the impact on their students' learning.

The final evaluation report and corresponding PowerPoint presentation will be presented to the district leadership team in order to provide specific reinforcements and refinements for the PD series. The team will be given the opportunity to listen to the suggestions for improvement, then implement any recommendations they deem feasible and appropriate for the following school year. If the district leaders implement suggested changes, they will further the teachers' learning related to Common Core teaching competencies in mathematics. Effective teaching is critical to student success, as educators have the capacity to cultivate a culture of high expectations and elevated levels of achievement for all students. With successful teacher professional learning opportunities in place, the goal of college and career readiness for every child can be more than just a goal, it can be a reality.

Section 4: Reflections and Conclusions

Introduction

In this section I will address the strengths and limitations of the doctoral project, a program evaluation of the Green Valley School District Common Core math professional development series. I will also include recommendations for further study and discuss ways in which the problem, lack of teacher preparation to effectively implement CCSS math practice and content standards, could be addressed in a different manner. I will conduct a self-analysis to determine what I learned about scholarship, project development and evaluation, as well as leadership and change. I will discuss what I learned about myself as a scholar, practitioner, and project developer. Finally, I will include a personal reflection on the importance of my work, and what I learned through engaging in the process of completing a doctoral project study.

Project Strengths

I chose to conduct a program evaluation of the district-wide CCSS professional development series in order to provide valuable feedback to district leaders as to the impact the training and support conducted over the course of the 2013-2014 school year had on teaching practices. The PD series was the first of its kind in Green Valley, synching all 11 elementary sites simultaneously to provide a common message, consistent information, and opportunities for both virtual and face-to-face teacher interactions. Past teacher professional growth opportunities consisted of workshops conducted at the district office, capped at approximately 120 participants due to limitations in space and resources. In launching the Core standards, Green Valley

recognized the need for large-scale teacher development, and used Safari Montage video-conferencing software to reach all 500 elementary teachers on a continuous basis to introduce radical shifts in math teaching methodology correlated to the new standards. In addition to using technology to enhance PD, Green Valley hired their first-ever math instructional coaches (TOSAs). These five coaches were released from their classrooms for a period of two years, and spent the 2013-2014 school year receiving intensive training in best practices in mathematics instruction. The TOSAs then worked collaboratively with the Director of Elementary Education to design and implement the bimonthly web conferences, which were supported by videotaped and live demonstration classes, and two facilitated planning days per year with every grade level team at all 11 elementary sites. The TOSAs devoted their first year in their positions to learning instructional strategies, theoretical and conceptual frameworks aligned with socioconstructivist teaching, and creating units of study, as well as assessments and performance tasks.

Overall, the district math training series was viewed as effective, positively impacting teaching practices across district elementary classrooms. The teachers, formerly content area experts in math, were asked to step outside of their comfort zones, close their teacher's manuals, and develop inquiry-based classrooms rich in math discourse and collaborative learning tasks with real-life application. Many teachers were taught math according to procedures and standard algorithms, and had grown accustomed to following the scope and sequence outlined in the math text, instilling a model-guided practice-independent practice cycle of skill acquisition. In short, in the wake of Common

Core, teachers felt lost, anxious, and overwhelmed. Green Valley acknowledged these emotions, elicited on-going feedback from teachers, and embraced early adoption of the standards in order to allow sufficient time for teachers to learn how to teach math according to the new facilitative and conceptual approach. The 2013-2014 year marked the first year of full CCSS implementation, and the introduction and zero accountability message that encouraged open-mindedness and risk-taking in the previous year, quickly gave way to district assessments and data collection, as well as frequent administrative walkthroughs to ensure the carryover of the strategies acquired through bimonthly PD.

Despite a mix of both positive and negative responses to CCSS math instruction, entailing a release of the standard algorithm and new strategies including branching, decomposing, partial sums, open number lines, number strings, models, and compensation (Figures 6-7), site administrators and instructional coaches overwhelmingly reported a shift from teacher-directed lessons to student-centered activities. Despite the initial discomfort of teachers, math teaching practices were transformed as a direct result of the district professional development. Number talks (Figure 8) and vocabulary-rich math discourse echoed through school hallways, while students were heard not only "showing their work," as they did previously, but also explaining their reasoning and justifying their mathematical thinking. Teachers district-wide evidenced use of K-W-C (Figure 9) charts to help students to "wrap their arms around the problem," before devising any number of correct paths in which to arrive at a correct solution. The message that teachers conveyed to students was to embrace failure,

task risks, and to value the process of finding the answer as much, if not more, than the answer itself.

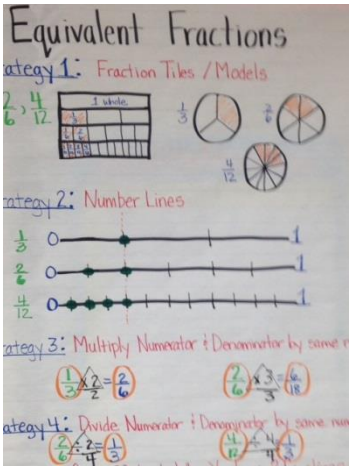

Figure 6. Fraction strategy poster

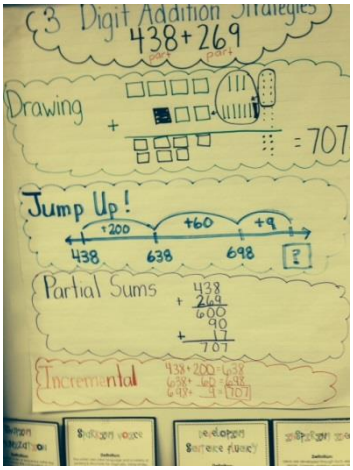

Figure 7: Addition strategies poster

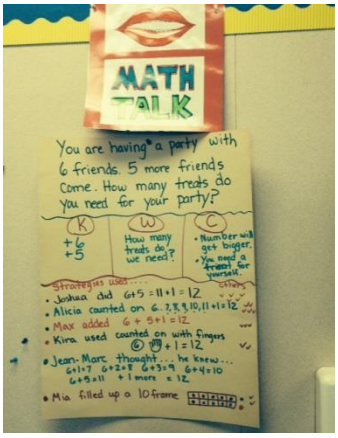

Figure 8: Math talks poster

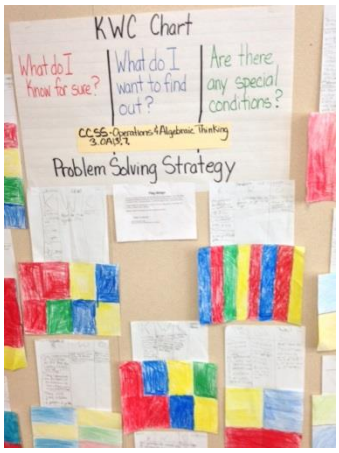

Figure 9: K-W-C chart

In conducting a program evaluation, I did due diligence by not only highlighting the successes of the PD, but the areas for refinement as well. Areas for improvement,

including increased time for collaboration and reflection at the conclusion of web conferences, increased facilitated planning time with TOSAs, provision of additional resources, access to digital libraries for refreshers and follow-ups, and more specific and immediate coaching opportunities in live classrooms, were included in the program evaluation in order to provide district leaders with recommendations for future professional development. This information will provide district leaders with direction when designing the next year's teacher training in CCSS. These potential changes have the capacity to better meet the needs of the teachers in launching the new standards effectively while ultimately improving student understanding and achievement. The cornerstone of the Common Core State Standards is career and college readiness for every student through rigorous standards, high expectations, and teaching that promotes active participation and deeper levels of student thinking and knowledge.

Project Limitations and Recommendations for Remediation of Limitations

As with any project, there were limitations associated with my study. My sample size consisted of 20 participants employed as principals, assistant principals, or instructional coaches. I did not include a sample of teachers, who may have also offered valuable insights as to how their teaching practices have shifted following implementation of the CCSS professional development. The data could have been enriched by including feedback from a sample of teachers in grades kindergarten through fifth. An additional limitation of the study is that the time frame for collecting and analyzing data occurred within the scope of one academic year.

A longitudinal study, following the teacher practices over the course of three years may have shown a more dramatic shift in teaching practices as the teachers became more competent and confident in employing the various methodologies and releasing their directive roles in favor of facilitative ones. A final potential limitation entails the district reaction to the evaluation report. Due to lack of time, funding, and the increased pressure of training teachers in all three core areas: math, reading, and writing in the upcoming school year, the leadership team may not be receptive to making changes and allocating additional resources to math PD at this point.

A final way to improve upon my study would to include student data. The true measure of effectiveness of teacher practices in math instruction lies in the student progress. If the students fail to grasp the concepts taught in the classrooms, then the teacher training would not be regarded as successful or impactful. In the absence of standardized testing data until 2015, district assessments and performance tasks would have served as a preliminary measure of student achievement and response to the new standards. A follow-up study should focus on whether the new teaching strategies lead to increases in student achievement in mathematics as measured by standardized, nationally-normed, CCSS assessments that will replace prior state standardized testing measures. It would be insightful to investigate how students in Green Valley compare to students across the nation in reaching levels of proficiency with the new math standards, given the district-wide continuous and intensive teacher professional development.

Scholarship

I have learned a great deal about myself as a learner and a researcher throughout the course of my journey at Walden University. My doctoral coursework taught me the foundations of educational research, and allowed me to become part of a virtual community of learners. I acquired scholarly writing skills and quickly learned that this genre was outside of my realm. Under the guidance of my professors, I refined my skills and learned to produce both position and impact papers. The doctoral study was truly a passion project for me, as I have spent the past two years fully immersed in the Common Core launch, and witnessed the educational impact of the new standards firsthand. Throughout the course of my work on the project study, I have improved my research skills and ability to synthesize information from peer-reviewed sources to develop cohesive, research-based assertions. I have learned to saturate the literature, and to conduct continuous searches through the electronic database in order to ensure I am current on the latest research and trends in my subject area. Through this process I discovered that at no point is a scholar ever done researching, as new perspectives and sources emerge daily.

One of the largest challenges I faced in conducting a project study investigating Common Core teaching practices is that research in this area is somewhat limited compared to previous teaching paradigms. The relative newness of the CCSS provides ever-changing perspectives published by both proponents and opponents of the shift in public education. I have enjoyed reading pieces advocating both sides, and will continue to closely follow this issue as it continues to unfold in coming years. I am grateful to my

doctoral committee for the guidance in focusing solely on the teaching side of the CCSS launch in order to develop a study that was cohesive and focused.

Another area in which I evolved throughout the completion of my study is in data collection and analysis. Prior to beginning my doctoral project, I did not see the value in qualitative data as compared to quantitative data. I prided myself on being a numbers person, endlessly searching for numerical representations or statistics to prove or disprove my theories. Upon selecting a topic, Common Core math teaching practices, that had minimal quantitative data available, I learned that qualitative data such as interviews and open-ended questionnaires offer insights and perspectives that are also valuable. I enjoyed allowing the qualitative data from my case study unfold, while inductively identifying emergent themes as I combed through the interview transcripts time and time again.

I am grateful for the opportunity to become a scholar-practitioner, as I now possess the skillset to identify a real problem or issue within the context of my professional life in the public school setting, and use research to develop potential solutions to the problems to improve teaching and learning within my district. The doctoral study process has taught me to become a critical thinker, persevere in the face of adversity, and to strive for objectivity in research. The knowledge and skills I acquired through enrollment in the EdD. Program enabled me to obtain leadership positions within my school district. I have grown increasingly confident and competent in these positions, due in part to my continuing education and expanding knowledge base.

Project Development and Evaluation

I began the doctoral study process unsure of the direction it would take. After completing my data collection and analysis, program evaluation seemed a natural fit for the culminating project. Development of a program evaluation, identifying the strengths and weaknesses of the district CCSS professional development, enabled me to make a positive contribution to my school district by providing specific feedback and recommendations for improvement. The objective of a program evaluation is to provide objective data to decision-makers to allow them to decide next steps to take in either improving or eliminating the program. In providing district leaders with a comprehensive evaluation report, my work has the potential to impart change that will positively impact over 500 teachers and 11,000 students.

Completion of the doctoral project study was not without its challenges. I experienced a number of setbacks. I reached my frustration point on more than one occasion when completing yet another round of rewrites, the exhaustion making it almost impossible to string together a coherent thought. I was extremely nervous when recruiting participants, as shared membership in the employing agency with the participant pool has both benefits and drawbacks. I imagined the awkwardness that would ensue at staff meetings when no one volunteered to complete questionnaires or to be interviewed. Fortunately, I had all but seven potential participants in the population agree to participate in my study, and I was able to schedule and conduct interviews without incident.

The transcription of the interviews was labor-intensive, but in listening to the audio recordings over and over, I immersed myself in the data and took ownership of the observations and insights my participants shared with me. I was honestly shocked by the consistency in interviewee responses, and became increasingly aware of the impact of the collaborative and cohesive nature of leaders within my school district. In coding the data and attempting to actually write-up my findings, I often felt overwhelmed and without clear focus. Thankfully, the direction I received from my committee chair was just the rational feedback I required to keep me moving forward.

Overall, I would describe the doctoral project study as laborious, intense, and life-changing. I knew if I could achieve my lifelong goal of earning a doctorate, I would capable of conquering any challenge that came my way. My son, just a year old when I began my studies, is now preparing to enter kindergarten. He serves as a living, breathing indicator of just how much time has gone by and how many sacrifices have been made to get to this point. However, I know one day he will be proud of me and of all I have accomplished. My hope is that he learns to value education as much as I have.

Leadership and Change

I recall, during one my first courses at Walden University, the professor introducing my fellow students and myself to the various leadership styles. At the time I was teaching special education, with aspirations to become a site administrator and an instructional leader. I remember adamantly identifying myself as a transformational leader, meaning that I would motivate and inspire my colleagues, leading by example in both a progressive and innovative fashion. A year into my studies, I found myself seated on a

panel interview, in a room of strangers, pleading my case as to why I should be the pick for an assistant principal vacancy. I had no prior relationships with any of the panel members, nor did I have an employment history with this particular school district. However, I did have passion for both public education and leadership, acquired through both my teaching experiences and my studies at Walden. This passion, coupled with my knowledge of the frameworks supporting effective instructional leadership, helped me to obtain my first administrative position. I quickly learned that being a leader carried a sense of responsibility unlike any other I had ever faced. I specifically recall engaging in collegial discussions with my Walden classmates, many of whom held similar professional positions, to seek insights as to how I should address various challenges at my site. This virtual PLC was invaluable in continuing my development as a scholar-practitioner and as an educational leader.

The continuation of my doctoral studies after assuming a site leadership role was far more difficult than I could have imagined, as the 12-hour work days and endless stream of interruptions threatened to derail me from completing the program. Through it all, I persevered. I learned to multitask and make productive use of nearly every minute of the day. Managing my time and prioritizing my resources in this manner enabled me to focus on both my job and my education, and I merged my two worlds whenever possible. After being inspired by the readings and video clips accompanying Tony Wagner's (2008) *Global Achievement Gap*, I designed a staff meeting around the concept of meeting the needs of millennial learners. This training was met with overwhelmingly positive feedback from my teachers, and earned me their respect as an instructional

leader. As I complete my doctoral program, I prepare to meet the new challenges waiting for me as a newly minted site principal. I am eager to begin my tenure as a transformational leader at my school and within the larger district. My education through Walden University has taught me that the most inspirational and successful leaders embrace failure as learning opportunities, maintain a clear vision, and are not afraid to take an organization in the direction it needs to go, even in the face of adversity.

One of the trademarks of effective leaders is the ability to promote change. Without change, organizations become stagnant. Over the course of my time at Walden and as a site administrator, I have learned that many individuals struggle with change. Change makes us uncomfortable, pushing us out of our comfort zones and fostering uncertainty and fear. My doctoral project study focused on one of the greatest educational shifts of our time: the launch of national Common Core State Standards. I was fortunate to have begun my tenure at my school site in a leadership role just as the CCSS in mathematics were introduced. I witnesses firsthand the apprehension and resistance that accompanied the shift in instructional practices. Teachers who had been experts of their craft suddenly felt like novices and failures. Over the past two years several educators have shed tears in my office, frustrated by the rapid-fire change brought about by the launch of the new standards in reading, writing, and math. Through my studies at Walden I learned that change takes time, and it is the role of the leader to support staff and provide them with the resources they need in order to be successful in implementing shifts of any kind. On many occasions, I found that simply listening to the outraged and uncertain teachers and

parents, really hearing and validating their concerns, was all that was needed to get one step closer to the highly sought after concept of *buy-in*.

One of the tenets of Walden University is the premise of creating students who become agents of change. I was inspired by the innovators I studied through my education coursework, as well as by the guest lecturers at my Walden residencies. Each of these individuals identified a local problem, and addressed it through enacting meaningful and lasting change, making a positive impact on the world in some way. At this point my world is small, consisting of one school district, in one city, in one state, in one nation. However, it is my goal to inspire social change and work tirelessly to eradicate the achievement gap through effective research-based instructional practices within my school site. If I can lead my team towards equity in education, and provide disadvantaged and minority children with opportunities they may not have otherwise accessed, I firmly believe that I have made a difference. It is my hope that those children will then go on to make a positive difference in the lives of others.

Analysis of Self as Scholar

Over the past 4 years I have evolved as a scholar through my work with Walden University. During graduate school I found success easily, and assumed that my doctoral program would be stimulating, yet highly manageable for me. I quickly learned that post-graduate work was far more challenging than my Master's program, though far more interesting as well. I immediately soaked up the new knowledge acquired through my first few courses, pouring over assigned readings with enthusiasm and participating in discussion boards with gusto. I quickly learned, after struggling through my first written

assignments, that scholarly writing was a far cry from any types of writing I had produced in recent years. I cringed as I received feedback on my first paper, horrified by the plethora of red marks that covered nearly every page. Over time, I have gained proficiency in scholarly writing, and even succumbed to the dreaded APA-style formatting. I have also learned to appreciate those red marks, comments, and corrections provided by my professors and committee members, for they represent an opportunity to evaluate my work with a more critical eye, and to convey my thoughts in the strongest possible light.

My strong research skills, a direct result of countless hours completing searches through the Walden library database, have furthered my career and earned me the respect of many of my colleagues. My ability to create research-based position papers translated into two accepted grant proposals for technology and reading intervention services, as well as one formidable application for the California Distinguished Schools Award. Through inclusion of a clear problem, research-based interventions and methodologies to address the identified problem, and data in support of the eradication of the given problem, my application caught the eye of the Distinguished Schools Committee, and helped to earn this high honor and state recognition for my school. I know that my skills in creating concise, clear documents supported by current research were acquired through my coursework and doctoral study development at Walden University.

Analysis of Self as Practitioner

I enrolled in my doctoral program three and a half years ago, working as a special education teacher and district mentor but desperately wanting to impart influence and

change on a broader level. I hoped that furthering my education through a program specifically designed for educational leaders would provide me with the knowledge base and soft skills required to advance into an administrative role. I recall attending my first Walden residency and marveling at my fellow students, many of whom I had heard speak at various education conferences across the state. I couldn't even imagine ever being in the same league as these highly respected instructional leaders. As one of the only teachers in attendance, I felt inferior to my colleagues, and vowed that upon graduation from Walden I too, would be amidst their ranks.

I am proud to have acquired my first and second administrative roles during my time at Walden. After serving as an assistant principal for two years, I was recently promoted to the position of elementary principal. As an assistant principal and Walden student, I was inspired to stay abreast of educational reforms and regularly scoured peer-reviewed journal articles for trends in public education and the impact those trends would have on my staff and students. Educational research became a way of life for me, and I cannot imagine relinquishing access to the Walden Library database upon completion of my degree. In my professional life I embrace the notion of life-long learning. I plan to continue to learn and grow as both a scholar and practitioner in my new position as principal.

Analysis of Self as Project Developer

In my professional life, I have always been in my element when designing and implementing new programs. One of my greatest achievements as a teacher was when I created a nationally recognized reading intervention program at my site. This program

was evaluated on an annual basis. I was required to prove its effectiveness through student data evidencing growth in order to maintain district funding. In my academic life, I have never before attempted to conduct a case study program evaluation of this magnitude. The analysis of a district-wide professional development impacting over 500 teachers is far more complex than identifying strengths and weaknesses of a reading intervention program targeting 18 students. The development of my doctoral study project was an intense process, and I quickly learned the importance of ensuring every step was completed accurately before advancing to the next phase of development. Each time I revised the project, or presented the data in a different format, the overall product gained clarity and validity. As a result of this process, I feel confident in conducting future program evaluations. I believe the knowledge I have acquired in the realm of academia will serve me well in examining various educational programs in my professional world.

The Project's Potential Impact on Social Change

The Green Valley School District prides itself on the promise to prepare students for the rigor of college work and to provide opportunities for all students to pursue higher education (Green Valley Mission Statement, 2013). Green Valley strives to live up to this promise through providing a quality education based on high standards, effective practice, continuous improvement, and innovation (Green Valley District Plan, 2013). In ensuring every teacher has access to sustained professional development and support in implementing research-based best practices in mathematics, district is fostering equity and high expectations for all educators. As a byproduct, students from all subgroups and

populations have access to the same high-quality instruction. The district PD has the potential to eradicate the achievement gap in mathematics through training teachers to develop deeper levels of conceptual understanding and mathematical reasoning skills in their students. This deeper knowledge will lead to increased achievement in mathematics, ensuring greater levels of proficiency for all learners.

The project study determined that the district PD series was effective in transforming the teaching practices of Green Valley elementary teachers. Site administrators and instructional coaches observed teachers across the district engaging in facilitative math discourse, designing constructivist learning tasks tied to real-life scenarios, and teaching conceptual strategies to arrive at solutions to given problems. The consistency in practice across the district was attributed to the common message and consistent support across all 11 sites. District leaders synched all schools simultaneously through use of web conferencing software, ensuring clear communication of expectations for instruction. The use of math coaches to engage in collaborative planning, demonstrate lessons, and facilitate collegial discussions regarding analysis of student work ensured cohesive protocols were in place among all 500 teachers. The implementation of the PD ensured alignment of instruction to the new Common Core math practice and content standards. The overarching goal of the CCSS is to ensure rigorous curriculum and high expectations for all students to ensure they are prepared for the demands of college and career. In order for U.S. students to compete in the new knowledge economy, they must demonstrate the ability to effectively communicate, collaborate, think critically and creatively, and solve problems. The teachers in Green Valley were trained to foster the

development of these “soft” skills in their classrooms, first assuming the role of the learner before gradually assuming the role of the facilitator.

The launch of the CCSS represents one of the largest social changes in education in history. Federal policymakers addressed the lack of equity in public education by ensuring all students were exposed to the same set of standards essential for success in secondary education and the workforce. To date 44 states have adopted the new standards, and are in the process of enacting major paradigm shifts in the way teachers instruct and the manner in which students learn. Every child should have the opportunity to attend college, and the CCSS strive to ensure that every learner is given the necessary skills and tools to choose his own path.

In developing a program evaluation of the district CCSS professional development series, and outlining areas for reinforcement and refinement, district leaders have the option to further improve the training through data-driven decision making. It is essential for district personnel to fully understand the impact of their program on teaching practices. In implementing recommendations for improvement, cabinet members have the capacity to further the competence of elementary teachers and enhance the mathematical understanding of learners from all racial, ethnics, and socioeconomic groups. Strong skills in the area of math will serve Green Valley students throughout their academic and professional endeavors. Educational leaders across the country may learn from the evaluation of the PD in this study, and may model their district PD after Green Valley. The impact of increased CCSS math training for teachers throughout the nation has the

potential to minimize the achievement gap in mathematics and increase college readiness in students across the United States.

Implications, Applications, and Directions for Future Research

In communicating with site administrators and math coaches serving 11 elementary sites, I learned more about the instructional practices of teachers in my district than I could have ever imagined. As a site assistant principal, I routinely conducted formal and informal observations of math lessons, but had no frame of reference due to my lack of exposure to other schools. In reviewing questionnaire data and conducting interviews with instructional leaders, I learned that the district PD model did result in an observable widespread shift in the approach to teaching mathematics. I was surprised by the consistency in responses due to the reality that the participants' schools were often quite different in their student populations and overall demographics. Conducting the program evaluation showed me that effective PD has the potential to impart sustained and meaningful change that can be immediately implemented in any school, regardless of whether the students served are primarily from low socio-economic backgrounds, learning English as a second language, or live in affluent neighborhoods with two college-educated parents. The research-based best practices acquired through ongoing professional growth opportunities, including systematic follow-up and coaching support, were appropriate for every teacher, in every classroom. Regardless of their backgrounds or history with mathematics, a broad range of learners found success with the new math strategies due to the teacher expectations that students would become active learners, working collaboratively with peers to develop their own meaning and understanding of

essential concepts. Core standards in math offer every student the opportunity to become leaders, and acknowledge and appreciate failure as an essential part of the learning process.

The insights I acquired throughout the development of my project study are valuable considerations for creation of future professional development. The launch of CCSS necessitates every district develop a plan for effective implementation and training of staff. As early adopters of the new standards, Green Valley was able to introduce one core subject area at a time, choosing to focus primarily on mathematics during the 2013-2014 school year. Teachers in Green Valley are sufficiently prepared for the official adoption of the CCSS in the 2014-2015 academic year, due to the intensive and sustained professional growth opportunities provided to every elementary teacher within the district. Recommendations for improvement can be applied not only to future math PD, but to Core trainings in the areas of writing and reading occurring in the upcoming year. This project can benefit researchers developing CCSS teaching studies by allowing the opportunity to examine the impact of the Green Valley PD series on math teaching practices. Due to the lack of current research addressing the educational impact of the new standards in practice, and the accompanying shifts in instruction, my study addresses a gap in literature. District officials nationwide may choose to use this project as a foundation for their own teacher professional development platform, due to evidence of the program's success.

Future research should address the teaching requirements to ensure the Core standards are implemented effectively and with fidelity, as well as most effective

methods of enacting teacher PD to address these requirements. Longitudinal studies should be conducted to measure the lasting impact of district training on classroom teaching practices, and the types of follow-up support needed to sustain the desired changes and to encourage teachers to "go deeper" in their practice. Future studies should focus not only the teaching elements addressed through PD, but on the subsequent impact on student learning. It is only is analyzing student data, that the true value of the training and effectiveness of the instructional practices can be measured.

Conclusion

Throughout my journey in completing my doctoral program and project study I have evolved personally, professionally, and academically. I developed the ability to think critically, analyze a plethora of sources, and interpret data to give it meaning. I learned to execute scholarly writing, and collaborate with my team of advisors to create the best possible product. Through my research, I acquired new knowledge that enabled me to grow as a practitioner and a leader in the field of education. I have become more attuned to the importance of enacting social change within my own community and the world at large. I have challenged myself in ways I never though imaginable, and accomplished lifelong goals that will inspire me to continue to grow. In short, I am completing this study a different individual than when I began to craft my problem statement. I am wiser, more competent, and more determined than I have ever been.

My project has several possibilities for future study and research. The topic, Common Core professional development, has not yet been studied on broad level, and this study fills a gap in literature regarding one of the hottest topics in public education to

date. My project is current, relevant, and important. Teacher professional development continues to baffle district leaders, and there has much debate about the most effective means to deliver high-quality, low-cost training to educators. The Green Valley District took a risk in enacting large-scale PD for 500 teachers simultaneously, but the risk was worth the reward. Teachers have relinquished their prescribed math manuals and rote algorithms, and are teaching students to actually think. It is my goal that leaders in the local district, as well as districts across the nation, will examine the successful elements of this program, as well as consider the areas for improvement. When teachers are given what they need to be successful for the long-term, the possibilities are endless.

The ideas that evolved organically as a result of this project have the capacity to impart social change both at the local and national levels. The key to unlocking student potential, and to ensuring college and career readiness for every child, lies in the ability to provide purposeful, engaging, and meaningful professional development for teachers. In addition to effective PD, teachers need to be given ongoing support, resources, and collaboration opportunities to ensure lasting and successful changes in practice. The needs of students are evolving and transforming every year, as we move deeper into the 21st Century. Teachers must be given the knowledge and tools they need to ensure all learners are prepared to face the demands of both college and career in an increasingly competitive world.

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Appendix A: Program Evaluation Report

Evaluation Report: Green Valley School District Common Core Professional Development Series 2013-2014

Description of the Program

The Green Valley School District addressed the problem of lack of teacher preparation in implementation and instruction of the Common Core State Standards in mathematics. District leaders designed and implemented a math professional development series, built upon the framework of Vygotsky's social constructivist learning theory, across 11 elementary schools. District officials embrace the notion that twenty-first century learners must be able to analyze, problem-solve, communicate, and collaborate with flexibility and autonomy (Wagner, 2008), and trained teachers in fostering these strategies through web conferencing, videotaped lessons, student performance task analysis, demonstration classrooms, instructional coaching, and structured professional learning communities. The district utilized Safari Montage interactive web conferencing tools to sync all 500 elementary teachers in the district, offering opportunities for virtual instruction-related discussions across 11 sites, while simultaneously broadcasting consistent information, clear expectations, and common messages across the district. The focus of the sessions included clarification of both short and long-term goals in mathematics instruction across the district. The long term goal for the math professional development series was that teachers would provide mathematics instruction that was balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards.

Program Timeline and Expectations

The Green Valley professional learning series was launched in August 2012, with a district-wide webcast introducing the new standards and the proposed three-year implementation plan. The first year teachers attended interactive web conferences on a bimonthly basis, as an introduction to the Common Core standards, and the shift from California content standards. Teachers were introduced to conceptual addition and subtraction strategies, and asked to try them in their classrooms. The expectation during the 2012-2013 school year was that teachers would be familiar with the standards for their grade level, and would be willing to take risks in trying new strategies. The teachers attempted their first math performance task as a preview of what their students would experience the following year following the official district launch of the CCSS. Teachers were provided with rationale as to why the shift in mathematics education was necessary, and what the instructional shifts might look like for them. Figure 1 depicts the Core standards transition plan distributed to all Green Valley Elementary teachers in Fall 2012. Figure 2 depicts the district message as to how the district would bridge the gap between current student learning expectations and 21st Century learner requirements. Figure 3 illustrates the rationale for adoption of the CCSS, provided to all district teachers during PD.

Elementary Common Core State Standards Transition Plan

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep— CCSS (2010, p.5)

Participants	90 PLC Teacher Leaders representing K-5 and Special Education from all 11 elementary sites.			
All Leaders	Rigorous Curriculum Design Model by Larry Ainsworth			
K-12 Articulation	Three teachers per grade level K-12 meet to select Essential Standards in ELA and Math			
90 PLC Teacher Leaders' Teams	ELA Leaders	Math Leaders	Writing Leaders	Kindergarten Leaders
2012-2013	• Teachers will develop interdisciplinary units combining the CCSS ELA and SS/Science standards • Units will follow the Rigorous Curriculum model including standards, pre, interim, and performance-based assessments, and engaging instruction ideas. • A timeline for the units and assessments will be developed.	• Teachers will develop math units following follow the Rigorous Curriculum model including standards, pre, interim, and performance-based assessments, and engaging instruction ideas. • A timeline for the units and assessments will be developed.	• Teachers will develop K-5 rubrics for the three types of writing: Informational, Opinion, and Narrative • Teachers will determine anchor papers to accompany rubrics. • The writing rubrics will be used in the ELA performance-based assessments.	• Teachers will complete ELA interdisciplinary units and assessments • Teachers will develop math units and assessments • Teachers will revise report cards • Teachers will pilot units and common assessments
2013-2014		Implement math units	Implement writing	Full Implementation of CCSS
2014-2015	Implement ELA Units			

Spring of 2015 – New National Test

Figure 1: *Green Valley District Elementary Core standards transition plan*

Figure 2: *District practices that bridge to the Core Standards*

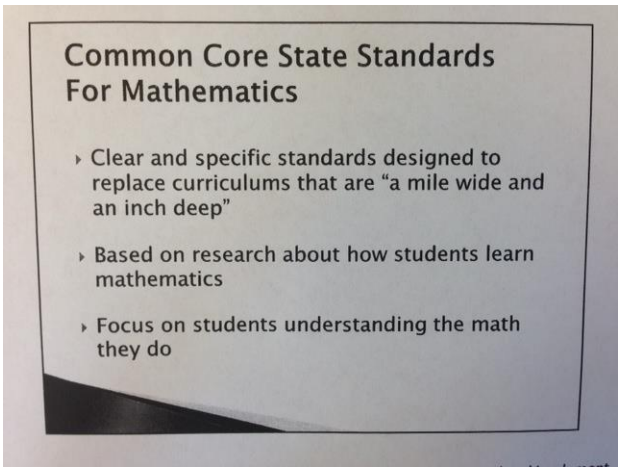
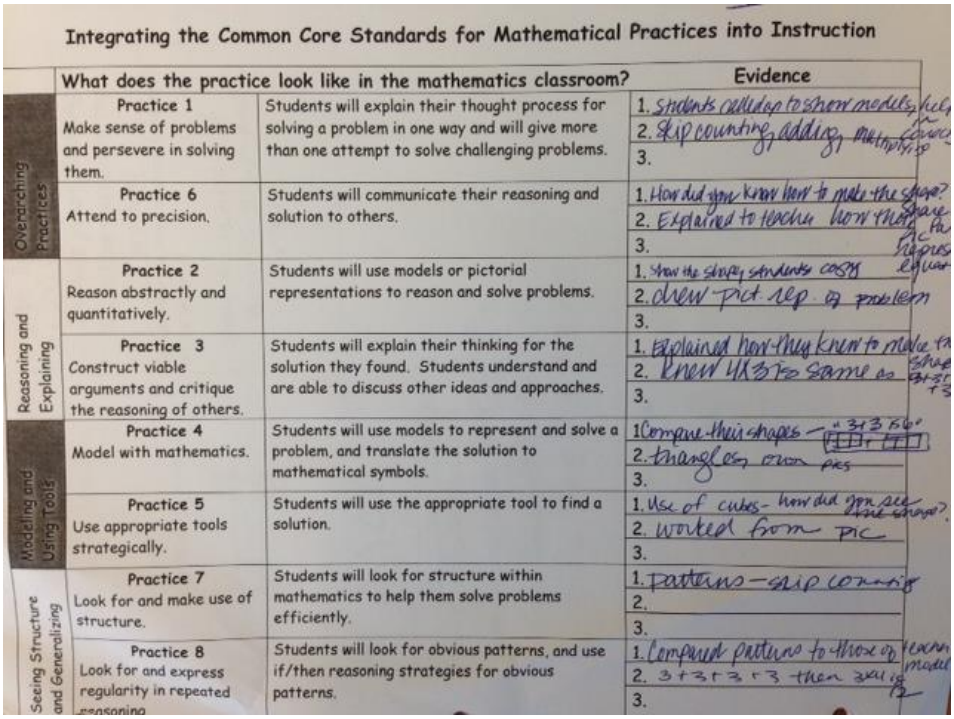


Figure 3: *Rationale for adoption of Common Core Standards provided to district teachers*

This evaluation focuses on the Green Valley School District Common Core math professional development series for the 2013-2014 school year. Over the course of this year, teachers participated in monthly interactive web conferences, three live coaching and classroom demonstration sessions with the new math instructional coaches, known as TOSAs (Teachers on Special Assignment), and two grade level facilitated planning days with the TOSAs. All teachers also attended a seminar in January 2014 presented by Stanford University professor Jo Boaler, addressing the topic of mathematics growth mindset. Grade level team leaders attended bimonthly training at the district office to learn the protocol for analysis of student work, and to help to develop grade level pre-tests, post-tests, units of study, and performance tasks aligned to Common Core. The expectation during the 2013-2014 school year was that teachers would use the district-created units of study and assessments, supplemented by the *Math Investigations* curriculum. Teachers were introduced to additional math strategies, and were expected to incorporate the methodology in their classrooms. Each teacher was expected to integrate

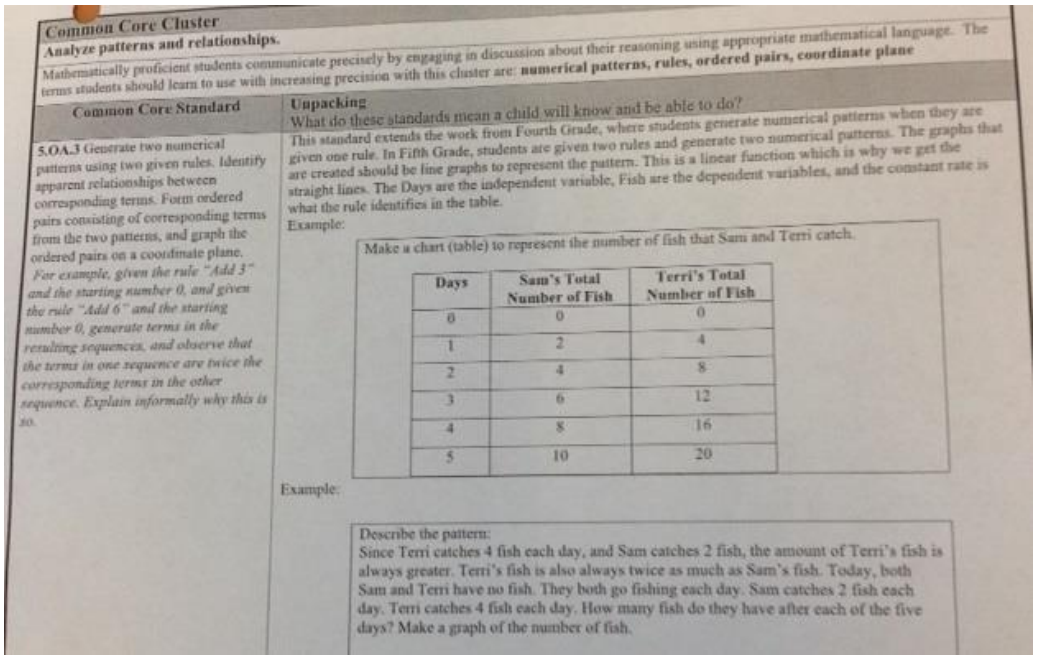
the following tools during instruction: number talks, K-W-C charts, number string problems, and talk moves. All of these strategies focused on teaching for understanding using problem-solving to acquire skills through math discourse, productive group work, and teacher facilitation of learning through real-world scenarios. Figures 4-5 depict a sample of the tools teachers were given during PD sessions to enable them to effectively transition from California math content standards to Common Core math standards. The 2014-2015 school year will focus on continued refinement of teaching skills, focusing on the principles of teaching for understanding.



Integrating the Common Core Standards for Mathematical Practices into Instruction

	What does the practice look like in the mathematics classroom?		Evidence
Overarching Practices	Practice 1 Make sense of problems and persevere in solving them.	Students will explain their thought process for solving a problem in one way and will give more than one attempt to solve challenging problems.	1. students collaborate to show models 2. skip counting, adding 3.
	Practice 6 Attend to precision.	Students will communicate their reasoning and solution to others.	1. How did you know how to make the shape? 2. Explained to teacher how they 3.
Reasoning and Explaining	Practice 2 Reason abstractly and quantitatively.	Students will use models or pictorial representations to reason and solve problems.	1. How the strategy students used 2. drew pict rep of problem 3.
	Practice 3 Construct viable arguments and critique the reasoning of others.	Students will explain their thinking for the solution they found. Students understand and are able to discuss other ideas and approaches.	1. Explained how they knew to make 2. Knew 4x3=3+3+3+3 same as 3.
Modeling and Using Tools	Practice 4 Model with mathematics.	Students will use models to represent and solve a problem, and translate the solution to mathematical symbols.	1. Compare their shapes – "3+3 60° 2. triangles own pics 3.
	Practice 5 Use appropriate tools strategically.	Students will use the appropriate tool to find a solution.	1. Use of cubes- how did you see the shape? 2. worked from pic 3.
Seeing Structure and Generalizing	Practice 7 Look for and make use of structure.	Students will look for structure within mathematics to help them solve problems efficiently.	1. patterns – skip counting 2. 3.
	Practice 8 Look for and express regularity in repeated reasoning.	Students will look for obvious patterns, and use if/then reasoning strategies for obvious patterns.	1. Compared patterns to those of 2. 3+3+3+3 then 3x4 is 3.

Figure 4: *Teacher worksheet depicting strategies for integration of Common Core mathematical practice standards*



Common Core Cluster

Analyze patterns and relationships.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: **numerical patterns, rules, ordered pairs, coordinate plane**

Common Core Standard	Unpacking
5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	What do these standards mean a child will know and be able to do? This standard extends the work from Fourth Grade, where students generate numerical patterns when they are given one rule. In Fifth Grade, students are given two rules and generate two numerical patterns. The graphs that are created should be line graphs to represent the pattern. This is a linear function which is why we get the straight lines. The Days are the independent variable, Fish are the dependent variables, and the constant rate is what the rule identifies in the table. Example: Make a chart (table) to represent the number of fish that Sam and Terri catch.

Days	Sam's Total Number of Fish	Terri's Total Number of Fish
0	0	0
1	2	4
2	4	8
3	6	12
4	8	16
5	10	20

Example:

Describe the pattern:
Since Terri catches 4 fish each day, and Sam catches 2 fish, the amount of Terri's fish is always greater. Terri's fish is also always twice as much as Sam's fish. Today, both Sam and Terri have no fish. They both go fishing each day. Sam catches 2 fish each day. Terri catches 4 fish each day. How many fish do they have after each of the five days? Make a graph of the number of fish.

Figure 5: *Sample resource for unpacking California content standard to align with CCSS*

Program Goals and Objectives

The overarching program goal, as stated by the Green Valley School District is that teachers will provide mathematics instruction that is balanced in conceptual and procedural learning, using the Common Core standards for mathematical practice and math content standards. The objectives for the 2013-2014 professional learning components were as follows:

1) Teachers would utilize number talks, talk moves, number string problems, and K-W-C charts to teach problem-centered mathematics in their classrooms.
2) Teachers would engage in collaborative inquiry during professional development sessions to solve problems using a variety of strategies, then replicate this methodology in their classrooms.

3) Teachers would utilize analysis of student work protocols to determine student misunderstandings and understandings with grade level teams in order to drive classroom instruction.
4) Teachers would shift from stand-and-deliver, teacher-led lessons to teacher-facilitated, student-centered lessons.

Description of the Evaluation

Using a program evaluation logic model, I examined the design and implementation of the CCSS math professional development series. The research questions driving the evaluation included:

1) What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development?
2) What are the differences in observed math instructional practices before and after the district CCSS professional development series?

The logic model components included in the program evaluation encompass the activities/events associated with the district PD, the outputs of the activities, and the intermediate outcomes (Spaulding, 2008). The activities section of the evaluation determined whether the events associated with the training served their intended purpose, and met the defined goals and objectives of the district. The outputs of the activities documented the changes in teacher beliefs and opinions that occurred as a result of participation in the math PD activities. Finally, the intermediate outcomes identified the changes in teacher practice and behaviors that occurred as a result of participation in the

district-wide professional learning opportunities. The end outcome will not be included at this time, as the final results will take four to six years to emerge following the math training series (Spaulding, 2008). This evaluation is formative in nature, in that teacher Common Core PD is ongoing.

The state superintendent published quality professional learning standards to promote quality teacher development and learning. The seven interdependent standards include: data, content, and pedagogy, equity, design and structure, collaboration and shared accountability, resources, and alignment and coherence (California Department of Education, 2013). My program evaluation determined whether the Green Valley PD adhered to the professional learning standards when training teachers in new math practices.

Evaluation Rationale

Numerous policy reports and some laws require professional development to include an evaluation of whether it was effective in meeting the needs of teachers (National Institute for Effective Teaching, 2012). Despite the widespread emphasis on teacher professional learning opportunities as a critical component of educational reform efforts, educators have minimal information to contribute to the quality assessment or determination of impact of PD on teaching and learning (Haslam, 2010). The purpose of my evaluation and corresponding evaluation research is to determine the value of the district PD in meeting the needs of the teacher-learners (Cellante & Donne, 2013).

This report serves as an evaluation of the Common Core math PD in relation to the administrators' and instructional coaches' perceived impact on teaching practices. Lodico, Spaulding, and Voegtle (2010) state program evaluation is used to determine whether or not a program is actually improving teaching practices. Evaluations are tools for key stakeholders to use when continuing and making changes to existing programs, or deciding to eliminate programs, based upon findings. This formative program evaluation includes insights as to the greatest challenges and successes associated with launching a district-wide PD series of this magnitude, and will offer recommendations to drive improvements for upcoming additional CCSS implementation initiatives.

This document describes, based on the perceptions of instructional leaders, how the CCSS professional development transformed teacher practices in mathematics instruction, as well as attitudes and beliefs pertaining to teaching the new math practice and math content standards. Areas of perceived weakness are addressed in order to provide district stakeholders with the tools to make informed planning decisions designed to further improve teacher training and support related to the new practice and content standards. Reforms in this area must seek to further elevate teaching, learning, and equity through increasing the cohesion and coherence of the education system (Kornhaber, Griffith, & Tyler, 2014). Success in preparing teachers for CCSS instruction will generate equality among all student groups through provision of intangible resources, including consistent standards and expectations, as well as opportunities for learning (Kornhabler et al., 2014).

The evaluation has the capacity to drive future teacher training and educational reform efforts by ensuring the observed teaching practices following PD implementation enacted a paradigmatic shift in math instruction. Teachers were expected to align classroom practices with the new math practice and math content standards, resulting in deeper conceptual understanding as well as increasing the communication, collaboration, problem-solving, creativity, and critical thinking components of math lessons and corresponding activities. The insights and observations of district site principals, assistant principals, and instructional coaches provided crucial information pertaining to the successes and shortcomings of the Common Core math implementation in transforming teaching. Recommendations for improvement will be offered to district stakeholders based upon the feedback of the educational leaders witnessing CCSS math teaching in action on a regular basis across eleven elementary sites.

Evaluation Goals

The goal of the report is to provide an analysis, through program evaluation, of the impact of the district-wide, multi-faceted professional development series designed to prepare teachers to effectively teach the Common Core math practice and math content standards in elementary classrooms. To date, much of the professional development implemented in California schools has been poorly planned and implemented, resulting in insufficient outcomes (California Department of Education, 2013). Few PD activities have addressed systematic goals and teacher practice, resulting in lasting and meaningful transformation of instruction (California Department of Education). Spaulding (2008) states program evaluation is appropriate when the desired outcome through dissemination

of results to a particular organization, pertaining to a specific program, is the intent of enacting swift change. This evaluation report, addressed to district leaders, has the potential to result in immediate changes in development of future teacher PD.

Teachers in Green Valley had not been exposed to strategies for inquiry-based learning in the area of mathematics, essential for successful implementation of the new math practice and college and career readiness standards (Green Valley School District Director of Elementary Curriculum, personal communication, August 20, 2013). Teachers needed specific training in structuring math lessons around problem-solving situations and effective use of concrete and representational manipulatives (Green & Piel, 2012). In order to address the problem of unskilled CCSS math teachers, the Green Valley School District turned to professional development to enhance teacher competencies while creating conditions for successful instruction (U.S. Department of Education, 2013, District CCSS Workshop, 2013). Well-designed, research-based PD has the potential to elevate teacher practice when it considers educator needs, focuses on pedagogy and content, ensures equitable outcomes, is job-embedded, intensive, and continuous, emphasizes collaboration and shared accountability, provides relevant resources, and is standards-aligned (California Department of Education, 2013). The district created a three-year CCSS professional development plan that includes creating new curriculum and providing professional development for every teacher in Green Valley (District CCSS Workshop, 2013).

The goals for the evaluation were to analyze the impact of the professional development series addressing Common Core math implementation and instruction on

classroom teaching practices. The question that drove the evaluation was: What was the impact of CCSS math professional development on teaching? The research questions included: What teaching practices have site administrators and instructional coaches observed in mathematics following the Common Core professional development? What are the differences in observed math instructional practices before and after the district CCSS professional development series?

Evaluation Data and Participants

Through questionnaires, interviews, document analysis, and observation, I examined how educational leaders, including site principals, assistant principals, and instructional coaches perceived the impact of district-wide Common Core math professional development on teaching practices. The sample for this study consisted of 20 instructional leaders employed by the Green Valley School District. Twenty individuals completed an online questionnaire, while five participants completed both the online questionnaire and one-to-one interviews. The individuals completing the questionnaire were employed in the following positions: 45% were principals, 30% were principals, and 25% were math instructional coaches, known within the district as Teachers on Special Assignment (TOSAs). Four of the five participants interviewed were employed as site principals, while one was employed as a site assistant principal. Post-hoc observations of three recorded webinars addressing various aspects of CCSS math were conducted, in addition to document and audiovisual analysis of supporting materials (PowerPoint slides, strategy posters, videotaped math lessons) presented at the interactive web conferences.

In the field of education, interviewing is the most common form of data collection (Merriam, 2009). The data for this project consisted of one-to-one interviews with five selected site administrators, supplemented with multiple choice and open-ended participant questionnaires for 20 designated site instructional leaders, and post-hoc observations of three district math web conferences. One key dimension of program evaluation entails the assessment of learner acquisition in order to accurately determine whether the learning objectives of the training were addressed and met (McNeil, 2011). The participants in the study, site administrators and instructional coaches, were able to routinely visit classrooms during math instruction and report on the teacher practices and behaviors they observed. This group of instructional leaders also offered a unique perspective in that they were able to report on particular successes and challenges at their sites in response to the launch of CCSS, to further improve future PD in this area.

Educational programs can be evaluated via quantitative data, such as student test scores, or qualitative data, such as stakeholder perceptions regarding program strengths and weaknesses (Young-Lyun, 2011). In this instance, I conducted a micro level, qualitative program evaluation to gather information on the impact and overall effectiveness of math PD within the local school district. This method is useful in assisting stakeholders to make decisions regarding not only the quality of a teacher-training program, but in holding the architects of such programs responsible for the learning of educators in attendance (Schaffer, 2014). Although the ultimate goal of educator professional learning is to improve levels of student learning and achievement,

the more immediate goal is enhanced knowledge, expanded skillsets, and improved practice of teachers (Haslam, 2010).

The effectiveness of the Green Valley CCSS math professional development will ultimately be measured by a collective decision made by the district leadership team (Young-Lyun, 2011). Spaulding (2008) states schools must regularly evaluate educational practice and programs in order to grasp their ultimate worth and determine areas of reinforcement and refinement. Numerous current approaches in PD evaluation entail the involvement of staff/participants, as opposed to relying on external evaluators with no personal connection to the learning community (Walker, Clancy, & Cheng, 2013). The inclusion of staff members in determining whether a program has met its intended goals leads to meaningful and practical recommendations for changes that typically include a personalized action plan as to how to carry out those changes within the local setting (Walker et al.) In conducting the evaluation I focused on the perceptions of site level administrators and instructional coaches in order to thoroughly examine the observed impact of the PD series on teaching practices across district elementary schools, as seen through their eyes.

Background Information: District Instructional and Attitudinal Trends in Mathematics Prior to Program Implementation

Prior to the launch of the Green Valley PD series math instruction was observed to be primarily teacher-led, using the math manual. The typical instructional format encompassed teachers instructing skills in isolation through a modeling-guided practice-independent practice model. Students were taught specific procedures and algorithms,

practiced those skills using practice problems, and were assessed on computational skills. Problem-solving occurred at the end of lessons, if at all. The launch of the new standards required a radical shift in instructional methodology. The top two descriptors addressing teacher attitudes towards CCSS math were overwhelmed and apprehensive. The district PD sought to provide teachers with all of the necessary tools and strategies to successfully implement and effectively teach the new standards.

Figure 6: *Teacher Attitudes Prior to District PD*

Observed Activities Addressing Common Core Professional Development

Three 60-90 minute post-hoc observations of recorded district-wide Common Core math web conferences were conducted to support the data obtained through questionnaires and interviews. The web conferences occurred at three different points throughout the 2013-2014 school year: August, January, and March to depict the progression of the professional development series. I summarized the content of the web conferences in order to provide an overview of the trainings attended by 500 elementary teachers district-wide.

The first CCSS math web conference of the year occurred in August. The context of this session was a welcome back session for 2013-2014 school year. District leaders provided an explanation of timelines, and district roll-out plan for Common Core Standards, as well as introduction to supports: TOSAs (instructional coaches). Teachers were given *Investigations* curriculum, and teacher-created units of study in addition to

pre/post-tests, and performance tasks. Teachers were led through contents of *Investigations* curriculum: including assessments, Common-Core alignment, and how to use *Investigations* as a resource to support conceptual knowledge in mathematics.

The focus of this session was to covey to teachers that district was in a state of imbalance, instability, uncertainty, and flux. Common message across the district was that the 2013-2014 year would be a year to take risks, try new lessons, stretch lessons, communicate, collaborate, think critically, pursue challenge, reflect, and revise. The Director of Elementary Curriculum provided an introduction to the math instructional coaches and their responsibilities and roles: developing Common Core math lessons, guided planning with teams, modeling lessons, professional development, researching best practices, and developing resources for teachers.

Participants listened to the overview and timeline plan broadcast via webcast. Teachers were guided through use of *Investigations* materials by a consultant, then given some time to "explore" the materials on their own. Teachers were given the math unit "suggested progression and resources." Teachers had the opportunity to ask questions prior to being a copy of each grade level's "Focus for Mathematics" to read silently before they were given time to collaborate with their grade level teams.

Participants had the opportunity to ask questions via the chat feature of the web conference. The Director of Elementary Curriculum remotely responded to each question upon receipt. Questions included the following:

Will we be given additional resources other than Investigations?

Can we use our old math materials?

Will we be given days for planning?

How will have enough time to grade each individual performance task?

How strict are the district timelines?

How do we handle grades on the report cards? Will they align to these new assessments?

Based upon my observations, teachers seemed overwhelmed by the new units and the timelines. They seemed concerned about the assessments and performance tasks, as they were multi-faceted and looked different from the previous assessments. Teachers appeared to collaborate within their teams to determine next steps for launching the units at the beginning of the school year. The technology cut in and out quite a bit, which frustrated the participants.

The second professional development session I observed occurred in January 2014 and addressed the topic of providing balanced instruction in mathematics: conceptual understanding, application, flexibility, and procedural fluency. During this session teachers watched videos of math lessons in district classrooms which included math talks, and K-W-C (problem solving graphic organizer) charts taught in math classrooms. Teachers were given K-W-C charts to complete and sample problems to solve collaboratively. Teachers were asked to reflect upon demonstration lessons and were given discussion questions. Teachers then learned how to complete a graphic organizer addressing conceptual understanding, application, flexibility, and procedural fluency by using math problem/numerical expression, picture/visual model, and computation/procedure. They were directed to explain why their answers made sense. Teachers solved additional sample problems, then collaborated and reflected. Goals were

broadcast by Director of Elementary Curriculum and included use of Number Talks and K-W-C strategies. Figures 7-9 illustrate sample resources distributed to teachers to teachers to practice and reinforce the new learning.

Figure 7: *Practice problems completed by teachers to explain reasoning*

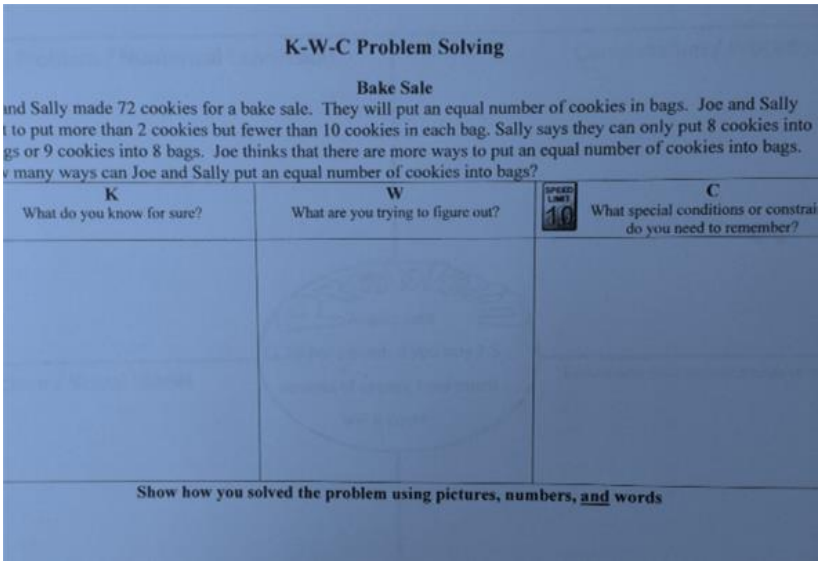


Figure 8: *K-W-C Problem-Solving Chart*

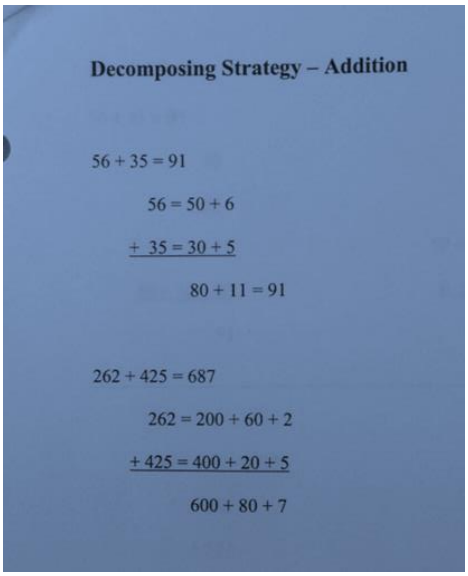


Figure 9: *Addition decomposing strategy chart*

The focus of the session included clarification of both short and long-term goals in mathematics instruction across the district. The long term objective shared was that teachers would provide mathematics instruction that was balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards. The stated objectives of the day's PD Session were as follows: We [would] view lessons incorporating the KWC strategy and determine the teacher actions that helped the students comprehend math problems. Teachers [would] select components of the lessons to implement in their instruction.

During the course of the training participants listened to the objectives (long and short term) introduced by the Director of Elementary Education. Teachers then listened as the Director of Elementary Education shared reflections from last PD session led by Jo Boaler. Reflections included: 1) Students with growth mindset persist longer on problems, relish challenges, and learn from mistakes. 2) All students can achieve at the

highest levels of math 3) Math should never be associated with speed. What is important is to deeply understand things and their relationship to one another. 4) If we are serious about encouraging students to develop growth mindsets we need to provide open tasks that have the space within them for learning (low floor/high ceiling), not short tasks that students are meant to get right or wrong. 5) Each learning experience changes a student's ability.

Participant questions and feedback were captured by the interactive webinar dialogue/chat feature. Statements included the following: 1) The K-W-C charts have been successful in helping students to "wrap their arms around the problem" 2) Using K-W-C charts and number talks means slower pacing. It's tough to stay within the timelines when devoting an entire class period to one or two problems. 3) It's been challenging to find enough resources to teach math in this way 4) Timed tests are not recommended by Jo Boaler, but if students can't complete basic facts in timely manner, are they really fluent?

Overall, my observations of the session enabled me to witness teachers as learners. They were given problems to solve, but were able to utilize a number of strategies. I also noted that teachers were asked to collaborate with colleagues and explain their thinking. Teachers shared experiences regarding their ability to simulate students in the classroom, and were able to see strategies in action through videotaped demonstration lessons.

The final interactive web conference I observed occurred in March 2014. During this session, the Director of Elementary Curriculum provided overview of the PD,

including long-term objectives and the objective of the day's PD session. The Director of Elementary Curriculum stated new learning to be acquired via the day's PD session. Teachers were then directed to read Chapter 2 from *Classroom Discussions*, to learn the tools of classroom talk and talk moves. Teachers highlighted the purpose of each talk move, then watched videos of teachers using talk moves in the classroom. Teachers were give discussion time in small groups to identify connections of talk moves to Essential Elements of Instruction. Teachers were taught how to apply number talks to single problems and number strings, applying strategies to subsequent problems to identify patterns/relationships. Teachers watched a video of a number talk for 6 x7. Teachers were then asked to discuss the lesson they viewed, and were given questions to address. Teachers were asked to select a number string i.e. 49+8, 49+23, 49+37, 49+51 and discuss within their teams possible strategies and how they might record them. They were then asked to discuss what questions they could ask to help students make connections without directly teaching them the strategy.

Teachers viewed a second video of teachers using talk moves: revoicing, repeating, reasoning, adding on, and wait time, using a multiplication string for 4 X 24. To close the web conference, the Director of Elementary Curriculum restated the long-term objective for the district: Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning. The Director then shared that the district would spend two months piloting the *Dreambox* math software beginning the following month to supplement classroom instruction and activities. Participant questions and feedback were captured using the interactive chat feature of the wen conferencing software, Safari

Montage. Participants questions included the following: Will we be given more to plan with our team throughout the school year via release time? Will we be able to observe the TOSAs (instructional coaches) enacting these moves in the classroom? Based on my observations, teachers were engaged throughout the session, and discussed how they would implement these strategies in their own classrooms. The teachers seemed less apprehensive about trying the new strategies, but still discussed the need for resources and planning time.

Observation data pertaining to the district-wide PD was analyzed, categorized, and coded to determine emergent themes in regards to expected shifts in instructional practices at the district level, following implementation of the Common Core math professional develop series. The following themes pertaining to CCSS teaching were uncovered:

A) Teachers are encouraged to take risks, experiment with new lessons, teach outside of their comfort zones.

B) Teachers no longer have a math manual to rely upon. The *Investigations* text should be used as an instructional supplement. The district will provide units of study, pre/post-tests, and performance tasks for each unit.

C) Teachers are to use structured collaboration time to analyze student working, using the Analysis of Student Work Protocol.

D) Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards. Objective of PD Session

E) Teachers will assume facilitative roles in the classroom, incorporating strategies such as Talk Moves, Number Talks, and K-W-C charts to foster math discourse and student perseverance in problem solving

F) Teachers will deviate from showing students solely algorithms to solve problems, teaching several different strategies (branching, decomposing, open number lines, partial sums, etc.) to build mental flexibility with numbers and deepen conceptual understanding of mathematical concepts.

Observations of district math web conferences complemented my questionnaire and interview data in that I was able to view introduction and application of the specific math strategies, such as branching, decomposing, number talks, and K-W-C charts, referenced by participants. I was also able to view videos of demonstration classrooms across the district in order to compare the teacher behaviors reported by administrators and instructional coaches, to the practices executed in the videos. Overall, I found the data obtained through completion of observation s to support the trends and themes developed through analysis of questionnaires and interview transcripts. The web conferences met the identified goals and objectives conveyed at the outset of each session. Instructional leaders rated the effectiveness of the district math PD in preparing staff to teach to the Common Core standards. Respondents were asked to select one choice from the following options: highly effective, somewhat effective, neither effective nor ineffective, somewhat ineffective, and highly ineffective. 65% of participants rated the PD as "somewhat effective," while the remaining 35% selected "highly effective."

The next section of the evaluation, outputs of activities, will describe the changes in teachers' thinking, beliefs, and opinions (as reported by site instructional leaders) due participation in the CCSS math PD series.

Outputs of Activities

Based on data collected throughout the evaluation process, professional learning participants experienced changes in attitudes and perceptions pertaining to adoption of the CCSS and corresponding instructional strategies. Although administrators and instructional coaches reported continued feelings of their teachers being overwhelmed, the majority of participants displayed feelings of excitement. Data analysis conveyed that both positive and negative emotions were communicated following the launch of Common Core math.

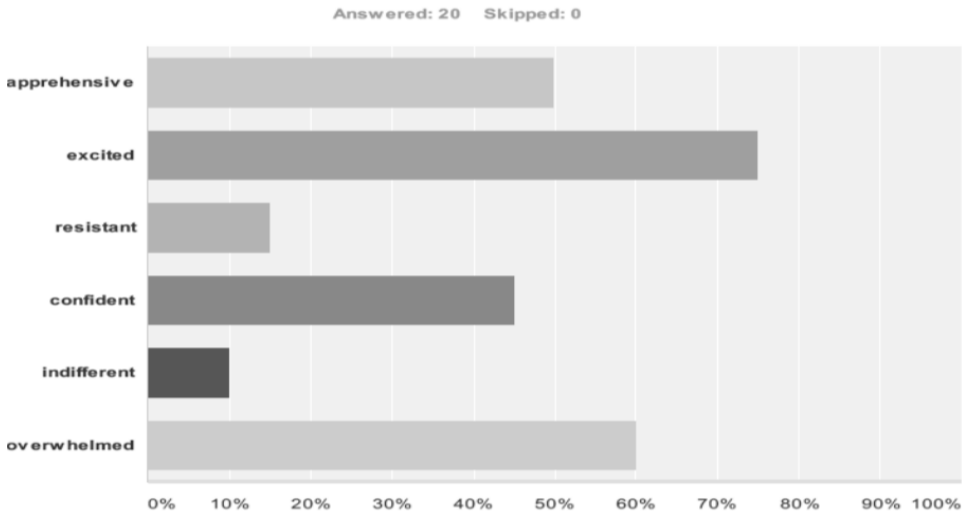


Figure 10: *Teacher Attitudes Following District PD*

Positive Emotions, Attitudes, and Opinions

Positive attitudes and behaviors included teachers' expressions of engagement, optimism and enthusiasm. Administrator responses were generally positive in nature when reporting their observations of teachers' responses to the district PD. Examples of insights included, "[They] loved them, loved them, loved them, because it showed them what to do. They were like fish out of water; they had no clue what to do." An additional leader shared:

> It's been really good. I walk out after web conferences, and walk classrooms, and the staff really has embraced the training. I typically see the new learning in the next couple of days going on in the classrooms. I think overall the web conferences have been positive and well received here in terms of at least those initial steps in trying to implement new learning.

Another observation was, "I think they are most successful when there's an immediate takeaway, where the teacher is like, 'That makes sense to me, I get it, I can do that." Feedback from teachers, as reported by administrators, was generally positive in nature. An additional administrator shared:

> They are doing what they see. So when learn how to do a number talk, or they learn a new strategy, or even the number strings, or the talk moves, I've already seen those things back in the classroom, so I think they're understanding that all of the staff development they have been getting is an expectation.

Reactions to the math instructional coaches (TOSAs) were also favorable, as reported by administrators. Participants observed overwhelming positive feedback to the

math coaches, who provided both real-time and videotaped demonstration lessons. Insights from administrators included:

> They love it. I've sat in on four or five sessions so far and it is beneficial, good, rich, deep discussions, and I think that's getting at a deeper level of instruction for the teachers than the webinars. I think the webinars are more like a surface, general kind of thing for everybody, but I think when the TOSAs come out, and they meet with them, it gets a little bit deeper."

Negative Emotions, Attitudes, and Opinions

Negative feedback and attitudes on the part of the teachers included observed expressions of frustration, and ill-preparedness. Although in the minority, there were some less favorable responses to the PD on the part of teachers shared by site administrators. Examples of such responses included, "As far as the professional development, I think the professional development gave teachers the big ideas, not necessarily what to do every day." Other participants reported teachers feeling frustrated by the lack of the lack of time to plan how to implement new strategies in their classrooms as a function of the PD, as well as a lack of resources to effectively carry out the new expectations in practice. Despite some negative feedback from teachers in regards to the effectiveness of the district PD series in preparing them to teach to Common Core math standards, the instructional leaders stated the majority of teachers viewed the support and trainings offered across all 11 elementary sites as impactful and beneficial.

The next section of the evaluation will describe the intermediate outcomes of the professional development series. The intermediate outcomes report on the changes in practice and behavior among teachers as a result of the new learning that took place.

Intermediate Outcomes

District Instructional Trends in Mathematics Following Program Implementation

Teacher practices following the implementation of the CCSS PD emphasized a more student-centered approach. The following figures depict a comparison of instructional focus before and after implementation of the Core training.

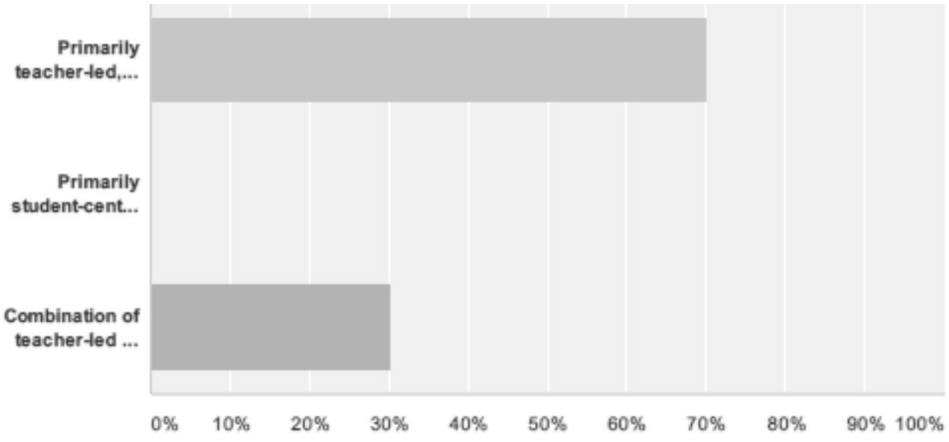


Figure 11*: Observed Overall Math Instruction Prior to CCSS Professional Development*

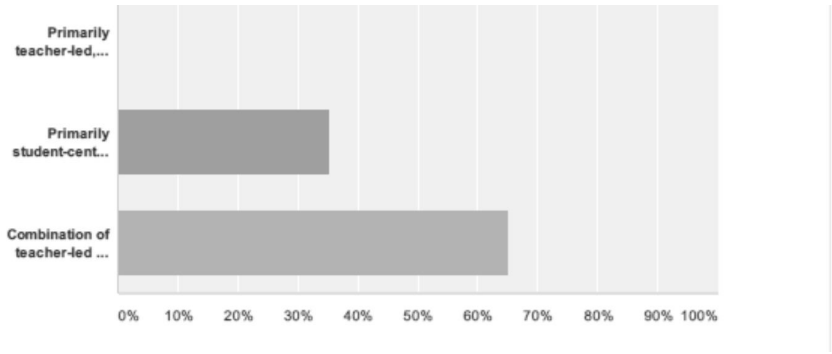


Figure 12*: Observed Overall Math Instruction Following CCSS Professional Development*

Based on participant responses regarding greatest changes in observed teaching practices following the district-wide CCSS professional development series, the following instructional shifts occurred:

1) Increase in discussion, collaboration, and math discourse
2) Students are asked to explain their reasoning and thinking in oral and written format
3) Increase in inquiry-based learning through use of math games and manipulatives
4) Increased emphasis on problem solving, using a variety of strategies
5) Greater focus on conceptual understanding versus mathematical procedures

Figures 13-17 depict examples of instructional tools used in the classroom to illustrate CCSS mathematical concepts and corresponding strategies.

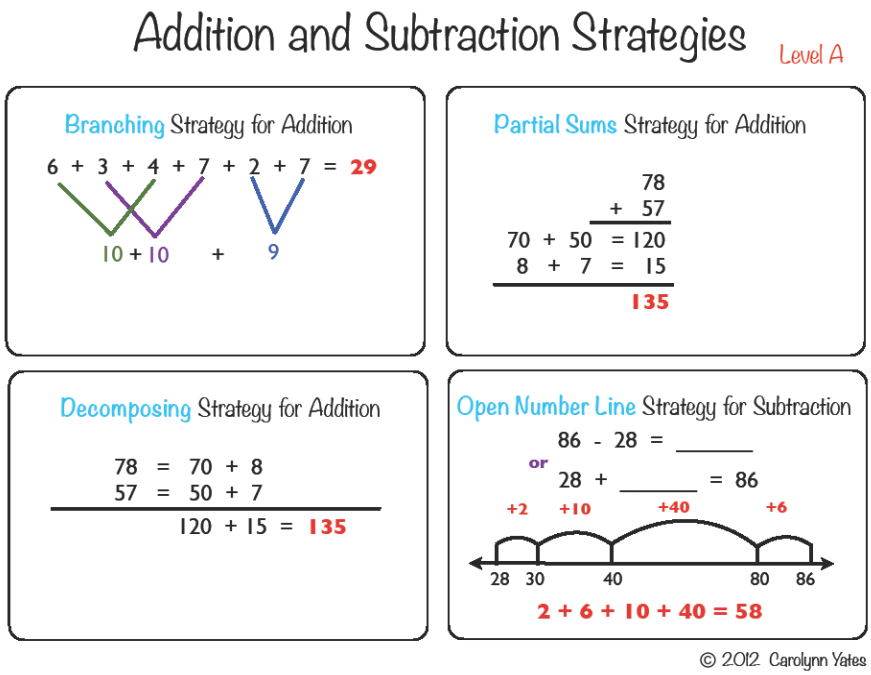


Figure 13: *Example of Primary Addition/Subtraction Teaching Tool Utilized After District PD*

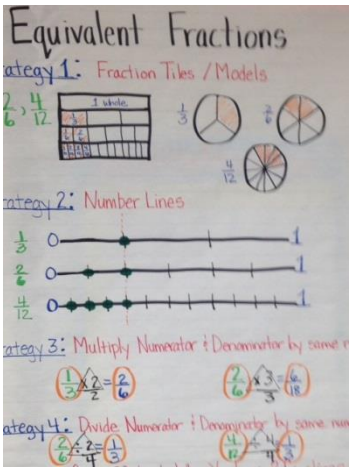


Figure 14: *Fraction Poster Utilized After District Math PD*

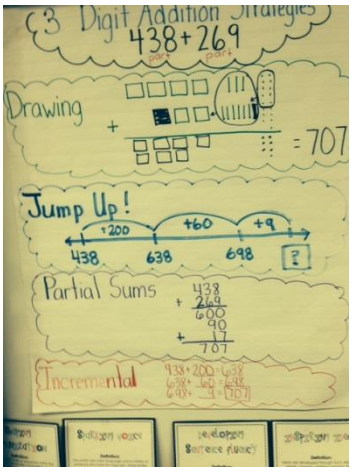


Figure 15:*Upper Grade Addition/Subtraction Strategy Poster Utilized After District Math PD*

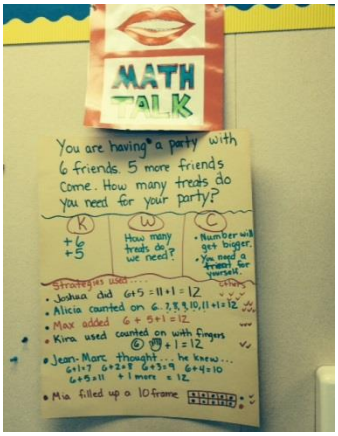


Figure 16: *Math Talk Poster Utilized After District Math PD*

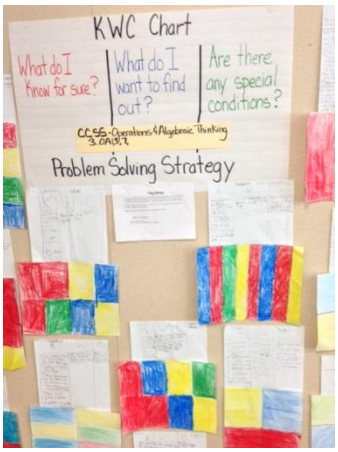


Figure 17: *K-W-C Chart Utilized After District PD*

In order to identify the true impact of the district PD on all aspects of math teaching practices, it was important to identify the greatest changes in instruction and teacher behavior. Common phrases, words, and messages among the administrators' responses addressing the greatest successes and impact associated with CCSS in math classrooms in relation to teaching were coded and categorized to unveil the following trends:

A) Teachers are more facilitative

B) Teachers ensure students are engaged in learning

C) Teachers are providing conceptual background information and rationale when teaching math

End Outcomes

End outcomes refer to the hard outcomes as a result of a program or initiative. This data, typically measured by student learning, requires four to six years to emerge. The Green Valley CCSS professional development series recently completed its second year of implementation. The official adoption of the Common Core math standards

occurred less than one year ago. The nationwide launch of the standards, and subsequent standardized testing measuring student proficiency will not occur until the 2014-2015 school year. As a result, the end outcomes of the program will not be included in this formative evaluation. It would be beneficial to conduct a follow-up evaluation within the next four years to measure the final outcomes of the PD.

Program Alignment to California Professional Learning Standards

Professional learning standards are an essential component of quality professional learning. The California Department of Education (2013) recommends all professional development evaluations examine seven standards to promote quality learning. The standards include data, content and pedagogy, equity, design and structure, collaboration and shared accountability, resources, and alignment and coherence (California Department of Education. The following chart describes the Green Valley School District Common Core math professional development series in relation to the California professional learning standards.

Standard	**Description of Standard**	**Did the Green Valley PD sufficiently address this element (Y/N)?**	**Evidence**
Data	Use of varied sources and information to guide design	Yes	Research-based practices employed, using reference materials such as Common Core framework, *Number Talks* (Parrish, 2008) and *Teaching*

			Student-Centered Mathematics (Van de Walle et al., 2014)
Content and Pedagogy	Enhances educators' expertise to increase the capacity for students to learn	Yes	Teachers-as-learners were exposed to constructivist and social learning principles to engage in collaborative inquiry and productive group work
Equity	Equitable access, opportunities, and outcomes for all students, addresses achievement gap	Yes	Every elementary teacher within the district was provided with the same training. Emphasis was on expectation that "all students can achieve at high levels," and that there is no fixed ability in math, intelligence is malleable (mindset). Teachers trained in creation of problems with multiple entry and exit points to accommodate a wide range of learners, promoting success for all with concepts.
Design and Structure	Evidence-based approaches used, emphasis on focused, sustained learning and improved practices	Yes	PD was on-going, teachers provided with specific objectives at the outset of each session, as well as clear expectations for transformation of practice using tools/strategies provided
Collaboration and Shared Accountability	Facilitates the development of shared purpose for learning and collective responsibility for achieving desired outcomes	Yes	Teachers worked in collaborative teams to analyze student work using given protocol, focus on student understanding/misunderstandings. Teams worked together to develop action plans and next steps to enhance student learning.
Resources	Dedicates resources that are adequate, accessible, appropriate for	Yes	Teachers provided with district-created units of study, pre/post tests, performance tasks, rubrics, video demonstrations, strategy posters, text resources for

	achievement of desired outcomes		professional development, personalized instructional coaching
Alignment and Coherence	Contributes to coherent system of educator learning and support to connect district, school priorities with state and federal requirements	Yes	Objective of PD was to prepare teachers for the launch of the Common Core State Standards in mathematics, a state and federal mandate.

Program Strengths

In order to gain a broad perspective regarding the shifts in math instruction following CCSS professional development, instructional leaders reported how they believed the district PD changed overall math teaching practices at their sites. Participants were asked to select from the following three choices: PD has not resulted in change in practice, PD has resulted in minimal change in practice, PD has resulted in significant change in practice. 80% of respondents selected "PD has resulted in significant change in practice," while the remaining 20% chose "PD has resulted in minimal change in practice." None of the respondents indicated that PD did not result in any change in practice.

In order to determine the specific elements of the PD responsible for the teachers' instructional changes, respondents shared the two elements of the PD that they believed were most essential in changing the math practices of their teachers. The participants were asked to select from the following options: district-wide PLC/web-conference,

demonstration classrooms (videos of teachers in practice and observations of coaches), common planning time, instructional resources, debrief/reflections with math coaches, and analysis of student work protocols. 80% of leaders selected "common planning time," 50% selected "demonstration classrooms," 50% chose "debrief/reflections with math coaches," 35% selected "district-wide PLC/web conferences," 20% chose "instructional resources," and 15% selected "analysis of student work protocols."

Teachers used the techniques acquired through social learning and constructivism, practiced via web conferences and district-wide virtual PLCs, in addition to the modeling and instructional supports offered by the TOSAs, to create learning environments grounded in problem-solving, math discourse, and reasoning. The overarching theme that emerged after evaluating the program involved a radical shift in teaching following the district PD and launch of the new standards. The program was most effective in affecting the following aspects of teaching: risk-taking, use of facilitative teaching tools, application of numerous problem-solving strategies, math discourse, release of standard algorithm , increase in high level math vocabulary, and increased use of math practices: explaining reasoning, persevering in problem-solving, and critiquing reasoning of others.

Program Weaknesses

Despite observed changes in practice overall, participants reported some challenges in incorporating CCSS-aligned strategies. These challenges may have been contributing factors to the nature of observed math instructional techniques following the PD. Instructional leaders were asked to share the greatest challenges in incorporating CCSS math practices at their sites. Based on participant responses, the following

represent the most prevalent challenges in incorporating Common Core math practices at elementary sites:

1) Time
2) Resources/curriculum
3) Mindset of teachers

Recommendations for Program Improvement

Recommendations for improvement in future CCSS PD include more time at the end of sessions for teachers to discuss, reflect, and create actions plans to generalize the new learning to their classrooms. Additional recommendations include funding an extra release day for teachers to engage in collaborative planning time facilitated by a math instructional coach. Another way to improve the retention and practice of strategies acquired through district trainings includes more informal coaching opportunities in classrooms across the elementary sites. The provision of specific and immediate feedback during real-time teaching has the potential to ensure teachers are confident in using questioning techniques to facilitate conceptual understanding. An additional area for improvement is in the provision of CCSS-aligned resources and developed lessons. Site administrators reported teachers devoting excessive amounts of time to searching for tools to use in the classroom in the absence of a cohesive, standard curriculum. Finally, due to the lack of time to gather teachers for additional PD, district leaders may wish to consider filming short refresher videos, showing practices in action using students and teachers, for teachers to access on their own time or during weekly structured teacher collaboration time in order to maintain professional growth in mathematics on an

ongoing, and more frequent basis. The benefits of using technology to enhance teacher training include the convenience of accessing information virtually anytime, anywhere. The more comfortable and competent teachers become with the new teaching practices aligned with CCSS, the greater the impact on their students' learning.

Summary

The Green Valley School District math professional development series was effective in preparing educators to launch the Common Core Standards in mathematics. The program met its defined goals and objectives, and sufficiently transformed teaching practices in elementary classrooms in order to prepare students to meet the demands associated with the rigorous new math content and practice standards. Additionally, the district PD met all of the requirements outlines by the California Department of Education (2013) to qualify as quality professional learning to promote optimal teacher development.

Appendix B: Interview Questions

1. What is your role at your elementary site (Principal, Assistant Principal)
2. Please share examples of activities you typically observed in both primary and upper grade elementary math lessons before the CCSS PD occurred.
3. Please share examples of observed math teaching strategies and methodologies in both primary and upper grade classrooms you observed before the implementation of the district CCSS PD.
4. Please share the PLC model at your site, specific to mathematics, prior to the CCSS PD. Describe the methods of communication and collaboration among both primary and upper grade teachers at the grade level and school-wide.
5. Based on your observations, how did teachers at your site respond to the Common Core math standards adoption at the beginning of the 2012-2013 and 2013-2014 academic years? How would you describe their attitudes and behaviors?
6. Based on your observations, how did teachers respond to the district wide bimonthly CCSS professional development series? How would you describe their attitudes and behaviors during the sessions?
7. What feedback did you receive from teachers in regards to the effectiveness of the CCSS PD in preparing them to launch Common Core math in their classrooms?
8. Following participation in on-going PD and math PLCs, what types of activities have you observed during classroom observations and walk-throughs of math lessons?

9. Following participation in on-going PD and math PLCs, what do you most typically observe the teacher doing during math instruction during observations and walk-throughs?
10. Have you observed any changes in teaching practices since the incorporation of the district PD math series? If so, please describe them and give specific examples.
11. Which grade levels appear to have undergone the greatest shift in teaching practices since the CCSS PD? Why do you think so?
12. Have you observed any changes in communication and collaboration among grade level and vertical teams since the incorporation of the district-wide math PLC? If so, please describe them.
13. Were there specific grade levels that you believe experienced a greater shift in communication and collaboration following the district PD? If so, why do you think this occurred?
14. What were the greatest benefits and greatest drawbacks of the district CCSS training in preparing teachers for Common Core math instruction?
15. How would describe teachers' responses to the demonstration classrooms and instructional coaching?
16. What has been the greatest impact on teaching practices since the district CCSS PD?
17. What have been the greatest successes associated with CCSS in your math classrooms in relation to teaching?

18. What have been the greatest challenges associated with CCSS in your math classrooms in relation to teaching?
19. What should other schools and districts take into account when designing and launching a CCSS math teacher professional development series?

Appendix C: Participant Questionnaire

1. What is your role in the district? (Choose One)

   __Principal __Assistant Principal __Instructional Coach

2. How many years have you served in this role? (Choose One)

   __Less than 1 __1-3 __4-6 __7-10 __11-15 __16-20 __21-25 __Over 25

3. How many observations and classroom walk-throughs involving math instruction do you conduct on an average monthly basis?

   __0-5 __6-10 __11-15 __16-20 __21-25 __26-30 __31-40 __over 40

4. How many district Professional Development Sessions (PD) pertaining to Common Core math, including web PLCs, cabinet meetings, and instructional coaching demos, have you attended?

   __0-3 __4-6 __7-10 __11-15 __16-20 __over 20

5. How would you describe observed overall math instruction in classrooms at your site(s) prior to the implementation of CCSS PD?

   __Primarily teacher-led using math manual __Primarily student-centered (Hands-on learning, inquiry-based, teacher as facilitator) __Combination of teacher-led and student centered learning

   Please add additional comments here:

6. How would you describe teachers' attitudes and beliefs towards CCSS math practices and expectations at the beginning of the 2013-2014 school year? (Check all that apply)

   __apprehensive __excited __resistant __confident __indifferent __overwhelmed

   Please elaborate or add additional comments here:

7. How would you describe teachers' attitudes and beliefs towards CCSS math practices and expectations after attending district-wide PD? (Check all that apply)

   __apprehensive __excited __resistant __confident __indifferent __overwhelmed

   Please elaborate or add additional comments here:

8. How would you rate the effectiveness of the district PD in preparing staff to teach to CCSS?

   __highly effective __somewhat effective __neither effective nor ineffective __somewhat ineffective __highly ineffective

   Please elaborate or add additional comments here:

9. How would you describe observed overall math instruction in classrooms at your site(s) FOLLOWING the implementation of CCSS PD?

__Primarily teacher-led using math manual __Primarily student-centered (Hands-on learning, inquiry-based, teacher as facilitator) __Combination of teacher-led and student centered learning

Please add additional comments here:

10. Please explain, based on your observations, the greatest changes in teaching practices following the implementation of the district-wide PD?

11. How do you believe the district PD has changed math teaching practices at your site?

__PD has not resulted in change in practice __PD has resulted in minimal change in practice __PD has resulted in significant change in practice

12. What elements of the PD have been most essential in changing the math practices of your teachers? (Please select two)

__district-wide PLC (web conferences) __demonstration classrooms (videos of teachers in practice and observations of coaches) __common planning time __instructional resources (Expressions, Investigations, etc) __debrief/reflections with math coaches
__analysis of student work protocols

13. What have been the greatest challenges in incorporating CCSS math practices at your site?

Thank you for your time and attention!

Appendix D:Green Valley School District CCSS Professional Development

Post-Hoc Observation Protocol (Recorded Webinars)

Date of Observation: _____

Date of Professional Development Session: _____

Duration of Observation: _____

Total Number of Attendees: _____

1. Session Context (Description of Session Observed):

_____
_____
_____
_____
_____
_____
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_____
_____
_____
_____
_____
_____

2. Session Focus (Intended Purpose of the Session Based Upon Objectives Stated):

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

3. Description of Instructional Resources Provided (Articles, Audiovisual, Sample Problems, etc):

4. Description of Participant Activities:

5. Participant Questions/Feedback (as captured by interactive webinar dialogue/chat feature):

6. Additional Information/Comments Regarding PD Session:

Appendix E: Letter to Potential Participants (Site Administrators)

Dear Elementary Site Administrators:

I am in the process of completing my Ed.D and would like to invite you to participate in my doctoral study entitled *A Case Study: The Impact of Common Core Professional Development on Teaching Practices*.

I am hoping that you all are willing to spend 10-15 minutes completing an online questionnaire (multiple choice and open-ended) via surveymonkey.com that will explore your perceptions and opinions regarding the teaching practices of your staff following the district-wide Common Core math professional development series. You were all selected as potential participants due to your instructional leadership skills, knowledge, and expertise in the areas of Common Core math and lesson analysis.

As explained in the attached Consent Form, your responses are purely opinion-based, and both your identity and the identity of the district will be kept confidential. The questionnaire is online to allow for confidentiality, and I will not be able to match the responses to the participant. The link to the questionnaire can be found on the attached consent form. By completing the questionnaire, you are acknowledging that you read and understand the consent form.

I am also seeking site administrators to spend 30-60 minutes participating in a face-to-face or telephone interview that will explore your perceptions and opinions regarding the teaching practices of your staff following the district-wide Common Core math professional development series. As explained in the attached Consent Form, your responses are purely opinion-based, and both your identity and the identity of the district will be kept confidential. You may skip any questions you feel are too personal, and may discontinue to interview at any time. Please carefully review the consent form and reply *"I Consent"* to this e-mail if you are willing to be interviewed for my study. The first five prospective participants to return the consent form will be selected for the interviews.

A narrative analysis will be provided to all site leaders at the conclusion of the study, highlighting the key findings. I hope to provide a rich, holistic description of the impact of CCSS professional development, based on the cumulative responses from all district elementary sites.

Thank you so much for your support. I am grateful to be part of such a collaborative and dynamic team.

Sincerely,

Betsy Kannenberg

Appendix F: Letter to Potential Participants (Instructional Coaches)

Dear Elementary Math Instructional Coaches:

I am in the process of completing my Ed.D and would like to invite you to participate in my doctoral study entitled *A Case Study: The Impact of Common Core Professional Development on Teaching Practices*.

I am hoping that you all are willing to spend 10-15 minutes completing an online questionnaire (multiple choice and open-ended) via surveymonkey.com that will explore your perceptions and opinions regarding the teaching practices of your staff following the district-wide Common Core math professional development series. You were all selected as potential participants due to your instructional leadership skills, knowledge, and expertise in the areas of Common Core math and lesson analysis.

As explained in the attached Consent Form, your responses are purely opinion-based, and both your identity and the identity of the district will be kept confidential. The questionnaire is online to allow for confidentiality, and I will not be able to match the responses to the participant.

A narrative analysis will be provided to all site leaders at the conclusion of the study, highlighting the key findings. I hope to provide a rich, holistic description of the impact of CCSS professional development, based on the cumulative responses from all district elementary sites.

The link to the online questionnaire can be found on the attached consent form. By completing the questionnaire, you are acknowledging that you read and understand the consent form.

Thank you so much for your support. I am grateful to be part of such a collaborative and dynamic team.

Sincerely,

Betsy Kannenberg

Appendix G: Administrator Consent Form

CONSENT FORM

You are invited to take part in a research study of the impact of Common Core professional development on teaching practices. You were chosen for the study because you are a district elementary site principal or assistant principal. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Elisabeth Kannenberg, who is a doctoral student at Walden University. This study is being performed as part of an EdD doctoral study examining the impact of Common Core professional development on math teaching practices. Elisabeth Kannenberg is employed as an assistant principal within the District. However, Elisabeth Kannenberg is assuming the role of the researcher within this study, and this role is separate and unrelated to the assistant principal position within the school district. The questions you will be asked as part of this study are opinion-based. There will be no repercussions for your answers, and the information will be gathered with confidentiality and used for educational purposes.

Background Information:

The purpose of this study is to examine perceptions regarding the impact of Common Core Professional Development on math teaching practices.

Procedures:

If you agree to be in this study, you will be asked to:

1) Spend 10-15 minutes completing an online questionnaire accessed via https://www.surveymonkey.com…
2) Spend 30-60 minutes participating in a face-to-face or phone interview

3) Keep your answers confidential

Please note that participants have the option to complete the online questionnaire only, without also participating in the face-to-face or phone interview.

Voluntary Nature of the Study:

Your participation in this study is voluntary. This means that everyone will respect your decision of whether or not you want to be in the study. No one in the School District will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind during the study. If you feel stressed during the study you may stop at any time. You may skip any questions that you feel are too personal.

Risks and Benefits of Being in the Study:

The risks are minimal and the information will be gathered with confidentiality. The benefits will be providing important insights pertaining to Common Core professional development and subsequent math instruction to benefit school districts nation-wide that have also adopted the Common Core State Standards.

Compensation:

No compensation is being offered.

Confidentiality:

Any information you provide will be kept confidential. The researcher will not use your information for any purposes outside of this research project. Also, the researcher will not include your name, the school district name, or anything else that could identify you or the school district in any reports of the study.

Contacts and Questions:

You may ask any questions you have now. Or if you have questions later, you may contact the researcher via email. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 1-800-xxx-xxxx

You may print or keep a copy of this consent form for your records.

Statement of Consent:

In order to protect privacy, no signatures are being collected. Completion of the online survey at https://www.surveymonkey.com…indicates consent, should you choose to participate in the study.

If you choose to participate in the interview portion of this study, please respond to the researcher by replying to this e-mail with the words "I consent" to indicate agreement.

Appendix H: Instructional Coach Consent Form

CONSENT FORM

You are invited to take part in a research study of the impact of Common Core professional development on teaching practices. You were chosen for the study because you are a district math instructional coach. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Elisabeth Kannenberg, who is a doctoral student at Walden University. This study is being performed as part of an EdD doctoral study examining the impact of Common Core professional development on math teaching practices. Elisabeth Kannenberg is employed as an assistant principal within the School District. However, Elisabeth Kannenberg is assuming the role of the researcher within this study, and this role is separate and unrelated to the assistant principal position within the school district. The questions you will be asked as part of this study are opinion-based. There will be no repercussions for your answers, and the information will be gathered with confidentiality and used for educational purposes.

Background Information:
The purpose of this study is to examine perceptions regarding the impact of Common Core Professional Development on math teaching practices.

Procedures:

If you agree to be in this study, you will be asked to:

1) Spend 10-15 minutes completing an online questionnaire accessed via https://www.surveymonkey.com/s/R3NP2PX
2) Keep your answers confidential

Voluntary Nature of the Study:
Your participation in this study is voluntary. This means that everyone will respect your decision of whether or not you want to be in the study. No one in the School District will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind during the study. If you feel stressed during the study you may stop at any time. You may skip any questions that you feel are too personal.

Risks and Benefits of Being in the Study:
The risks are minimal and the information will be gathered with confidentiality. The benefits will be providing important insights pertaining to Common Core professional

development and subsequent math instruction to benefit school districts nation-wide that have also adopted the Common Core State Standards.

Compensation:
No compensation is being offered.

Confidentiality:
Any information you provide will be kept confidential. The researcher will not use your information for any purposes outside of this research project. Also, the researcher will not include your name, the school district name, or anything else that could identify you or the school district in any reports of the study.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via email@waldenu.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 1-800-xxx-xxxx.

You may print or keep a copy of this consent form for your records.

Statement of Consent:

In order to protect privacy, no signatures are being collected. Completion of the online survey at https://www.surveymonkey.com/s/R3NP2PX indicates consent, should you choose to participate in the study.

Appendix I: Green Valley School District Common Core Math

Professional Development 2013-2014

Post-Hoc Observation Protocol #1 (Recorded Webinars)

Date of Observation:

Date of Professional Development Session: 8/15/2014

Duration of Observation: 120 minutes

Total Number of Attendees: 50 at sites/500 district-wide

1. Session Context (Description of Session Observed):

   Welcome back session for 2013-2014 school year. Explanation of timelines, and district roll-out plan for Common Core Standards, as well as introduction to supports: TOSAs (instructional coaches), Investigations curriculum, and teacher-created units of study in addition to pre/post-tests, and performance tasks. Teachers were led through contents of Investigations curriculum: including assessments, Common-Core alignment, and how to use Investigations as a resource to support conceptual knowledge in mathematics.

2. Session Focus (Intended Purpose of the Session Based Upon Objectives Stated):

   Covey to teachers that district is in a state of imbalance, instability, uncertainty, and flux. Common message across district that this (2013-2014) will be a year to take risks, try new lessons, stretch lessons, communicate, collaborate, think critically, pursue challenge, reflect, revise. Introduction of the math instructional

coaches and their responsibilities/roles: Develop Common Core math lessons, guided planning with teams, model lessons, professional development, research best practices, develop resources for teachers. Overview of day given: Overview of Investigations with consultant from publishing company, overview and access of Common Core curriculum through the district website, Review the Focus Standards for math CCSS, Provide modeling of Investigations daily routines and lessons, time for teachers to collaborate.

3. Description of Instructional Resources Provided (Articles, Audiovisual, Sample Problems, etc):

   Webinar/video conference: Introduction from Director of Elementary Curriculum, Narrated Powerpoint presentation, provision of Investigations curriculum: Teacher's Resource book. Student activity book, Differentiation and Investigation Guide, Common Core inserts, online Investigations website (modeled exploration of web site and resources via web conference/LCD projector sync), timelines of math units for each grade level provided to teachers via hand-outs

4. Description of Participant Activities:

   Participants listed to overview and timeline plan broadcast via webcast. Teachers were guided through use of Investigations materials by consultant, then given some time to "explore" the materials on their own. Teachers were given the math unit "suggested progression and resources." Teachers had the opportunity to ask questions prior to being a copy of each grade level's "Focus for Mathematics" to

read silently before they were given time to collaborate with their grade level teams.

5. Participant Questions/Feedback (as captured by interactive webinar dialogue/chat feature):

   Will we be given additional resources other than Investigations?

   Can we use our old math materials?

   Will we be given days for planning?

   How will have enough time to grade each individual performance task?

   How strict are the district timelines?

   How do we handle grades on the report cards? Will they align to these new assessments?

6. Additional Information/Comments Regarding PD Session:

Teachers seemed overwhelmed by the new units and the timelines. They seemed concerned about the assessments and performance tasks, as they were multi-faceted and looked different from the previous assessments. Teachers appeared to collaborate within their teams to determine next steps for launching the units at the beginning of the school year. The technology cut in and out quite a bit, which frustrated the participants.

Appendix J : Green Valley School District Common Core Math

Professional Development 2013-2014

Post-Hoc Observation Protocol #2 (Recorded Webinars)

Date of Observation:

Date of Professional Development Session: 1/22/2014

Duration of Observation: 60 minutes

Total Number of Attendees: 50 at site/500 district-wide (web-conference)

7. Session Context (Description of Session Observed):

   Providing Balanced Instruction in Mathematics: Conceptual Understanding, Application, Flexibility, and Procedural Fluency

   Teachers watched videos of math lessons in district classrooms: math talk, K-W-C (problem solving graphic organizer) taught in math classroom, teachers were given K-W-C charts to complete and sample problems to solve collaboratively. Teachers were asked to reflect upon demonstration lessons and given discussion questions, teachers learned how to complete a graphic organizer addressing conceptual understanding, application, flexibility, and procedural fluency: using math problem/numerical expression, picture/visual model, computation/procedure, explain why your answer makes sense. Teachers solved sample problems, then collaborated and reflected. Goals were broadcast by Director of Elementary Curriculum: use Number Talks and K-W-C strategy

8. Session Focus (Intended Purpose of the Session Based Upon Objectives Stated):

   Long term objective: Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning using the Standards for Mathematical Practice and Mathematics Content Standards. Objective of PD Session: 1) We will view lessons incorporating the KWC strategy and determine the teacher actions that helped the students comprehend math problems. 2) Teachers will select components of the lessons to implement in their instruction.

9. Description of Instructional Resources Provided (Articles, Audiovisual, Sample Problems, etc):

   Interactive (narrated/video conference) Powerpoint, Videos of demonstration lessons/classrooms, sample problems to work through, graphic organizers to support sample problems

10. Description of Participant Activities: Participants listened to the objectives (long and short term) introduced by the Director of Elementary Education, Teachers listened as Director of Elementary Education shared reflections from last PD session led by Jo Boaler: 1) " Students with growth mindset persist longer on problems, relish challenges, and learn from mistakes." 2) "All students can achieve at the highest levels of math" 3) Math should never be associated with speed. What is important is to deeply understand things and their relationship to one another. 4) If we are serious about encouraging students to develop growth mindsets we need to provide open tasks that have the space within them for

learning (low floor/high ceiling), not short tasks that students are meant to get right or wrong. 5) Each learning experience changes a student's ability.

11. Participant Questions/Feedback (as captured by interactive webinar dialogue/chat feature):

    1) The K-W-C charts have been successful in helping students to "wrap their arms around the problem" 2) Using K-W-C charts and number talks means slower pacing. It's tough to stay within the timelines when devoting an entire class period to one or two problems. 3) It's been challenging to find enough resources to teach math in this way 4) timed tests are not recommended by Jo Boaler, but if students can't complete basic facts in timely nammer, are they really fluent?

    Additional Information/Comments Regarding PD Session:

    Teachers as learners-given problems to solve, but were able to utilize a number of strategies . Teachers were asked to collaborate with colleagues and explain their thinking.

    Teachers were able to simulate students in the classroom.

    Teachers were able to see strategies in action through videotaped demonstration lessons

Appendix K: Green Valley School District Common Core Math

Professional Development 2013-2014

Post-Hoc Observation Protocol #3 (Recorded Webinars)

Date of Observation:

Date of Professional Development Session: 3/26/2014

Duration of Observation: 60 minutes

Total Number of Attendees: 50 teachers at site/500 teachers district-wide (web conference)

1. Session Context (Description of Session Observed):

   Director of Elementary Curriculum provided overview of PD sessions, including long-term objective and objective of PD session. Director of Elementary Curriculum stated new learning to be acquired via the day's PD session. Teachers were directed to read to read Chapter 2 from *Classroom Discussions*, to learn the tools of classroom talk and talk moves. Teachers highlighted the purpose of each talk move, then watched some videos of teachers using talk moves in the classroom. Teachers were give discussion time in small groups to identify connections of talk moves to Essential Elements of Instruction. Teachers were taught how to apply number talks to single problems and number strings (applying strategies to subsequent problems to identify patterns/relationships. Teachers watched a video of a number talk for 6 x7. Teachers were then asked to

discuss the lesson they viewed, and were given questions to address. Teachers were asked to select a number string i.e. 49+8, 49+23, 49+37, 49+51 and discuss within their teams possible strategies and how they might record them. They were then asked to discuss what questions they could ask to help students make connections without directly teaching them the strategy. Teachers then viewed a second video of teachers using talk moves: revoicing, repeating, reasoning, adding on, and wait time, using a multiplication string for 4 X 24. To close the web conference, the Director of Elementary Curriculum restated the long-term objective for the district: Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning. The Director then shared that the district would spend two months piloting the Dreambox math software beginning the following month to supplement classroom instruction and activities.

2. Session Focus (Intended Purpose of the Session Based Upon Objectives Stated):
   Long term objective: Teachers will provide mathematics instruction that is balanced in conceptual and procedural learning. Objectives for the day's PD: 1) We will take "Number Talks" to a deeper level of application through the implementation of two new tools 2) "Talk Moves" 3) Number String Problems
3. Description of Instructional Resources Provided (Articles, Audiovisual, Sample Problems, etc):
   Interactive Powerpoint (webinar), Hand-out describing "talk moves," videos of classroom math instruction utilizing strategies of focus, Chapter 2 from *Classroom Discussions*

4. Description of Participant Activities:

   Teachers were directed to read to read Chapter 2 from *Classroom Discussions*, to learn the tools of classroom talk and talk moves. Teachers highlighted the purpose of each talk move, then watched some videos of teachers using talk moves in the classroom. Teachers were give discussion time in small groups to identify connections of talk moves to Essential Elements of Instruction. Teachers were taught how to apply number talks to single problems and number strings (applying strategies to subsequent problems to identify patterns/relationships. Teachers watched a video of a number talk for 6 x7. Teachers were then asked to discuss the lesson they viewed, and were given questions to address. Teachers were asked to select a number string i.e. 49+8, 49+23, 49+37, 49+51 and discuss within their teams possible strategies and how they might record them. They were then asked to discuss what questions they could ask to help students make connections without directly teaching them the strategy. Teachers then viewed a second video of teachers using talk moves: revoicing, repeating, reasoning, adding on, and wait time, using a multiplication string for 4 X 24.

5. Participant Questions/Feedback (as captured by interactive webinar dialogue/chat feature):

   Will we be given more to plan with our team throughout the school year via release time?

Will we be able to observe the TOSAs (instructional coaches) enacting these moves in the classroom?

6. Additional Information/Comments Regarding PD Session:

Teachers were engaged throughout the session, discussed how they would implement these strategies in their own classrooms. The teachers seemed less apprehensive about trying the new strategies, but still discussed the need for resources and planning time.

Appendix L: Community Cooperation Letter

Green Valley Unified School District
Mrs. X, District Representative

February 17, 2014

Dear Elisabeth Kannenberg,

Based on my review of your research proposal, I give permission for you to conduct the study entitled *A Case Study: The Impact of Common Core Professional Development on Teaching Practices* within the Green Valley Unified School District. As part of this study, I authorize you to e-mail elementary site principals, assistant principals, and math instructional coaches (Teachers on Special Assignment) informing them of the study and inviting them to participate in the study by completing an online questionnaire and/or face-to-face/telephone interview. Individuals' participation will be voluntary and at their own discretion. I also authorize you to observe district-wide Common Core professional development sessions, and to analyze archival components of Common Core PD sessions that have already occurred in the 2013-2014 school year (Powerpoint slides and videotaped math lessons used as part of the PD).

We understand that our organization's responsibilities include: access to prospective participants via district e-mail system and access to archival PD components (Powerpoint slides, and videotaped math lessons used in PD) via the district server. Interviews may take place at a school site within the district before or after school hours or via telephone located at the school site during before or after school hours. We reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the research team without permission from the Walden University IRB.

Sincerely,

Ms X.

Ms. X, District Representative

Walden University policy on electronic signatures: An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically. Electronic signatures are regulated by the Uniform Electronic Transactions Act. Electronic signatures are only valid when the signer is either (a) the sender of the email, or (b) copied on the email containing the signed document. Legally an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. Walden University staff verify any electronic signatures that do not originate from a password-protected source (i.e., an email address officially on file with Walden).

Appendix M: Walden University IRB Approval Number

Approval Number is 03-18-14-0291220

Curriculum Vitae

Elisabeth Kannenberg

SUMMARY

Thirteen years of proven success in public education as an elementary assistant principal, K–6 special education teacher, district BTSA mentor, summer school principal, and administrative leadership doctoral candidate.

PROFESSIONAL AFFILIATIONS

American Association of School Administrators

Association for Supervision & Curriculum Development (ASCD)

HONORS/AWARDS

Teacher of the Year, 2004
C Elementary School

EXPERIENCE HISTORY

Assistant Principal, X Elementary School
2012-present
Responsible for co-leadership of K-5 school serving 1,100 students and 100 staff members. Duties include:

- evaluation of staff and site-based programs
- facilitation of IEP, SST, grade level, PTO, and committee meetings
- student supervision and discipline
- parent communication
- site coordination of district and state testing
- and special project development

Principal, A Elementary Summer Enrichment/ESY
B School District, 2011 and 2012
Responsible for all functions of leadership for 237 students and 40 staff members for summer enrichment, intervention, and special education classes.

District Mentor BTSA Program
B School District 2007–2012

Responsible for mentoring and coaching first and second year teachers, leading to

CREDENTIALS

Preliminary Administrative Services Credential

Mild/Moderate Education Specialist Credential

CLAD Credential

Autism Specialist (added authorization)

EDUCATION

Walden University. (Minnesota) Ed.D, Administrative Leadership for Teaching and Learning, 2014

A University, M.Ed, Special Education. 2005. Credentialed as Mild/Moderate Education Specialist and CLAD.

B University, B.S., Social Work. 1999.

competency in CSTPs through the Formative Assessment System.

Special Education Teacher, D Elementary

B School District 2005–2012

Responsible for instruction of general and special education students in grades 5-6 across a variety of settings. Designed and taught successful intervention and inclusion programs.

Special Education Teacher

C and Bayside D Schools, E Union School District 2001–2005

Responsible for instruction of special education students in grades K-4. Served as IEP Chairperson at two sites. Trainer of nonviolent crisis intervention (CPI) behavior management.

EXPERIENCE HIGHLIGHTS

Development of Shared Vision
Participant and presenter at district and site strategic planning days. Designed Professional Learning Community activities related to site goals. Facilitated and communicated shared vision. Member of PTO and School Site Council.
Development of School Culture & Instructional Program Conducive to Student Learning & Staff Professional Growth

Leader in professional development presentations at the site, district, and national level. Implemented successful inclusion, team-teaching, and academic intervention models. Extensive knowledge of CSTPs and ability to effectively mentor new teachers through BTSA program.
Developed & implemented school-wide character education and social skills programs.

EXPERIENCE HIGHLIGHTS (continued)

Effective Management of Organization, Operation, & Resources

Allocated resources within budgetary guidelines as site leader. Interviewed, selected, and evaluated staff members. Worked collaboratively with facilities crew, office staff, and teachers to ensure safe and effective learning environment.

Collaboration with Key Stakeholders

Skilled in leading staff, departmental, and IEP meetings. Practiced consistent verbal and written communication with staff, parents, and teachers. Wrote and published highlights of school events in community newspaper. Elicited formal and informal on-going feedback from stakeholders. Created and published summer course descriptions in alignment with teachers' visions.

	Use of Multiple Data Sources to Assess, Identify, and Apply Instructional Improvement Proficient in use of MAP assessment, Data Director, and OARS program. Designed & implemented before-school academic intervention program, and worked collaboratively with grade levels team to refine site RTI model to close achievement gap through on-going data collection and analysis.