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UNIVERSITY OF CALIFORNIA
RIVERSIDE

Metaphors We Do Math By: A Comparative Case Study of Public and Catholic School
Teachers' Understanding of the Common Core State Standards in Mathematics

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Education

by

Jennifer Danielle Branch

December 2016

Dissertation Committee:

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Dedication

This dissertation is dedicated to my mother, Eileen Danielle Branch, who is no longer with us. Unfortunately, she passed in January of 2016 less than a year before this dissertation was completed. My mother always wanted to go back to school, but was not able to due to physical and mental limitations. The last year has been tough, but knowing that she is so proud of me is what kept me going. She was thrilled when I told her that I was going for my doctorate. I remember her exact words when I told her: “Oh wow, Jenn. You’re the one who can do it, so you go do it.” Well, I did it, Mom. I did it. This one is for you, Mom!

I also dedicate this dissertation to my wife, Denise Hernandez, who encouraged me to further my education even though I was quite content with my Master’s degree. Her strength kept me going when I was emotionally and physically weak. Her patience kept me going when I was frustrated and annoyed. Her unselfishness kept me going when I had to spend countless hours reading, writing, and revising. Her love kept me going when we were more than four hundred miles apart. Her support kept me going when I had nothing left to give. She is my everything and this PhD is as much hers as it is mine.

ABSTRACT OF THE DISSERTATION

Metaphors We Do Math By: A Comparative Case Study of Public and Catholic School Teachers' Understanding of the Common Core State Standards in Mathematics

by

Jennifer Danielle Branch

Doctor of Philosophy, Graduate Program in Education
University of California, Riverside, December 2016
Dr. Begoña Echeverria, Chairperson

The United States has undergone multiple mathematics reforms since the 1980s with each reform setting out to increase national test scores and improve mathematics education in the nation's schools. The current reform, the Common Core State Standards for Mathematics (CCSSM), seeks to create mathematically proficient students through a more active and rigorous curriculum. The goal of this yearlong study was to examine the understanding that intermediate and middle school math teachers make of the new reform. Math teachers in a Catholic grade school and a public middle school were selected to participate. All four math teachers from the public school and four math teachers from the private school were self-identified as individuals who considered themselves to be actively and consciously implementing the CCSSM. To investigate this phenomenon, I conducted a qualitative case study. Data included interviews with teachers; observations in classrooms, faculty and grade level meetings, and professional development sessions; and the collection of documents, including lesson plans and materials disseminated during professional development sessions. Using professional

learning communities and teacher inventory as the conceptual frameworks, I examine how teachers understand the CCSSM and what informs these understandings. Furthermore, I studied how teachers' personal, non-teaching experiences shaped their teaching practices and their implementation of the CCSSM. The results of the study indicate that teacher understanding of the CCSSM is best understood through the use of personal metaphors. Teachers at the two school sites understood the CCSSM in terms of their own personal experiences and beliefs. Making these connections between their previous experiences and internal beliefs shaped their classroom instruction and teaching practices in different ways than professional development and training has seen. These teachers connected their non-teaching experiences, such as involvement in theatre or the church, with how they interacted with students, the curriculum, and colleagues. Such connections have implications for the professional development and training of math teachers which suggests a focus on personal and real-world connections, rather than solely focusing on content. Overall, this study highlights current practices of math teachers and supports the need to further examine how teachers make sense of reform beyond professional training.

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Chapter 1: Introduction

It is clear there is a need for mathematical reform (Stigler & Hiebert, 2009). Although slightly on the rise from previous National Assessment Educational Progress (NAEP) scores, the 2009 results clearly show the persistent existence of the achievement gap between white students and students of color, low math skills among subgroups of students, and poor problem solving skills. The results of the NAEP indicate that the United States needs to improve their mathematics achievement (National Center for Education Statistics, 2013).

The Common Core State Standards for Mathematics were designed to include fewer standards so as to do away with the “mile wide and an inch deep” comparison and to provide a focus on clarity and coherence (<http://www.corestandards.org/Math/>). Emphasis in the Common Core is placed on understanding mathematics. One component of understanding highlighted is the ability to articulate why a particular statement is true or where a rule comes from. This understanding is arguably one of the biggest changes to the previous standards because the Common Core Standards consist of two types: mathematical practices, which are recurring through all grade levels, and mathematical content, which is different, yet connected at each grade level. The Standards for Mathematical Practices are a set of eight practices which describe the varieties of expertise that educators should seek to develop in their students. Expertise is viewed as continued development of one’s procedural, conceptual, and problem solving skills.

Common Core State Standards of Mathematics

In 2009 the National Governors Association (NGA) hired David Coleman, President and Chief Executive Officer of the College Board of America, to develop curriculum standards in Language Arts and Mathematics instruction. This initiative was to "provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them" (Mission Statement, Common Core State Standards). Furthermore, the standards were "to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers" (Mission Statement, Common Core State Standards). In fact, the U.S. Department of Commerce projected jobs in STEM related field to increase by 17% from 2008 to 2018, almost doubled that of non-STEM related jobs (Langdon, McKittrick, Beede, Khan, and Doms, 2011). As a result of this initial development, the Common Core State Standards for Mathematics¹ were created and released in June of 2010. As of the summer of 2014 forty-six of the fifty states are members of the Common Core State Standards Initiative, with the states of Texas, Virginia, Alaska, and Nebraska not adopting the initiative at a state level, and Minnesota choosing to adopt the English Language Arts standards and not the Mathematics standards. Currently, the Common Core State Standards for Mathematics (CCSSM) are

¹ This study focuses solely on the Common Core State Standards for Mathematics and does not focus on the Common Core State Standards for English for a number of reasons. One, I have been a math teacher since 2000 and taught during the era of No Child Left Behind and teacher accountability and have worked with students who demonstrate a lack of mathematical common sense and ability. As a graduate student, I became more interested in understanding educational reform and what it means for teacher learning and practice.

being implemented throughout public school districts and some private schools in the state of California.

Public schools across the country are implementing the CCSSM. Implementation is an involved process and includes a lot of different stakeholders, resources, and time. According to Kober and Rentner (2012) individual state implementation of the CCSSM comprises a variety of different elements including providing information to different stakeholders; developing additional planning to align curriculum, assessment, and teacher policies with the standards; and incorporating different reform activities for teachers, schools, and districts. These activities range from requiring districts to develop long-term comprehensive plans, to developing and disseminating materials for school districts, to carrying out statewide professional development initiatives and to help teachers master the CCSS and use them to guide instruction (p. 5).

In 2014, there were more than 200,000 students who attended Catholic schools². Catholic schools are under no obligation to implement the CCSSM. Evaluation and assessment of Catholic schools differ from their public-school counterparts (Kallemeyn, 2009). Though many Catholic schools utilize assessments for academic content areas, little research has been conducted on its use in terms of standards reform and implementation (Kallemeyn, 2009). Furthermore, Catholic school Common Core implementation is neither overseen nor directly supported by the local school district.

² This statistic includes such schools as grade schools TK-8, high schools 9-12, and K-12 schools. <http://www.cacatholic.org/sites/cacatholic/files/files/Our%20Catholic%20Schools%20in%20California%20-%20FINAL.pdf>

Therefore, the resources available and sought out, professional development sessions attended, and other ways of coming to know the standards provide a unique perspective different from what public school teachers experience.

Instructional Shift – Focus

The Common Core State Standards for Mathematics consists of standards for content and for mathematical practice (SMP). The CCSSM contain three instructional shifts from previous reforms which are evident in these content standards and standards for mathematical practice. These shifts highlight differences from the previous math standards reform of the 1990s and 2000s. In the 1990s the teaching of mathematics emphasized basic skills (Davis and Walmsley, 2008), while in the 2000s the focus was on both basic skills and problem solving (Becker and Jacobs, 2000). The state of California took things a step further and developed their own set of standards for K-12 education during 1990s. The CCSSM reveal three shifts that differ from the mathematical reforms in the last two decades.

First, there is a clearer *focus* on each grade level's content specific standards. Each grade level from kindergarten through the eighth grade consists of four or five mathematical domains. For example, the third-grade content standards have five domains which include operations and algebraic thinking, number and operations in base ten, number and operations of fractions, measurement and data, and geometry. These domains (number sense; algebra and functions; measurement and geometry; statistics, data analysis, and probability; and mathematical reasoning) are similar to the previous set of standards for the third grade, but differ in the exact make-up and specific standards

covered³. The previous set of math standards for the third grade included forty-nine standards while the current set of math standards in the CCSSM consist of thirty-five standards, two of which are specific to the state of California. The *focus* of the third-grade math standards is on concepts, skills, and problem solving related to multiplication and division of whole numbers and fractions. Each grade level has a specific focus which builds from the previous grade. The overall purpose of this *focus* for all grade levels is to help students continue to develop strong foundations, including conceptual and procedural understanding and fluency, and the competence “to apply the math they know to solve problems both inside and outside the classroom”

[\(http://www.corestandards.org/other-resources/key-shifts-in-mathematics/\)](http://www.corestandards.org/other-resources/key-shifts-in-mathematics/).

Instructional Shift - Coherence

A second key instructional shift of the CCSSM is *coherence* of topics and thinking across grades. The CCSSM stress that mathematics is not a list of unrelated concepts, procedures, and formulas, but rather they are a coherent organization of information consisted of interrelated concepts. As a result, the CCSSM were created with learning progressions in mind that connect across grades so that student understanding builds from year to year. For example, in 4th grade, students are to “apply and extend

³ The Mathematics Content Standards for CA public schools (1997) stated that “by the end of grade three, students deepen their understanding of place value and their understanding of and skill with addition, subtraction, multiplication, and division of whole numbers. Students estimate, measure, and describe objects in space. They use patterns to help solve problems. They represent number relationships and conduct simple probability experiments” (p. 11). On the other hand, the CCSSM (2010) stated that “in Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes” (p. 21).

previous understandings of multiplication to multiply a fraction by a whole number” (Standards 4.NF.B.4), which is an extension of the 3rd grade standard of developing understanding of fractions as numbers (Standard 3.NF.A.1-3). This standard continues to extend through the 7th grade. In 5th grade, students are expected to “apply and extend previous understandings of multiplication to multiply a fraction or a whole number by a fraction (Standard 5.NF.B.4). As 6th graders, students are to “apply and extend previous understandings of multiplication and division to divide fractions by fractions [by using] visual fraction models and equations to represent problems” (Standard 6.NS.A.1). This standard is further extended in the 7th grade where students are to “apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers (Standard 7.NS.A.1-2). By seeing the connection of this standard across grade levels it is clear that each standard is not a separate concept, but rather is a progression of previous concepts. The instructional shift of *coherence* reinforces major topics so students build their knowledge and understanding and develop deeper understanding and mastery of concepts.

Instructional Shift - Rigor

The third instructional shift of the CCSSM is *rigor*, or “deep, authentic command of mathematical concepts, [by] not making math harder or introducing topics at earlier grades” (<http://www.corestandards.org/other-resources/key-shifts-in-mathematics/>).

There are three aspects of *rigor* in the content standards of each grade level and in the standards for mathematical practice. The idea of *rigor* is for educators to “pursue conceptual understanding, procedural skills and fluency, and application with equal

intensity” so their students develop mathematical understanding in these three key interrelated and critical areas of mathematics (<http://www.corestandards.org/other-resources/key-shifts-in-mathematics/>). Conceptual understanding is the understanding of key concepts, such as place value, ratios, number sense, and spatial reasoning. All of these concepts relate to other specific mathematical domains and are interrelated throughout grade levels. The National Research Council’s (NRC, 2001) report *Adding It Up* defines conceptual understanding as understanding why a particular mathematical concept is important and recognizing various contexts in which it is useful and can be applied. Developing conceptual understanding will help students be able to access concepts from a variety of perspectives and will allow them to see math as more than a set of unrelated concepts, procedures, and formulas. Profound conceptual understanding of content standards at each grade is crucial for student success in succeeding grades. Students with conceptual understanding truly understand mathematical ideas across contexts and recognize math is more than isolated facts, formulas, and procedures. Students who have profound conceptual understanding connect mathematical ideas across domains and subjects and see its use and importance in every day experiences, recognizing various contexts in which it is useful and can be applied.

Although speed and accuracy are important, true procedural understanding and fluency involves the ability to apply procedures appropriately to various problems, contexts, and situations as well as to build understanding across concepts (NRC, 2001). Furthermore, procedural fluency is the ability to connect or modify procedures and to recognize when one strategy or approach is more reasonable or appropriate than another.

In order for students to access more complex concepts they must practice and develop their procedural understanding and fluency. Therefore, fluency must be addressed not in isolation, but with conceptual development. Rittle-Johnson, Siegler, and Alibali (2001) argue that procedural and conceptual knowledge influences one another and should not be taught separately, but rather simultaneously. Others contend that once students have memorized and practiced procedures that they do not understand, they have less motivation to understand their meaning or the reasoning behind them (Hiebert, 1999; Byrnes, 1992; Baroody, 2003). Therefore, it is important to build procedural fluency alongside conceptual understanding, strategic reasoning, and problem solving.

The third component of *rigor* is the application of mathematical knowledge. The CCSSM require students to use math in various situations and contexts that require mathematical knowledge. Simply being able to recall a formula, steps to solving a problem, or basic vocabulary will not be sufficient in connecting and applying mathematical concepts. Students are expected to use their mathematical knowledge and choose the appropriate concept for application whether they are prompted to do so or not. For example, the CCSSM 6th grade standards require students to “develop understanding of statistical variability” (Standard 6.SP.A.1-3) and to “summarize and describe distributions” (Standard 6.SP.B.4-5). Providing students with data and informing them what data display to use does not require the student to apply their mathematical knowledge in different ways, nor does it allow the student to apply or make connections with what they have learned to new concepts or situations. Providing opportunities for students to perform and apply their knowledge of statistics and probability in different

ways allows students to make connections between their procedural and conceptual knowledge. Furthermore, getting students to come up with their own statistical question to investigate, come to a decision on how to display their data, such as through a dot plot, a box and whisker plot, or a histogram, and explain their reasoning allows them ownership of their data, and a way to bridge their procedural and conceptual understanding of the two standards. Therefore, the *rigor* of the CCSSM is being able to accurately and correctly applying mathematical knowledge which depends heavily on having deep conceptual understanding and procedural fluency.

Instructional Shifts and the Standards for Mathematical Practice

The three key instructional shifts of the CCSSM are also embedded in the Standards for Mathematical Practice, a set of eight practices which describe ways in which students are to engage in mathematics. These eight standards stem from the National Council of Teachers of Mathematics (NCTM) process standards and the National Research Council's (NRC, 2001) report *Adding It Up*. Together these organizations stressed the importance of problem solving, reasoning and proof, communication, representation, connections (NCTM, 2003), adaptive reasoning, strategic competence, conceptual understanding, procedural fluency, and productive disposition (NRC, 2001).

According to the NRC (2001), mathematical competency, referred to as mathematical proficiency, consists of five interwoven and interdependent strands that come together to create mathematically proficient students. Two of these strands include conceptual understanding and procedural fluency, were discussed above. A third strand is

strategic competence. Strategic competence refers to the ability of students to be able to formulate mathematical problems, represent them in different forms, such as visually, in word form, or using mathematical symbols, and solve them. Strategically competent students “should know a variety of solution strategies as well as which strategies might be useful for solving a specific problem” regardless of the context or situation (NRC, 2001, p. 124). Another strand, adaptive reasoning, is to think logically and critically about these concepts in their various contexts and situations. The final strand of mathematical proficiency is a productive disposition. Students with a productive mathematical disposition see the importance of mathematical ideas in everyday life. They also see mathematics as something that can be learned, worthwhile, and useful across disciplines, contexts, and situations. These five strands along with the NCTMs process standards join together and help make the eight standards for mathematical practice (see Table 1.1).

The NCTM process standards describe ways in which mathematics students should perform math as increasingly competent mathematicians (NCTM, 2003), whereas mathematicians are more than those in the field of mathematics. Mathematicians includes everyone because everyone needs math in their daily lives. The goal is for students to recognize this. As a result, math programs need to allow students opportunities to be problem solvers, to make connections between and among concepts and problems, and to investigate mathematics so as to uncover patterns and reasons rather than be told what is important. These experiences provide students with opportunities to showcase their

Table 1.1 The CCSSM Standards for Mathematical Practice⁴

| Standard for Mathematical Practice (SMP) | Description | Mathematically proficient students can |
|--|---|---|
| SMP1 | Make sense of problems and persevere in solving them | -look for entry points to a problem -make conjectures -monitor and evaluate their progress and change course if necessary |
| SMP2 | Reason abstractly and quantitatively | -make sense of quantities and their relationships -represent problems symbolically -represent problems contextually |
| SMP3 | Construct viable arguments and critique the reasoning of others | -justify their conclusions -recognize and use counterexamples -ask useful questions to clarify or improve the arguments |
| SMP4 | Model with mathematics | -apply the mathematics they know to solve problems -represent problems in a variety of ways |
| SMP5 | Use appropriate tools strategically | -identify relevant internal and external mathematical resources -use technological tools to explore and deepen their understanding of concepts |
| SMP6 | Attend to precision | -use clear definitions -state the meaning of the symbols -calculate accurately and efficiently |
| SMP7 | Look for and make use of structure | -look closely to discern a pattern or structure -can step back for an overview and shift perspective |
| SMP8 | Look for and express regularity in repeated reasoning | -look both for general methods and for shortcuts -evaluate the reasonableness of their intermediate results |

⁴ As stated in the CCSSM (2010), “the standards for mathematical practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important ‘processes and proficiencies’ with longstanding importance in mathematics education” (p. 6). Accessed May 19, 2016 <http://www.corestandards.org/Math/Practice/>.

knowledge and to express their ideas through communication and representation.

Competent math students are able to build new knowledge through open-ended questions and extended exploration; express their thoughts both verbally and in writing; model real-life situations by using diagrams, equations, or charts; recognize and speculate based on patterns they observe; and understand that mathematical ideas are interconnected and build on each other.

The Standards for Mathematical Practice describe how developing math students ought to express their understanding of mathematical ideas and concepts. As they grow in subject matter knowledge, students expand their ability to present, discuss, explain, and perform and practice mathematics in various ways. These mathematical practices are not to be taught in isolation, but rather are to be connected to the mathematical content at each grade level. As with the grade level content standards, the standards for mathematical practice also adhere to the three key instructional shifts of the CCSSM at all grade levels. Students are expected to practice math at all grade levels as the SMP are a part of the K-12 math standards (coherence). These standards are ways students demonstrate their mathematical proficiency, procedurally, conceptually, and in application (rigor). Finally, the overall focus of the CCSSM is to develop mathematically proficient students and the eight Standards for Mathematical Practice are an extension of each grade level's content standards because the practices are ways in which students make mathematics meaningful, purposeful and useful in their lives inside and outside of

school⁵. Ultimately, this is the goal of the CCSSM and differs from previous reforms of the 1990s and 2000s where the focus of mathematical education was solely on basic skills and simple problem solving.

The CCSSM were created to ensure that all students develop their mathematical skills, mathematical understanding, communication skills, and become competent problem solvers. These skills are necessary to be successful in college, career, and life no matter where students go to school, work, or live. Together the content standards and the Standards for Mathematical Practice make up the CCSSM. Individually and collectively, both the content standards and the SMP convey the three instructional shifts of the CCSSM. Focus on specific content, coherence and development across grade levels and rigor throughout provides educators and parents with a clear picture of what it takes to create productive, competent, and proficient mathematicians.

Statement of the Problem

The implementation of the CCSSM require a thorough understanding of the content and practice standards, the instructional shifts from previous math standards, and the different pedagogical approaches required to teach and engage all students. Teachers are the ones implementing the CCSSM in their classrooms through their teaching practices, instructional strategies, and in working with their colleagues. In order to get at

⁵ The idea of real-world application of mathematics is not new to the CCSSM as real-world application has been a part of the math standards for years, but the CCSSM put this application at the forefront of the standards as they are not to be taught as something separate from content standards or in isolation. Real-world application in mathematics is an ongoing connection through the content and practice standards.

the implementation of the CCSSM we must look at what and how teachers are understanding the CCSS.

Goals of the Study

The principal goal of this study is to uncover how math teachers, both private school teachers and public school teachers, come to understand the new CCSSM. Though there is a tremendous amount of research on standards reform, this study seeks to add to that knowledge by analyzing teachers' personal background and professional interactions. Research suggests that the success of standards reform depends upon the interaction and implementation at the classroom level (Spillane, 2005). In other words, the teachers are a large part of whether or not reform is deemed successful and to what extent. In order to achieve this goal, this study will be framed using the *professional learning communities* and *teacher inventory* frameworks. Learning about what personal and professional resources and information teachers utilize to make sense of the CCSSM is useful. Examining teacher understanding in light of their personal experiences and beliefs will bring new perceptions about the successes and struggles in implementing new standards. It is important to uncover teacher understanding of the CCSSM they teach and how these understandings might shape their teaching practices in the classroom.

Dissertation overview

Following this introduction chapter, I put forth in chapter 2 my conceptual framework through the lens of professional learning communities, teacher inventory, and how the use of metaphors in education assists in uncovering teacher understanding of their experiences in the classroom especially during times of education reform.

Chapter 3 reviews the literature on standards reform, teacher learning, and professional development. It also details the methods I used in this qualitative case study including background information about the public school and Catholic school where I conducted my research.

Chapter 4 examines the public-school teachers' understanding of the CCSSM as a whole unit, seeing the CCSSM as collaboration. In this Chapter, I argue that the math teachers at Alberta Middle School (AMS) made sense of the CCSSM during their various opportunities to collaborate on important aspects of teaching, such as student learning and the use of different instructional strategies. In doing so, these experiences revealed underlying beliefs these teachers have about teaching and learning when it comes to the CCSSM. In Chapter 5, I go into further detail specifically on one math teacher (Mrs. Isaacs) at the public school and her unique understanding of the CCSSM, namely seeing the CCSSM as performance. In this chapter I argue that the understanding the CCSSM as *performance* metaphor to describe Mrs. Isaacs' understanding of the CCSSM is useful in three distinct ways. This metaphor helps connect Mrs. Isaacs understanding of how the teaching and learning math in her classroom plays out.

Chapter 6 examines the private school teachers' understanding of the CCSSM as a whole unit. In this chapter, I argue that the math teachers at Junipero Serra Parish School (JSPS) understood the CCSSM as a *failed jazz ensemble*. The individual teachers were more concerned with their own classroom specifics and didn't utilize the strengths of their colleagues. As a result, the math teachers as a whole were unable to progress in their teaching of the math content standards or standards for mathematical practices. In

Chapter 7, I go into further detail specifically on one math teacher (Mr. Mejia) at the Catholic school. I argue that Mr. Mejia's personal faith guided his understanding and teaching of the CCSSM and use the metaphor of understanding the CCSSM as *intermediary* to link his philosophy of teaching, faith, and approach to understanding the CCSSM.

Chapter 8 examines the significance and implications of CCSSM understanding in mathematics instruction. This chapter argues that the professional learning communities of the teams of math teachers exhibited positive expected themes, such as collaboration and opportunity (AMS), as well as negative unexpected themes, including a lack of togetherness, focus, and regard for collective growth (JSPS). On the other hand, when looking deeper into individual understanding of the CCSSM, one math teacher at each school site displayed a unique approach to and understanding of the CCSSM. This chapter also examines limitations of the study, recommendations for educators, and suggestions for future research.

Chapter 2: Conceptual Framework

Professional Learning Communities

The proposed study focuses on the social and cultural aspect of teacher understanding, rather than on the cognitive or psychological aspect. Learning and understanding is viewed as a social construct that is shaped through social interaction. In other words, one's understanding is socially and culturally mediated. There are numerous learning and sociocultural theorists whose work can be applied to the notion of understanding. The proposed study utilizes the concept of *professional learning communities* to understand the phenomenon of how and to what extent both Catholic and public school teachers make sense of the CCSSM in terms of their teaching practice.

Breaking down the concept of professional learning communities (PLCs) by focusing on the individual terms allows us to get a deeper understanding of what PLCs are and what they are intended to do. The term *professional* suggests a focus on the attainment of certain abilities, knowledge, and skills (Stoll, et al., 2006). *Learning* implies constant growth meaning those teachers and other educators that are part of the PLC constantly learn about their practice, their students, and are able to reflect on both aspects in order to improve their craft and increase student achievement. According to Koellner-Clark and Borko (2004) in a teacher *community* – “a core responsibility is to help other teachers learn by encouraging them to contribute to large group discussion, pressing others to clarify their thoughts, eliciting the ideas of others, and providing resources for others' learning” (p. 225). As a result, a *professional learning community* consists of members who work together, who have common goals in mind, and strive to

continuously learn more about and improve themselves, their craft, and those around them.

Although from the literature there is no clear definition of what professional learning communities entail, there are various characteristics on which researchers agree. DuFour (2004) asserts that there are three big ideas to PLCs, which include ensuring that students learn, developing a culture of collaboration, and focusing on results. He claims that the term PLC is used loosely, when in fact it requires a lot of hard work, dedication, and constant revising of goals, intentions, and objectives (p. 6). Vescio, Ross, and Adams (2008) add another component to PLCs. They assert that it is also important for teachers and educators in PLCs to not only ensure student learning, but that there is also a focus on teacher learning and that members take ownership of this learning by being decision makers and taking control of their own learning (p. 85). Vescio, Ross, and Adams emphasize the importance of teacher collaboration, but Newman (1996) argues that in order for this collaboration to be effective and useful, members must set aside the idea of teaching as being an isolated profession and engage in reflective and meaningful dialogue with colleagues.

Stoll and colleagues (2006) further Newman's conceptualization of PLCs by highlighting the importance of reflective dialogue and a culture of collaboration, but also emphasizing the necessity of a collective responsibility of all members and significance of shared expectations, values, and norms. They take these essential characteristics of PLCs further stating the importance of teachers and educators respecting and supporting

one another, trusting each other with their ideas, and having community membership be all inclusive (p. 227).

Learning within a professional community of educators with the goal of a change in teacher practice and student achievement is a difficult undertaking (DuFour, 2004; Elmore, Peterson, and McCartney, 1996). Koellner-Clark and Borko (2004) studied a group of middle school mathematics teachers, most of whom met each other for the first time, during a two-week summer seminar focused on developing algebraic reasoning. The seminar's focus was to build community among the participants and identify the characteristics that support the development of this community. Participants were seated in small groups, assigned problems that encouraged discussion and participation, and included segments of cross collaboration. Koellner-Clark and Borko (2004) found that the teachers often built off of each other's ideas, encouraged each other to participate to make the most of their own learning, and supported each other's thinking urging one another to clarify their thoughts. They state that these are all ways in which communities initially begin to evolve and take shape (p. 228). The participants in this seminar exerted the essential characteristics of PLCs, such as interactive discussion (Stoll, 2006), collaboration (DuFour, 2004; Newman, 1996; Vescio et. al, 2008), ownership of one's own learning (Vescio et. al, 2008), and respecting, supporting, and trusting each other with their ideas (Stoll, 2006). These teachers supported one another in their thinking, learning, and sense making all of which are necessary components to make sense of one piece or another and effectively and systematically implement the CCSSM. Coming to

understand the CCSSM as individuals and as a collective math department is essential to learning how to put the CCSSM into action in one's classroom.

Although Koellner-Clark and Borko (2004) provide evidence that their group of teachers began to form a professional learning community, they do caution against assuming that a collection of teachers automatically implies a professional learning community. Williams, Brien, Sprague, and Sullivan (2006) further this notion by examining school-level barriers to establishing PLCs in schools. Current literature reveals that there are two types of institutional barriers, those that are organizational characteristics, such as culture, leadership, and capacity-building and operational characteristics, such as professional development opportunities, data collection and analysis, and systematic trust (p. 3). In their two-year study, Williams and colleagues (2006) studied four schools within two school districts in New Brunswick, Canada. The authors and additional members of their research team met with school personnel three separate times to “create a shared understanding of PLCs,” to discuss “potential barriers to the educational reform process,” and finally to share the results of a themed list of barriers that were gathered from all four schools (p. 7, 8). Williams, Brien, Sprague, and Sullivan found the school barriers to include themes of culture, leadership, teaching, and professional development. The section on teaching is an interesting case because it strays slightly from the literature on school barriers. The authors show that possible school barriers associated with teaching include: teachers' approach to lesson planning, their instructional and assessment practices, and teacher's interpretation of school curriculum.

Overall, Williams and colleagues uncovered influential barriers that hinder a school's ability to establish an effective and goal-oriented PLC.

Other factors, though, may limit professional growth and establishing PLCs in more subtle ways. Horn and Little (2010) examine how conversational routines and group dynamics can either "open" or "close" discussion. In their study, Horn and Little describe two groups of teachers with various experiences, knowledge, and beliefs towards discussing problems in practice. With the common goal of improving teaching, teachers offered each other support through various avenues and perspectives. By putting problems and concerns out on the table, other members were able to "introduce and evaluate multiple explanations of the problems that surfaced (p. 202), thus enabling teachers to reflect on their own teaching through the accounts of others. On the surface analysis of both the Academic Literacy and the Algebra group portray characteristics of professional learning communities centered on student work, student learning and problems of practice. How these conversational routines play out, however, creates significant differences in the opportunities for true growth and learning. For example, in the Academic Literacy Group, the way "normalizing" routines were enacted served to focus on the problem as the individual's and did not provide opportunities for the group to explore the issues as "problems of practice."

Allowing classroom challenges to be "problems of practice" rather than an individual's problem can open up many avenues for growth and learning. In the Algebra Group, conversational routines acted to enable a teacher to step back from the immediate situation, legitimize the issue, and receive group support in problem solving around the

issues being raised. The two-sides of Horn and Little's analysis point to the importance of non-judgmental group support (and trust) to facilitate in depth problem solving focused on concrete issues of practice. These groups and other professional learning communities must be structured in ways that provide opportunities for critical reflection and meaningful dialogue. The authors investigated the different interactions and "talk" that can support teacher learning and development. Horn and Little's analysis convincingly identified moves that facilitate teacher learning, such as normalizing problems and developing generalizations from particular events, as well as encouraging members to reconstruct their understanding of complex situations. Horn and Little identified that a professional learning community can foster affiliation with a group and make such exploration safe, which is a key component of professional learning communities.

The concept of *professional learning communities* will help me see things that teachers do together in a particular way. Listening carefully to and be attentive during practices that occur inside and outside of the classroom will be key in understanding how teachers come together to make sense of the CCSM. Such practices may include discussing students' success and/or abilities; grading and assessment; ways of communicating with each other, with parents, and with students; planning lessons and collaborating vertically; and other daily activities or tasks that allow me to get an idea of the components of the community (Little, 2003). To what extent these participants explain and clarify their ideas, admit weakness or misunderstanding, give feedback, and develop trust and strong relationships with each other throughout their participation in

various tasks, activities, and practices will provide insight into ways the teachers build and strengthen their community (Koellner-Clark and Borko, 2004). Furthermore, utilizing the idea of *professional learning communities* will help me see the extent to which teachers come together to improve their professional practice, navigate their differences, and foster their intellectual development (Grossman, Wineburg, and Woolworth, 2001). In addition, it is important to understand how these practices come to be known, shared, and changed.

Learning and sense making as seen through the lens of *professional learning communities* focuses on the person as a member and participant of this community. Goffman (1974) notes that the individual exists in a sense that one brings certain resources and inner motivation to social contexts, but also that individuality does not exist in a sense because one brings with him or her the influence of others from previous interactions as well as language (influence, expectations, value system, and conventions). Following Goffman, I content that the community as a whole is an important unit to focus on, but on the other hand, I strongly believe that to get a better understanding of the professional learning community one needs to hone in on the individual's participation and membership of that community – to focus on what the individual brings to each interaction, gathering, activity, and so forth. In order to get at the individuals' resources, I take a look at what I refer to as teacher inventory.

Teacher Inventory and the Connection to the Common Core

Teachers bring a significant amount of resources with them to understanding and implementing standards reform. These resources include their knowledge of teaching

(Shulman, 1986; Cochran-Smyth and Lytle, 1999; Putnam and Borko, 2000); their schooling experiences; their beliefs of teaching and learning (Smagorinsky, 2000; Richardson, 1996); their classroom, career, and student goals (Smagorinsky, 1999; Schoenfeld, 2011); their attitudes (Richardson, 1996); their orientation or philosophy on education (Schoenfeld, 2011); their social network, available time and finances (Spillane, 2005); and their outlook on educational reform and policy (Ball, 1996; Darling-Hammond and McLaughlin, 1995; Little, 1993; Ball, Thames, and Phelps, 2008). Therefore, what I call “teacher inventory” consists of knowledge, philosophy and experiences, attitudes and beliefs, goals, and social network.

Teacher Knowledge

One component is the knowledge teachers bring to the classroom and to understanding their profession. Shulman (1986) suggests one major aspect of teacher knowledge is based on content, composed of three distinctive elements. *Content knowledge* refers to knowing about one’s subject matter as well as being able to “further understand why it is so” (p. 9). *Pedagogical content knowledge*, which is composed of content knowledge and “subject matter knowledge for teaching,” includes “an understanding of what makes the learning of specific topics easy or difficult” (p. 9). Lastly, *curricular content knowledge* refers to the ability to recognize and utilize “the full range of programs designed for the teaching of particular subjects and topics at a given level” (p. 10). It is also the materials associated with the curriculum. This includes *lateral curriculum* (how the subject can be related to other subjects) and *vertical curriculum* (understanding what came before and what comes after the subject and its related topics)

(p. 10). All three forms of content knowledge (subject matter, pedagogical content, and curricular) are highly relevant when thinking in terms of the CCSSM. To effectively and systematically implement the CCSSM teachers will need to know what the standards are (content), how to navigate them in the course of their teaching (pedagogical content), and be able to utilize appropriate resources and materials to help them do so (curricular content).

Shulman's concept of content knowledge can be applied to all subject matter from history to English to the sciences. Ball, Thames, and Phelps (2008) break down Shulman's categories of content knowledge and pedagogical content knowledge even further for math teachers stating that common content knowledge (CCK) "is the knowledge teachers need in order to be able to *do the work* that they are assigning their students" (p. 6). On the other hand, specialized content knowledge (SCK) is similar to Shulman's pedagogical content knowledge, but rather "it is distinctly mathematical knowledge...not necessarily mathematical knowledge familiar to mathematicians" (p. 6). More specifically specialized content knowledge includes such tasks as: presenting mathematical ideas, modifying tasks, asking productive mathematical questions, and evaluating mathematical explanations. These mathematical tasks of teaching are related to subject matter knowledge, but go beyond what is expected of any well-educated adult because they relate specifically to it being specialized (as it pertains to the profession of teaching) (p. 9). The authors define knowledge of content and students (KCS) as "knowledge [deriving] from experience with students and knowledge of their thinking; [it] is a type of pedagogical content knowledge that combines knowing about students

and knowing about mathematics” (p. 9). A similar breakdown of pedagogical content knowledge is knowledge of content and teaching (KCT), which is knowledge that combines knowing about mathematics and about teaching because “many of the mathematical tasks of teaching require mathematical knowledge that interacts with the design of instruction” (p. 9). In summary, Ball, Thames, and Phelps stress that “the mathematical demands of teaching require specialized mathematical knowledge, needed by teachers, but not needed by others” (p. 11) and that content knowledge for teaching is multifaceted and multidimensional (p. 12). In other words, content knowledge is only part of the knowledge of teachers. What they actually do and know in the classroom context is much more complicated.

Beliefs and Attitudes

A second component of teacher inventory is teachers’ beliefs and attitudes, which help researchers understand how and why a teacher makes certain decisions in and out of the classroom. According to Schoenfeld (2011), the interaction of teachers’ resources, goals, and orientations are at the heart of their decision making and ultimately their sense making. A teacher’s resources include one’s knowledge (subject matter, pedagogical, curricular, etc.), available materials, social skills and connections. One’s goals are what a teacher sets out to achieve in the classroom and are arguably attained through one’s utilization of resources. One’s orientations “include one’s beliefs, values, preferences, and tactics” (p. 460). The interaction of these various components occurs differently in teachers. As Schoenfeld uncovered in his study one teacher, Mr. Nelson, strongly believed that mathematical ideas should come from his students and not something that

he generates. As a result, he chose not to expand various lessons because it would be introducing new concepts rather than building on what the students already knew and had generated. Another teacher, Mr. Minstrell, valued inquiry and discussion in class and therefore welcomed any opportunity to engage in meaningful math talk with his students. This belief and orientation to learning guided the direction of his lessons. Both teachers valued different ways of teaching and engaging students. Schoenfeld's analysis shows that a teacher's resources, goals, and orientations interact differently and are the basis for one's decision making and sense making in the classroom. Experienced teachers, like Mr. Minstrell or novice teachers, like Mr. Nelson have varying sets of beliefs and attitudes. Other researchers find that the attitudes and beliefs of pre-service teachers are often optimistic and limited (Richardson, 1996; Smagorinsky, 2004). But, it is not just pre-service or novice teachers whose beliefs and attitudes guide their decisions and sense making in and out of the classroom.

As Hill (2001) pointed out in her study of teachers' sense making of district policy, understanding doesn't always match up with the intentions of the policy and classroom practice. Cohen's (1990) case of Mrs. Oublier, a second-grade teacher who attended workshops on mathematical understanding, represents the possibility of teachers taking what they learn in professional development and appropriating it incorrectly. While attending workshops Mrs. Oublier was simply given short explanations about engaging students in actively understanding mathematics and was told the changes were important (p. 311). This form of instruction, lack of collaboration with others, and little to no time to engage in these mathematical tasks resulted in Mrs. Oublier's lack of deep

understanding of how to work with students' mathematical understanding. Mrs. Oublier had difficulty in assessing how she was linking the frameworks for the new policy on teaching math to her instructional practices. She was not sufficiently supported and, thus, had no perspective other than her own biased opinion about her teaching. The lack of support in Mrs. Oublier's school site kept her from realizing her practices remained the same even though she was an advocate and implementer (or so she thought) of the new mathematics teaching policy. The organizational context of her school site was unable to provide the proper support and thus she was unable to learn from practice and recognize her misuse of the new policy. The case of Mrs. Oublier (Cohen, 1990) presents a case where school and resources fail to support a teacher in making the changes asked of her due to new policy.

The classic model of professional development for teachers suggests that teachers can implement new approaches to pedagogy simply by being told about the new approach and given a few instructions (Hawley & Valli, 1999). Drawing on Schoenfeld's framework for goal directed action, however, teachers must have the necessary resources and orientations to take actions towards a specified goal (2011). The piece underlines the importance of understanding the nature of teacher beliefs and learning, if one wishes to be effective in enhancing teachers' practices and developing knowledge.

Beliefs, resources, and goals are necessary to develop into a competent, well-versed teacher and to make sense of curricular reform. But, they are also necessary to continue reshaping as one gains more and more experience, knowledge, and resources. One's beliefs, attitudes, and sense making occur as a result of socialization with

colleagues, experience in the classroom, and exposure to various resources and reform agendas (Richardson, 1996, p. 110). As a result, teachers' understanding of the CCSSM needs to be understood both individually and as a professional community. As a member of this community teachers are participating members who bring with them a set of resources, which I refer to as teacher inventory. Getting at the heart of these resources and how, if, and to what extent they guide a teacher's sense making of the CCSSM is essential. Understanding the member of the community as well as the collective professional community allows me to get a full view of how teachers make sense of the CCSSM on an individual basis and as a community. Taken together, these two conceptual frameworks allow me access to how teachers' sense making at a collective level influences their ability to form professional learning communities with other teachers as they make sense of and implement the CCSSM. Further, I am able to conceptualize how individual teacher resources impact membership in the community (teacher inventory).

The Use of Metaphors in Educational Research

To further my analysis of teacher understanding of the CCSSM, I utilize metaphors to uncover how teachers are understanding the CCSSM. People use metaphors in everyday language to explain ideas. Researchers have used metaphors to describe teachers' role in the classroom, professional identity, style of teaching, and knowledge of their subject matter. However, these insights have not been applied to mathematics reform.

In the classic *Metaphors to Live By*, Lakoff and Johnson (1980) argue that the majority of humankind's way of communicating is based in some form of metaphorical thought. In fact, Lakoff and Johnson state that "our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature" (p. 3). Simply put our entire existence -- mind, action, and words --encompasses metaphors on a daily basis. The use of metaphors may not even be a conscious effort, but rather is something that one is just used to as a common way to communicate without realizing one is doing so (Lakoff and Johnson, 1980). At other times, it is intentional. Either way, the use of metaphors is commonplace to assist in explaining, understanding, communicating, and convincing.

Lakoff and Johnson proclaimed that metaphors were more than the simple use of language, they were a way to communicate, reason, and understand one's surroundings and others' thoughts. They categorize the use of metaphors in a variety of ways, the most common being 1) daily concepts people live by, 2) systematic use of metaphors, and 3) orientational metaphors. Everyday language is metaphorical and daily happenings or events, like arguing with a colleague or disagreeing with a friend, can be described metaphorically without even thinking or realizing. Some examples include *she attacked the way I handled that parent* or *he shot down my suggestion* (p. 4). Speaking in these terms is common and hearing them is just as expected. The way people talk about certain concepts is systematic.

Lakoff and Johnson illustrated this further stating that people use metaphorical expressions in everyday language on a regular basis in other ways as well. This was

evident in their discussion of the comparison between time and money. The way people talk about time and money and the link between the two is organized and methodical. The way people talk about time they state that time is valuable, that it is worth something, that it is a resource. Many phrases comparing time and money include *she is wasting my time*, *I've invested a lot of time in this project*, *this new product will save you hours*, or *I lost a lot of time when I was in the hospital* (p. 7-8). Lakoff and Johnson demonstrated that using such words to describe or compare to another simply provides people with a partial understanding because now understanding that concept is being limited by the understanding of another concept. It limits the way people think about everyday things. In some respects, they are taken for granted. Other common uses of metaphors include the use of orientational metaphors. A lot of conceptual things are talked about in terms of being positive and up or negative and down. For example, *my spirits rose*, *she is at the peak of her health*, or *he came down with the flu*. Other examples involve comparing being rational and emotional as opposites, such as *fell to the emotional level*, *she raised it back to the rational plane*, *we put our feelings aside*, or *they couldn't rise above their emotions*. All of these examples provided by Lakoff and Johnson point to the commonplace nature of the use of metaphors. Speaking in terms of metaphors could be something done on purpose by outwardly choosing to compare two potentially unrelated concepts, but it could also be done subconsciously. Either way, metaphorical language is common in day to day conversations and researchers have found its place in the field of education.

Educational researchers have found that participants in their studies construct metaphors in order to better understand their situation or to assist someone else in understanding how they view themselves, others, or their relationships. For example, in a study by Seferoğlu, Korkmazgil, and Ölçü (2009), pre-service and in-service teachers described their role in the classroom. In-service teachers tended to describe their role in the classroom as someone who is a facilitator, namely teacher as facilitator or more specifically teacher as a conductor of an orchestra. Researchers also use metaphors to make sense of a particular phenomenon in a research setting in order to help create a visual or build a connection for their audience. Berliner (1990) writes an entire article around the metaphor of teacher as executive. Admittedly, he states that this metaphor is not common when speaking about the role of teachers, but he feels it is something worth noting. In his article, he argues that much of the talk on the role of management considerably overlaps with the role of teachers and how they must function in the classroom (p. 86). Through his use of metaphor Berliner illustrates that teachers do much the same as executives in that they have to plan, communicate goals, regulate workplace activities, create a pleasant work environment, educate new members, and motivate other members, among other aspects. Regardless, educators and researchers use metaphors in a variety of ways. Researchers have used metaphors to describe the role of teachers in the classroom (Berliner, 1990; Tobin, 1990), student achievement and learning (Grant, 1992; Saban, 2010), teacher knowledge (Munby and Russell, 1990; Carter, 1990; Leavy, McSorley, Bote, 2007; Zhao, Coombs, Zhou, 2010), teacher thinking (Seferoğlu, Korkmazgil, and Ölçü, 2009;), classroom management styles (Tobin, 1990; Carter,

1990), developing communities and togetherness (Wincek, 1995; Linehan and McCarthy, 2001) and constructing meaning in the classroom (Collins and Green, 1990; Marshall, 1990; Weade and Ernst, 1990), among others.

Tobin (1990) asked high school teachers to use metaphors to describe their classroom management and roles in the classroom. The purpose was to assist teachers in possibly changing classroom practice once teachers become aware of their current roles and are assisted in conceptualizing their roles differently. Some teachers used metaphors to describe themselves as teachers, including teacher as intimidator, comedian, preacher, policeman, mother hen, and entertainer. These metaphors not only explained the teacher's role in the classroom, but also revealed beliefs the teacher had regarding how to relate to students and how to communicate standards and concepts. The metaphors teachers used to describe their role in the classroom shifted from a focus on academic learning, to classroom management style, to assessment. In some cases, teachers used different metaphors to describe their role in the classroom: i.e. teacher as facilitator during instruction, teacher as manager when order was necessary, or teacher as assessor when determining the level of student achievement. Tobin states that teachers' role in the classroom depended on their beliefs about the relationship between teaching and learning as well as between the relationship between student and teacher. These roles were constantly shifting and may cross over.

Similarly, Carter (1990) explained how mentor teachers used metaphors for a variety of functions - not only to communicate knowledge but to describe their student teachers' classroom management and teaching style; to describe the mental activity of

teaching; to develop conceptions of teaching reflected in action; and to demonstrate how teachers reasoned about problems in the classrooms. Though metaphors were used to carry out conversations between the mentor teacher and the student teacher as a way to understand two major components of teaching - classroom management and one's own teaching style - the overall intention of the metaphor did not always match the interpretation of the metaphor by the student teacher. At times this limited rather than enhanced conversations about the student teacher's classroom management and teaching styles because it was uncomfortable to hear or because the metaphors used had negative connotations (p. 113). For example, one mentor teacher used "penguin feeding" as a way to describe her teacher's classroom management style. The mentor teacher meant it as a way to illustrate how the teacher should insure that each student was paid attention to at the exact moment they demanded attention. This metaphor was misinterpreted by the teacher and she assumed the mentor teacher implied that her classroom was a zoo and that the students were animals (p. 113).

Other times the metaphors heightened conversations and self-reflection because the student teacher realized she was trying to do too much or not enough for the students. For example, a mentor teacher used the metaphor of "gourmet cook" to describe the student teacher's teaching and interactions with students. This teacher was able to self-reflect and recognize that she was trying to entertain students with "flavorful and delicious" activities. Furthermore, another mentor teacher used the metaphor of "constant companion." By having deep and open conversations with their mentor teachers, the student teachers were able to identify that they were taking on more than they could.

Carter illustrates the use of metaphors as a way to describe one's approach to teaching and classroom management can be useful in self-reflecting and re-evaluating one's role in the classroom.

Others researchers use metaphors themselves to analyze data such as in exploring teacher knowledge, professionalism, and the teaching of subject matter. Grant (1992) used metaphors to describe three teachers' classroom teaching and revisited those teachers once they had a chance to view her analysis and interpretation of their teaching. The author had described one teacher as thinking about his subject of science as magic. The teacher agreed, but then suggested that his perception of teaching was better linked by thinking of science as wonder, explaining that the idea of science as magic goes against what science really is-that there are rational explanations for things. He went on to further state that he teaches the subject in a way that fosters students' interest and enthusiasm. So, though science as magic would still be an accurate metaphor, he prefers science as wonder.

Another teacher was described as thinking about his subject of history as a game. Following discussion on the researcher's interpretation, the teacher agrees, stating that there are many aspects of his teaching that follow the game metaphor, specifically that history is a set of individual games or battles of time between two or more people or groups and that his approach to teaching the subject of history is through participation and teamwork yet childlike and serious at the same time. Finally, a third teacher saw her teaching of English as a journey, as described by the researcher. She agreed to this description of her teaching, that she tried to take students on a journey through literature

genres, time, and pieces, but also wanted to clarify that the metaphor of journey describes how she came about the teaching of the subject of English. The metaphors Grant and the teachers use describe how they see their discipline/subject content and how they teach the subject, but do not necessarily describe how they try to help their students with the content.

Munby and Russell (1990) used metaphors to express teachers' knowledge of their subject matter, how they thought about their subject, and how they used this knowledge to teach content to students. One sixth-grade teacher, Linda, referred to sharing in her classroom. Linda mentioned the term sharing, or something similar to it, frequently. She expressed the idea that students share their thoughts, that it is imperative that students share whether formally or informally, and that there was share time in class. Munby and Russell considered this metaphorical because her use of the term sharing is different than when one shares food or time because that can be divided equally among people or things. Linda believed that sharing their ideas about stories, characters, and the creative process helped students recognize what they knew and what they did not know. It also helped them communicate their knowledge with others, including the teacher. This conceptualization of sharing is different, whereas with thoughts and ideas you cannot literally share because they are not tangible. Another middle school teacher, Jack, referred to his teaching of science as focusing on the scientific processes. By this he meant that it is important for the students to develop a hypothesis, test it, and modify it if necessary, but it also described his approaching to the teaching of science. He also revealed that in this process there was one desired answer or result, though this was not a

component of science and his belief on the nature of science. He believed that this was the best way that students learn and how he conducted his science classroom. In other words, how he viewed science and felt students learn best, was not the focus of what science actually was in the classroom. Furthermore, Jack connected his view of planning lessons in much the same way in the sense that he experimented with different things, sometimes the results surprised him, and other times he needed to reevaluate the results and come up with a different plan or approach just like with the scientific process (p. 119). Munby and Russell illustrated that when teachers describe their teaching in the classroom, their descriptions, though unintentional, are metaphorical in nature. Linda described her class as sharing because she felt it was necessary for her and her students to share their interests and knowledge for learning to take place, namely teaching as sharing and learning as sharing. Furthermore, Jack described the scientific method as a way he taught science. Jack intended for this to mean that he focused on the scientific method as a way to teach scientific concepts, but Munby and Russell argued that the way Jack went about his lesson planning and other aspects of teaching modeled that of the scientific process, namely teaching as the scientific method.

What Tobin (1990), Carter (1990), Grant (1992), Munby and Russell (1990) and others revealed was that using metaphors helped explain one concept in terms of another, but in doing that one limits the depth of understanding of the aforementioned concept. Using metaphors expanded one's understanding of the concept, but at the same time limited it because it was now thought of in those other terms rather than in its own terms. In the current study, my use of metaphors help shape the understanding of the CCSSM

that the teachers had, but at the same time limits the depth of the understanding by putting limits on those comparisons and in thinking of those ideas as solely in the other.

Chapter 3: Literature Review and Study Design

Understanding the CCSSM and standards reform is key to successful implementation. Therefore, the resources teachers have access to and utilize to learn about and become familiar with the CCSSM is vital to the success of the reform. To get at this understanding it is important to situate this study. As a result, this chapter looks at three key areas of prior research that are relevant to this study on teacher understanding of the CCSSM: (1) teacher understanding of standards reform in math and other subjects (2) professional development as a means, or resource, for teachers to come to know the standards and (3) the use of metaphors as a way to understand professional knowledge, experience, and teaching.

Teacher Understanding of Standards Reform

In order for standards reform to be successful and implemented teachers and educators need to have access, time to discuss, internalize, reflect, and have opportunities to collaborate and work with colleagues in order to transform these ideas into classroom practices (Spillane, 2005; Hill, 2001; Cohen and Hill 2000; Coburn 2001, 2005, 2008). Spillane (2005) and Hill (2001) studied policy reform at the state, district, and school levels finding that those teachers who discussed policy together and used available resources (i.e. each other, the intended curricular materials, time, and their own experiences) made sense of the policy in question. This sense may or may not be in line with the policy and emerged from connecting one's previous knowledge and experiences to the current policy (Spillane, 2005), discussing misconceptions and other concerns with

colleagues (Spillane, 2005; Hill, 2001), and examining pedagogical practices (Hill, 2001).

In his multilayered investigation of Michigan's state policy system for mathematics and science education Spillane (2005) explored local policymaking and the response of teachers. Spillane used data from interviews and surveys and found that local actors viewed the standards quite differently. Some actors viewed the standards as a way to specify and sequence math and science topics at each grade level, to illuminate how to deliver instruction to students, and as a way to organize and plan around a thematic approach (p. 71). Others saw the standards as a way to put more emphasis on scientific concepts that are fundamental (p. 72). Still others saw the standards as a way to transform student learning, "to ensure that students had the opportunity to learn and understand important mathematical concepts" both computational and conceptual (p. 72, 73). Overall, Spillane found that local actors interpreted and made sense of the policies in various ways, such as connection familiarity with previous standards as Spillane argues that the sense that individuals and groups make "depends on the sense [they] already have - that [our] existing knowledge is a primary source in the development of new, sometimes better, understandings" (p. 76). This occurred differently within school districts and across local actors.

This familiarity also figured prominently in districts' understanding of the standards. More familiar ideas, such as using manipulatives or problem solving strategies tended to get policymakers' attention, while more novel mathematical ideas did not fare as well with district policymakers including such concepts as communication and

reasoning (p. 77, 78). Local actors connected previous understanding of past standards and policy with current reform in three distinct ways. Some district personnel misunderstood the new reform as similar to some of their existing ideas and policy, stating that mathematical problem solving has been around for years and that it was not any different than when they were kids. Others tended to notice basic similarities rather than structural similarities focusing on specific terms instead of deeper conceptual understanding. Lastly, a third group recognized familiar ideas, such as group work and story problems, and completely ignored unfamiliar concepts. According to Spillane most district policymakers developed understandings that just scratched the surface of the ideas presented in the standards resulting in only modest changes in existing local understanding (p. 89).

On the other hand, Spillane found that teachers' higher level of understanding was due to opportunities where teachers interacted, discussed instructional practices, and collaborated together. The administrators of these schools recognized the need for such conversations to take place and therefore "worked to create opportunities for teacher sense-making that were social, coherent, and grounded in ongoing conversations about teachers' practice" (p. 165). The teachers made sense of the standards in part because they discussed any misconceptions, how the standards related to instruction and their students, and because administration provide the time for them to do so. Overall, Spillane found that teachers came to terms with the new standards policy due to their ability to stay connected with each other and having ample resources, such as time and each other.

In other words, teachers and other educators can make sense of standards reform via their previous knowledge, experience, available resources, and professional networks.

Conversely, Hill (2001) found that time to go over the math standards and discuss with colleagues did not necessarily translate into appropriate sense making. While observing and interviewing district personnel and teachers Hill found that what teachers did and did not do in their collaboration spoke to their understanding of the current policy. In breaking down policy, teachers constructed their own vision of mathematics teaching and learning, supported state standards with local policy, and spent time aligning standards across grade levels. As a result, teachers thought they understood the local standards policy as it pertained to their schools and students.

But Hill found that what teachers did not do was just as important. Teachers could not identify arguments or inconsistencies among their sources (state and local materials) and/or to discuss instruction in light of what the state and local policy intended (p. 298, 299). Using language, words, and meanings as being socially constructed as the base for her analysis, Hill argues that the specific words and context of the standards had a specialized meaning for the policymaker community that differed from the local teachers and their community (p. 290). Although teachers discussed components of the reform and the standards together, using available resources, they lacked the necessary discourse – that of the policymakers – to be able to make sense of the policies. Furthermore, teachers' sense making, or lack thereof, was due to their inability to hone in on their mathematical knowledge, including content, pedagogy, curricular knowledge of mathematics and the language that pertains to each genre. For example, when discussing

fourth and fifth grade standards the teachers talked about using certain worksheets and manipulatives rather than discussing various instructional approaches, students' level of engagement, and achievement outcomes. Even when the teachers discussed instructional practices they did not make distinctions between the problem centered, constructivist mathematics promoted by the state or teacher-supplied mathematics promoted by district-adopted materials (p. 299). Hill concluded that these teachers' lack of specific pedagogical knowledge, practices, and the language and meaning that support it prevented them from coming to an agreement on sense making both individually and as a group.

Conversations with colleagues are one type of opportunity to learn about and make sense of math reform (Cohen and Hill, 2000; Coburn, 2001; 2005; Coburn and Russell, 2008; Little, 1982; Little, 2003; Hill, 2001). In their quantitative study Cohen and Hill (2000) surveyed nearly 600 elementary school math teachers about their teaching practices and their opportunities to learn about current instructional policy. Most teachers reported they had their students work individually or practice computational skills on a daily basis. They also used the textbook more than 30% of the time as their main resource for classroom instruction. Cohen and Hill refer to these practices as components of conventional mathematics practices. More than 70% of teachers reported that they have their students make conjectures, discuss different ways to solve problems, and work in cooperative groups to solve math problems at least once a week. These practices refer to framework practices.

Cohen and Hill argue that new instructional policy cannot truly be understood or enacted unless teachers are given opportunities to learn a new mathematics policy, how it relates to their school's context, and what it entails for their instructional practices. They found that the teachers' learning opportunities generally came in the form of professional development, such as specific content related workshops, general information about policy enactment, or seminars focused on student engagement and participation. These various learning opportunities not only seemed "to increase innovative practice but [also] to decrease conventional practice" (p. 310). In other words, teachers did not just add new practices to their existing ones, but rather they changed the heart of their practice and in some case their preferred teaching style. The authors contend that teachers' opportunities to learn about reform are based on their exposure to reform ideas, their exposure to specific content related to reform, the consistency between the two, and sufficient time to shift in the direction that the state policy envisioned (p. 300). Their findings make it clear that teachers' opportunities to learn about reform affect their knowledge and practice and therefore relate to the extent to which these practices align with what policy makers envisioned. Thus, it is crucial that teachers have access to the content of new instructional policy as well as the time to reflect and make sense of the policy in order to transform these ideas into classroom practices.

The literature on standards reform is clear: teachers need opportunities to learn about current policy and time to discuss and collaborate with teachers on what it means for their school and students (Spillane, 2005; Hill, 2001; Cohen and Hill, 2000; Coburn, 2001, 2005, 2008). In her study on reading policy reform, Coburn illustrates that

“teachers construct and reconstruct multiple messages about reading instruction in the context of their professional communities” as individuals and as a collective group (p. 145). The messages teachers received came from different sources and had different meanings. In some instances, “the specific messages about reading instruction embedded within [the] policy were not always the same ones to reach Stadel Elementary” (p. 150). Spillane refers to this as the telephone game, meaning that as messages traveled from district personnel to administrators to teachers the final message received differed from the original. Furthermore, teachers came into contact with various messages due to gatekeeping by the principal and reform leaders (p. 151). The principal chose what information to pass on to teachers as well as what information to let pass. Once the message had been received by teachers, Coburn argues that these collaborations and discussions among colleagues are shaped by two important factors – who is involved and the direction of the conversation.

The patterns of interaction among teachers, especially who is speaking with whom and in what capacity and context is important to consider when understanding teachers’ sense making of current policy. During formal interactions teachers were not always paired with like-minded individuals. On the other hand, during less formal interactions teachers tended to seek out individuals who shared their teaching worldviews. The nature of the conversation is the second factor, “specifically the extent to which conversations are structured to provide conditions for engagement and reflection” (p. 152). For example, one small group of heterogeneous teachers spent limited time discussing the reading series because “they felt it did not fit with the

structured reading instruction in their reading groups (p. 157). The nature of that conversation went virtually nowhere, taking little direction toward the intent of the policy, and had little to no depth in constructing teacher knowledge of the new reform. In summary, Coburn (2001) shows that teacher sense making lies in their learning opportunities for meaningful collaboration.

In contrast, Hill (2001) and Coburn (2001) point out that mere opportunities to learn are not enough. These opportunities need to be centered on specific goals, content oriented, based on instructional practices, and rich in meaning and purpose (Coburn, 2001, p. 158). Unfortunately, such knowledge does not always translate into reformed instructional practices. In fact, teachers may feel they are taking a step backward when it comes to being creative and innovative in the classroom. Spillane (2005) and Cohen and Hill (2000) show that districts and schools who support teachers' opportunities to learn have practices that adhere to the intentions of policymakers. These opportunities tend to come in the form of district and school allotted time to collaborate with colleagues and professional development.

Professional Development and Standards Reform

In order to effectively and systematically implement the CCSSM, teachers need to come to know what the Common Core standards are, what it requires of them as learners and teachers, and how to create ways for students to actively engage in classroom practices in order to connect with the goals of the CCSSM. Many scholars view professional development as a possible means to increase knowledge among teachers, especially during times of curricular reform (Desimone, 2009; Borko, 2004). Some

scholars define professional development as any situation where teachers are learning, which can take place formally or informally in the hallways, in the classroom, in a school community, or at an educational workshop (Cohen and Hill, 2000; Borko, 2004). Putnam and Borko (2000) state that the most crucial form of professional development and teacher learning occurs in one's own classroom. I follow Little (1987) in understanding/defining professional development as any activity that allows for faculty and staff to improve their performance or role in the classroom, school or district. Furthermore, I interpret these activities to include offsite institutes to district promoted professional development seminars to program training to informal conversations teachers have among colleagues. I collectively refer to these activities as professional learning opportunities.

Putnam and Borko (2000) argue that teachers learn best when learning is situated, social, and distributed. Situated learning focuses on where knowledge takes place, such as in a teacher's classroom during instruction, at a formal professional development seminar, or in the hallway discussing student assessment with colleagues. Situated learning goes beyond learning in general and focuses on the specific situation in which it occurs. Informal conversations with colleagues are just as important as formal discussion in meetings. More specifically Putnam and Borko state that "interactions with the people in one's environment are major determinants of both what is learned and how learning takes place" (p. 5). Lastly, they argue that together people learn more and have a deeper knowledge when information is shared and co-constructed.

Coburn (2001) furthers this argument in her study of teachers and their sense making of a new reading policy arguing that teachers' various social networks influenced their sense making. Teachers and administrators at Stadele Elementary participated in a reform program where they "develop[ed] standards and grade-level indicators for reading and assess[ed] student progress toward meeting the standard in reading comprehension" (p. 148). Teachers discussed their understandings of the reading policy formally during district and school level meetings and also informally during interactions with colleagues. During more formal interaction teachers found themselves discussing the reading policy with colleagues who may not hold their same beliefs on student learning and teaching practices. This made conversations, agreement, and a collective understanding difficult to achieve. Less formal interactions fared differently. Teachers sought out likeminded individuals to share their concerns with and to help make sense of messages they received on the reading policy. In other words, "because different groups were composed of different teachers with contrasting worldviews, preexisting practices, and shared understandings, teachers in different formal and informal groups interpreted and actualized messages from the environment in substantively different ways" (p. 157). These interpersonal interactions and informal conversations with others helped guide teachers' knowledge construction. Coburn (2001) and Putnam and Borko (2000) argue that one's sense making is shaped by who one interacts with, how often and to what extent these interactions take place, and the content being discussed. The situations in which colleagues collaborate are critical during times of curricular reform, such as with the CCSSM.

Learning opportunities are seen as most effective when they are contextual and collaborative. In his study of a large urban school district, Scribner (1999) found that teachers were motivated to learn based on their content knowledge needs, pedagogical skills deficit, challenges to classroom management, and noticing gaps in student-centered knowledge (p. 246). Teachers collaborated on the aspects that most concerned their classrooms, students, and personal need to be more informed. Therefore, the discussion and activities that followed were based on their individual and collective needs and were contextual in nature. Scribner notes that collaboration does not come naturally to all teachers. It is necessary to create a safe environment for teachers to agree and disagree on issues, to encourage participants to listen, and foster a commitment to help each other learn “both intellectually and in their teaching practice” (Koellner-Clark and Borko, 2004, p. 223).

Community building, collaboration, individual and collective learning, and context are components of sense making for teacher learning. However, teacher knowledge should not be dormant and short-lived. Teacher learning and all professional development, regardless of how one defines it, should be on-going and continuous (Abdal-Haqq, 1996; Ball, 1996; Putnam & Borko, 2000; Little, 1984; Scribner, 1999; Vescio, 2008; Wilson and Berne, 1999). Ball (1996) stresses the importance of constant reflection and follow-up activities, such as long-term support or even on-going interaction with colleagues as part of professional development (p. 501-502). These opportunities to continue teacher collaboration, discussion, and expand one’s thinking allow for increased knowledge building and refine one’s understanding of complex

issues, which is the ultimate goal of professional development (Hawley and Valli, 1999). Continuous professional development focusing on the implementation and understanding of the CCSSM is key to building upon teacher knowledge. Teachers are not going to be able to alter their beliefs or attitudes towards classroom practice simply because curricular reform is in place (Schoenfeld, 2011; Richardson, 1996; Cohen, 1990). There needs to be constant revisiting of these ideas for teachers to truly gain valuable insight and knowledge of the CCSSM.

Hawley and Valli (1999) found that there are eight characteristics of effective professional development. Sandholtz and Scribner (2006) unveil how one school district is striving to adhere to the most effective aspects of professional development actually exerted too much control. On the surface, it seemed as though the school district served to provide professional development for its teachers in order for them to be an integral part of developing district standards on mathematics and literature. These professional development sessions and other meetings focused on student achievement, teacher involvement, continued for more than three years, and were rich in information (Sandholtz and Scriber, 2006). In these sessions and meetings teachers compared student assessment scores, revised standards, and discussed ways to improve student learning.

On the surface, it seemed these attempts adhered to the characteristics detailed by Hawley and Valli (1999). Through their detailed analysis Sandholtz and Scribner show that the actions of the school district actually followed closely with more traditional approaches to professional development rather than to those characteristics presented by Hawley and Valli (1999). In their attempt to be more inclusive the district actually

yielded far too much control. The district chose to develop their own standards rather than adopt state standards, to devote all professional development time to standards and assessment creation rather than include curriculum development and instructional strategies, and develop model lessons for teachers to use in the classroom rather than rely on teacher expertise and experience (p. 1113). For the district, inviting teachers to provide their thoughts on the standards was a way to create teacher buy-in. On the other hand, for teachers it actually allowed them to feel their input was not valued because their professional knowledge, experience, and creativity were not utilized in other aspects of schooling.

In order for the CCSSM to be effectively and systematically implemented into the classrooms, teachers need to have substantial, deep, and a thorough understanding of the direction, purpose, goals, and meaning behind them and be given the support to do so. Support comes in the form of various learning opportunities for teachers to involve themselves, such as time to plan, discuss, and reflect with colleagues; engaging with standards reform and policy through formal meetings; and using classroom practices to develop further insight into how to connect the intentions of the standards with learning in the classroom. These learning opportunities cannot occur in isolation, but rather need to continue, evolve, and constantly be revisited, revised, and reused. This understanding can only come to fruition if teachers are given ample opportunity to connect their teaching practices, beliefs, and their current knowledge with new knowledge of the CCSSM so it becomes embedded in their teaching practices.

Study Design

This study used qualitative methods to examine how intermediate (Catholic) and middle school (Catholic and public) math teachers understood teaching and learning as they discussed the CCSSM and implemented the CCSSM in their classrooms. Specifically, I used a case study methodology (Yin, 1994) to view mathematics teachers' access and understanding of the CCSSM. I paid particular attention to the discussions, collaborations, and conversation the teachers had with others and to their teaching practices in the classroom to answer the following research questions:

1. How do teachers understand the Common Core State Standards for Mathematics. What informs these understandings?
2. How are the Common Core State Standards for Mathematics being implemented by teachers?
3. How do these understandings shape teachers' practice in math instruction in classrooms?

Site Selection

Catholic School: Junipero Serra Parish School

The literature on teacher learning and sense making suggests a gap in understanding of how and to what extent standards reform informs and shapes the knowledge and classroom instruction of Catholic school teachers. Principals, teachers, and other educators in Catholic schools are not required to adhere to any district, state, or national policy on curricular reform, content standards, or classroom instruction to the

same extent as their public-school counterparts. Public schools may be given additional funding from the state to use toward implementation, while Catholic schools are not given funding from the state nor do they get additional funding from their local archdiocese to ensure such implementation. Moreover, Catholic school teachers and their respective school sites are not under any local, district, or state pressures to implement such educational reform. Yet some deaneries, schools, and teachers choose to do so. In other words, they are free from specific restrictions and local government pressures that oversee curriculum and instruction (McNeil, 2000) such as benchmark assessments, state testing, and pacing guides. If they choose to adhere to the current reform they may do so partially or completely, and under limited government control.

In the United States, there are more than 7,000 Catholic elementary and secondary schools with more than 135,000 teachers and well over 2,000,000 students (<http://www.edreform.com/2012/04/k-12-facts/>). This is a large subgroup of educators and students whose knowledge, experience, and perspective have not been widely considered when it comes to standards reform. Moreover, most previous research on standards focuses on a single grade level (i.e. second or fifth grade) or on a range of grades, such as middle school (6th – 8th) or high school (9th – 12th) (McAffrey, Hamilton, Stecher, Klein, Bugliari, and Robyn, 2001; Reys, Reys, Lapan, Holiday, and Wasman, 2003). There is a gap in the research that covers private schools and their experience with curricular reform and instructional policy, especially in grades K-8. This case study on the CCSSM addresses that gap.

The Catholic school portion of the study was conducted at a K-8 private Catholic school in Southern California. There are more than 600 Catholic elementary schools serving almost 160,000 students in California. Choosing the school to conduct my research was based on local public school district implementation of the CCSSM and conversations with private school principals. Public school districts across the state are seeking out ways to provide information to their teachers about the Common Core State Standards for Mathematics through professional development, district memos and paperwork, and encouraging teachers to take advantage of electronic resources through the California Department of Education. Private school teachers do not necessarily have the same access to standards information because private schools are not required to adhere to state or local standards policy in the same way that public schools are. Some private schools that work closely with local school districts are the exception.

In order to secure a prospective Catholic school for my research site I emailed and/or called five school principals to discuss my research. Three of the five school principals returned my email and/or phone calls. During the 2013-2014 school year, I met with three Catholic school principals. The three schools are located within a 10-mile radius of each other, yet have different demographics and varying resources. I spoke with the principal of a prospective site twice, but was informed the school had limited resources and was not intending on “rolling out” the new standards until the Archdiocese required them to do so. Furthermore, the principal declared that the school was focusing on improving their language arts program and that was his priority at the time. Meetings with another principal occurred during the same time frame. She informed me that her

school was going through a lot of teacher turnover and as a result she wasn't sure that her teachers would be a good study. In addition, she stated that the school and their surrounding sister schools were starting a professional learning community and as a result she wasn't sure how much more she wanted to put on her teachers.

Junipero Serra Parish School¹ was one of the three potential school sites. Prior to the study, I met with the principal three times. During these conversations and meetings, I found out that school had partnered with the local public school district in working with teachers and encouraging them to further their education, to access district files in order to fine-tune their instruction for all students, and to expand their content, pedagogical, and student learning knowledge through attending district and community sponsored professional development. During my time with this principal I also came to learn that her school was to adopt a new Common Core textbook series for both mathematics and language arts for the following school year, 2014-2015. I also learned that her school, along with nine other grade schools in the local deanery, were committing to a new professional development program focusing on professional learning communities. It was these circumstances of local public school district implementation and partnership, adoption of a new textbook series highlighting the CCSSM, development of a professional learning community, and principal willingness that ultimately led to choose Junipero Serra Parish School (JSPS) to conduct my study.

¹ All names of places and people are pseudonyms.

Junipero Serra Parish School was founded by the Sisters of the Holy Cross in the mid-1940s when its doors opened to almost 300 students in grades one through eight. In the late 1970s, the school added a kindergarten class. Two decades later, the order of sisters who founded the school withdrew their involvement and in the early 1990s the first lay principal was appointed to continue the school's mission of providing a meaningful Catholic education and promoting academic excellence for each student. During the year of this study (2014-2015) Junipero Serra enrolled students in transitional kindergarten through the eighth grade (TK-8) with one homeroom teacher for each grade and three auxiliary teachers. These supporting teachers include a full-time science teacher, a full-time middle school math and religion teacher, and a part-time middle school math teacher.

Conducting my study at a Junipero Serra Parish School, a school that registers students from TK-8, allowed for unique teacher interaction and collaboration that may not take place solely at an elementary, middle, or high school. These unique interactions and collaborations occurred during faculty meetings, subject level meetings, and informally throughout the day before school, during recess, lunch time, and teachers' free periods. Public elementary, middle, and high school teachers do not work with such a range of grades that allow for such unique interactions on a daily basis. On the other hand, the public school has more access to added resources, networks, and professional development, which allows for additional and different interactions with other professional learning communities that the Catholic school may not (see detailed information below regarding the public-school focus of this study).

By following Merriam's (2009) view of data collection I gathered data not as something waiting to be collected, but rather as something that is to be collected systematically and methodically based on one's research questions, theoretical orientation, the problems and purpose of the study and by the phenomenon being studied. In doing so, the fieldwork I examined assisted in getting to know how the participants came to know the CCSSM and how they made sense of the information, both individually and collectively, surrounding their use and implementation in the classroom.

Public School: Alberta Middle School

The second site for this study was a public middle school. I sought out potential middle schools by sending emails to the superintendent or assistant superintendent of fifteen school districts in Southern California that highlighted the implementation of the CCSSM on their district website. I sent out additional emails during the spring and summer of 2014. Five of the fifteen districts did not respond to the initial emails, to follow-up emails or to phone calls. An additional five districts declined interest in the study for reasons such as insufficient funds and/or staff to support such research, lack of time to devote to such research, or their teachers' having too much on their plates. I had further contact with the remaining five school districts. In summary, two of the fifteen school districts contacted for the CCSSM research study were potential public school sites.

Once I received approval from each district I contacted individual school sites and met with principals and teachers to inform them on their potential involvement in the study in order to select a final site. Each of these sites appealed to me as a potential site

for the study because of the interest, willingness, and openness of the teachers and principal. Ultimately, I chose Alberta Middle School (AMS) as the public school site for this study due to its similar student demographic as the Catholic school, the fact that the math teachers openly stated how often they collaborate with each other, its adoption of a new CCSSM aligned textbook series, and the professional development agenda the school had for the 2014-2015 school year, which included three mini professional learning seminars on the CCSSM and textbook publisher training sessions.

Alberta School was established in the late 1890s as part of the Woodbridge School District and included grades one through eight. As the surrounding cities and community developed Alberta School expanded and separated from the Woodbridge School District in the mid-1900s and ultimately joined the Wisecreek School District in the mid-1960s. It was then that the school divided into an elementary school and a middle school. The elementary school, which is since under a different name, houses students in grades K through 6 and the middle school, known as Alberta Middle School (AMS) since the late 1990s, enrolls students in the seventh and eighth grades. During the year of this study (2014-2015), Alberta Middle School enrolled 340 7th grade students and 325 8th grade students. As a result, there are two math teachers for both the seventh and the eighth-grade classes.

The Wisecreek School District is known throughout the state of California as a leader in educational planning, innovation, and academic programs. The school district has received local and national recognition for its outstanding programs, community relations, and staff development (district website). Conducting the public-school

component of my study at Alberta Middle School allowed for continued exposure to these programs, community and parent outreach, and professional development. One of these highly-recognized programs was a year-long seminar put together for parents on understanding and helping their children with the Common Core State Standards for Mathematics. These seminars were presented to the parents and outside community by the principal and the math coordinator. Administration and math department collaboration allowed me additional insight into their understanding of the CCSSM.

The best way to get at teacher understanding of the CCSSM was to investigate what the CCSSM are and how participants interpreted them. I also wanted to understand the processes by which the teachers came to make sense of the CCSSM both individually and as a collective group of teachers (Coburn, 2001). Conducting a qualitative case study allowed me to be close to the participants in order to gather information through interviews, observations, and participation in their world through attending various events, such as faculty and subject level meetings, training sessions and professional development seminars, and other school day occurrences, such as assemblies and classroom interactions. Conducting a qualitative study afforded me close contact, connection, interaction and communication with the participants (Freeman, deMarrais, Preissle, Roulston, and St. Pierre, 2007). The mere fact that “the data [was] collected in close proximity to a specific situation, rather than through the mail or over the phone” emphasizes the importance of understanding the phenomenon from the perspective of the actors involved (Miles and Huberman, 1994, p. 10).

Sample selection of Participants

The selection of the site participants for the public school was unproblematic, while the private school required more information (see Table 3.1 for a list of all participants). All of the math teachers at Alberta Middle School welcomed the opportunity to be involved in my study on teacher understanding and the CCSSM. The four math teachers agreed to be a part of the study. Initially, Mrs. Hastufah agreed to be interviewed, but did not want to be observed in her classroom teaching. After our initial interview, she changed her mind and welcomed me into her classroom. The other three math teachers agreed to be interviewed and observed and offered any additional information that was needed. I interviewed the nine teachers who taught math at JSPS. This includes any homeroom self-contained teacher and middle school teachers who teach two to three subjects. Of those nine teachers, five of them stated they felt they were implementing the Common Core to some degree, but didn't know to what extent and if they were doing it correctly. As a result of those initial interviews I observed five of the nine math teachers.

Research Design

Since my qualitative case study was on the CCSSM and teacher sense-making I focused on math teachers rather than on students (Spillane, 2005; Cohen and Hill, 2000; Cohen, 1990; Huntley, Rasmussen, Villarubi, Sangtong, and Fey, 2000; Coburn, 2001, 2005, 2008) I was interested in how the teachers make sense of and access the CCSSM. As a result of classroom observations, I observed the teacher and the students as they taught and learned math.

Table 3.1 Participant Information

| Alberta Middle School (pubic school) | Subjects Taught | Years Teaching | Years at Current Site/Position |
|---|--|-----------------------|---------------------------------------|
| Mrs. Mackenzie Isaacs | 7 th Grade level math 7 th Accelerated math | 35 | 8 |
| Mrs. Neetara Hastufah | 7 th Grade level math 7 th Accelerated math | 33 | 15 |
| Mrs. Felicia Evans | 8 th Grade level math 8 th Accelerated math | 20 | 20 |
| Mrs. Zorinda Pavey | 8 th Grade level math 8 th Accelerated math | 9 | 3 |
| Junipero Serra Parish School (private school) | Grade or Subjects Taught | | |
| Mrs. Maria Lechuga | K | 15 | 1 |
| Ms. Julia Anderson | 1 | 1 | 1 |
| Ms. Leonada Cheng | 2 | 6 | 6/3 |
| Mrs. Wendy Barclay | 3 | 14 | 14 |
| Mrs. Georgia Perrault | 4 | 14 | 14/3 |
| Mrs. Jackie Eckart | 5 | 25 | 12 |
| Mrs. Vicky Brown | 5,7 Math 6-8 Grammar | 4.5 | 4.5/1 |
| Mr. Don Mejia | 6-8 Math 6-7 Religion | 7 | 7/3 |

Participant Interviews

Interviews with educators contributed in understanding how each teacher made sense of the standards, both individually and collectively. At Junipero Serra Parish School initial participant interviews included the five self-contained classroom teachers who teach math to their grade level students (K – 4). I also interviewed the teachers who teach math to the fifth grade (2 teachers) and sixth through eighth grade (1 teacher). In addition, I interviewed the principal of JSPS, who is the sole administrator for the school. At Alberta Middle School I conducted initial interviews with the four math teachers,

which include two seventh grade and two eighth grade teachers. I conducted a series of unstructured and semi-structured interviews with the participants involved in getting to know about their sense making of the CCSSM since it is important to get to know participants' lived experience through difference types of interviews (Seidman, 2006, p. 9). Unstructured interviews tend to evolve rather than be planned and therefore allowed the participant an opportunity to discuss what he or she felt was important to them regarding their teaching, the standards, the school, the students, and even themselves (Bailey, 2006). Furthermore, participants had the opportunity to express themselves through informal interactions. Spontaneous daily interactions, conversations, and occurrences lend themselves to gather data. These instances were a great source for conversing with teachers and gaining a glimpse into their perspectives. Lastly, participants tended to be more at ease with informal conversations that took place during their daily routines rather than formal, set aside time for interviews; therefore "on the fly" conversations were also documented. At times, small group interviews were conducted due to teacher request, interest, and topic.

The semi-structured interview conducted ensured that certain topics were brought up and explored by the participant. This allowed me to decide how deeply to engage with any one particular issue or how broadly to cover a range of issues (Mason, 2002, p. 72). I used these interviews as a way to decide where else to seek out information and from whom. As a result, the foci of these interviews were the first two of my research questions: (1) How do teachers understand the Common Core State Standards for Mathematics? What informs these understandings? and (2) How are the Common Core

State Standards for Mathematics being implemented by teachers? During these interviews, I expected that I would also obtain data on the ways, teachers' knowledge of the CCSSM is manifested in classroom instruction, if at all. The initial interview I conducted with each teacher centered on getting to know their route to their current position and a little bit about their educational experiences the past couple of years. Some initial interview questions were:

- 1) How is it that you decided to become a(n) (elementary, middle school, math) teacher?
- 2) Tell me about your teaching experiences prior to your position at this school. How is it that you came to teach at this particular school?

After the initial interview with all of the teachers I used the data to conduct follow up interviews some of the teachers. This decision was based on teachers' responses to some of the initial interview questions, their involvement with professional development or math training of any kind beyond the professional learning communities set up by the Archdiocese, and casual conversations about the CCSSM which they brought up. Follow up interviews were conducted to understand teachers' interactions with colleagues throughout the school day and insight into teachers' access to the CCSSM and what they know about the CCSSM. These interactions took place formally or informally with other teachers, administration, or staff members, such as in faculty meetings, professional development sessions, during hallway chats, or lunchroom conversations. The idea was to get the participants' perspective of the content, meaning, purpose, and result of these conversations. I also intended to hone in on how teachers access and makes sense of the CCSSM. Therefore, follow up interview questions included asking participants to

elaborate on various colleague interactions and conversations, discussing faculty meeting and grade level meeting items, sharing experiences occurring in the classroom, and getting to know about any professional development activities that the teachers have been involved during the school year. As a result, I conducted five follow-up formal interviews at Junipero Serra Parish School and four at Alberta Middle School. Additional interviews included end of the year interviews and post professional development or training interviews. Besides interviews another way data was gathered in which I gained thorough understanding of participants' perspective was through participant observation.

Participant Observation

Besides interviews, observations were another way I collected data in the field in order to take part in the lives, happenings, experiences, and events of the people I studied (DeWalt and DeWalt, 2010, p. 1). Just like interviews and other data collection methods, the events I observed had a purpose and were based on my research questions, theoretical orientation, and ultimate goals of the study (Lichtman, 2012, p. 236). Initially I intended to observe in all of the classrooms in which mathematics took place (see Table 3.2 for interview and observation information). During the course of the study I only observed in a few of the self-contained classrooms. I observed mathematics taking place in the second, third, and fourth grade classrooms during the time the teachers set aside for mathematics since it wasn't the same schedule every day. I also observed the two seventh grade math teachers during their math class. One of the teachers taught 7th grade math and the other teacher taught what JSPS refers to as 7th grade advanced math. The number

of classroom observations is listed in the table below. During these classroom observations, I looked for key components of the CCSSM, such as an emphasis on

Table 3.2 Participant Interviews, Observations, and Professional Development

| Alberta Middle School (pubic school) | Number of Interviews | Lessons Observed | PDs Participated |
|---|-----------------------------|-------------------------|------------------------------|
| Mrs. Mackenzie Isaacs | 4 | 9 | 2 |
| Mrs. Neetara Hastufah | 2 | 3 | 3 |
| Mrs. Felicia Evans | 3 | 6 | 3 |
| Mrs. Zorinda Pavey | 3 | 6 | 3 |
| Junipero Serra Parish School (private school) | Number of Interviews | Lessons Observed | PDs/PLCs Participated |
| Mrs. Maria Lechuga | 1 | 0 | 4 |
| Ms. Julia Anderson | 1 | 0 | 4 |
| Ms. Leonada Cheng | 3 | 6 | 3 |
| Mrs. Wendy Barclay | 3 | 3 | 4 |
| Mrs. Georgia Perrault | 3 | 6 | 3 |
| Mrs. Jackie Eckart | 2 | 0 | 4 |
| Mrs. Vicky Brown | 3 | 6 | 3 |
| Mr. Don Mejia | 4 | 8 | 3 |

classroom discourse, engaging in the Standards for Mathematical Practice, and other instructional strategies that align with the CCSSM. These observations allowed me to witness how, if at all, and in what ways the teachers enacted their knowledge of the CCSSM in classroom practice.

Furthermore, I observed faculty meetings. JSPS had faculty meetings every Friday in the afternoon for approximately two and a half hours. Some of those meetings had specific foci, such as faith development, professional learning communities as a deanery, school procedures, calendar items, collaborating with the local public school

district, and grade level deliberations. For the private school, grade level deliberations were conducted in groups (K-2, 3-5, and 6-8). I observed eight faculty meetings at JSPS. The math teachers at AMS met every other Friday after school for about an hour for their math department meeting. On the off-Fridays, the teachers met as a middle school team to discuss district and school specific issues. The math department meetings included time to focus on student achievement, parent communication and information, school issued benchmark tests, student assessment, the standards for mathematical practice, and mini professional learning seminars. I observed nine faculty meetings at AMS. Attending weekly faculty meetings gave me opportunities to hone in on the information and resources available to the participants regarding the math standards. Observing during grade level and subject matter meetings provided insight into how, if at all, math teachers made sense of the CCSSM in light of other subjects and made connections with the curriculum both vertically and laterally (Shulman, 1986). Overall, during these meetings I focused on conversations about access to the CCSSM, teacher instructional practices, classroom interactions and experiences, and how the teachers interact with each other in order to makes sense of this information.

I also observed professional development sessions on the Common Core State Standards for Mathematics that the principal or the teachers attend. Taking part in any professional development sessions either in house or at an alternate location allowed me to have a front row seat on what information the participants are exposed to collectively and assisted in putting together follow up interview questions and conversation starters. There were two offsite professional development sessions which a couple of the

private school teachers attended as well as three professional development sessions that were led by someone from the Archdiocese. For the public school, all three professional development sessions were onsite and led by either the math coordinator or a district math coach. During these professional development sessions, I looked for what information was given to the participants, such as grade level standards, various resources including websites, references or names of educational professionals to network with, and example activities to use with students. I also looked for how participants interacted with each other to make sense of this information by focusing on how they converse with each other and the topics and depth of their conversation with each other and the facilitator. Finally, I looked for how the facilitators provided assistance to further the understanding of the teachers' or principal's knowledge of the CCSSM through allowing participants and teachers to engage in critical discussions, analyze their teaching practices, and connect their experiences and classroom context to what is being presented and discussed during the professional development. I observed four professional development meetings for the teachers at JSPS and three for the math teachers at AMS. Together all of these aspects of professional development provided me with information to get at how teachers are making sense of the CCSSM.

Document Collection

A final way I collected data was through document collection (Bogden and Biklen, 2007; Merriam, 2009). I collected such documents as paperwork and notes from faculty meetings, school memos and letters; pages from both school's website; any material disseminated during professional development sessions, and paperwork and

other materials from lesson plans. Collecting paperwork and minutes from meetings allowed me to look into what teachers and staff discussed in regards to the standards and instruction and how they made sense of the information they receive. More specifically I looked to see if anything related to the CCSSM and how much time was spent on these items. I knew when I saw CCSSM references when I noticed information on standards, curriculum, achievement, assessment, instructional strategies, student collaboration, student participation, and teacher input on these matters. Coburn (2005) argues that principals are themselves sense-makers when it comes to educational policy. Therefore, gathering school letters and memos provided me with a deeper look at what the administration portrayed as being important in regards to the school. When looking through the school's website I made note of anything that mentioned the CCSSM. Obtaining paperwork from professional development meetings allowed me to get at the information teachers received from others. Lastly, collecting lesson plans and materials helped me get at the instructional intentions of teachers and how they envisioned using the CCSSM in their classrooms.

Data Analysis

Interviews

All interviews were recorded and transcribed and all observational and field notes were handwritten then typed. I analyzed these transcripts, field notes, and other gathered documents looking for common themes using the six-step strategy suggested by Lichtman (2010). First, through careful reading of all texts I created initial codes and then revisited these codes to eliminate, rename, or clarify terms. Next, I organized the

codes into categories at times using the code as the name of a category. This was followed by modifying the category list and revisiting on numerous occasions. Lastly, I organized the categories into meaningful concepts relevant to my study. Since the research study design is informed by *professional learning communities*, *teacher inventory* (knowledge, beliefs, and resources), and *metaphors* I looked for themes of: (1) reflective and interactive dialogue; (2) shared expectations, values, and norms; and (3) language comparing items or speaking about them in different terms. Examples of reflective dialogue included seeking out others to improve one's craft, acknowledging others' contributions to the field, and discussing school and classroom aspects that pertain to overall student achievement. Additional codes for professional learning communities included seeking advice from others and exploring others' experiences. Examples of shared expectations, values, and norms include "moving forward," "discussion on goals," and "common language, artifacts, styles, etc." Lastly, further codes for the use of metaphors included "connections to teaching," "student and teacher expectations/roles," and "classroom experience." I also looked for themes that described what teachers brought to understanding the CCSSM, such as their content knowledge and the ways they talk about math (Shulman, 1986), including procedural versus conceptual talk (Wu, 1999); specific math standards and concepts at each grade level, and particular standards for mathematical practices; beliefs and attitudes (Richardson, 1996); goals (Schoenfeld, 2011); and experiences (Cohen, 1990; Smagorinsky, 2004). Examples of such codes were "content knowledge," "pedagogy," "personal schooling experiences," "ways students learn," "teacher practices," and "time/money/resources."

Observations and Documents

I coded the information I obtained from my observations of various events using the same categories and themes. I looked at the sense making that teachers had about the CCSSM and how this might shape classroom instruction during lesson plan observations. A teacher's lesson plan and what played out during the course of that lesson helped me determine to what degree his or her instruction matched with the CCSSMM. What a teacher included or excluded helped me determine what resources from the toolkit teachers utilized or not and to what extent. In addition, I looked at the content of teacher instruction focusing on procedural and/or conceptual understanding of instruction.

The documents I collected, including lesson plans, school letters, website information, and professional development and meeting handouts not only provided information, but also gave me an idea of what was valued and important based on what was and wasn't included. I coded these documents in much the same way as the interview transcripts and observation notes in order to begin connecting themes and patterns that emerged. Based on recent studies on teacher sense making additional codes that were considered for document analysis were "teacher discussion/collaboration," "classroom instruction," "student expectations," and "student understanding" (Coburn, 2008; Spillane, 2005; Coburn, 2005).

All stages of data analysis consisted of decision making. As noted by Miles and Huberman (1994), the data analysis process of this research study was ongoing and continuous. Data analysis is not done just post collection. As a researcher, I constantly

made choices about what to collect, when, how often, made connections with what had been collected in a systematic way, and drew conclusions from the data. Freeman, deMarrais, Preissle, Roulston, and St. Pierre (2007) believe that it is crucial to have “systematic and careful documentation of all procedures [in order to] provide a record for a researcher’s ongoing contemplation” (p. 26). They go on to say that a quality account “includes decisions that researchers make as they interact with those they study” (p. 27). Taking these concepts, analyzing them, revisiting them, and interpreting them in light of my theoretical and conceptual framework was also needed in order to continue to make sense of the material collected and to get a true sense of the perspective of the participants involved (Hammersley and Atkinson, 2007, p. 165). Data analysis was an ongoing process and occurred throughout the study. In the subsequent chapters, I discuss in more detail my main findings.

Chapter 4: AMS Math Teachers

Understanding the CCSSM as a Successful Jazz Ensemble

The math teachers at Alberta Middle School (AMS) were a team of collaborators. They spent time working with each other on lesson plans, analyzed student data, and found ways to improve their classroom instruction. In this chapter, I argue that the math teachers at AMS made sense of the CCSSM during their various opportunities to collaborate on important aspects of teaching, such as student learning and the use of different instructional strategies. These experiences revealed underlying beliefs these teachers have about teaching and learning when it comes to the CCSSM including that the subject of math is something individual learn, but is also something that individuals can learn together.

The math teachers at AMS collaborated in a variety of ways, including through district led professional development, during department and grade level meetings, and in their daily interactions with each other. Furthermore, the math teachers continued to develop student understanding of math concepts through collaborative groups and whole class discussions in their classrooms. The four math teachers at AMS, two seventh grade teachers and two eighth grade teachers worked together as a team, both in grade levels and as a math department and they expected and guided their students to do the same. Understanding the CCSSM as a *successful jazz ensemble* described the math teachers' collective understanding of the CCSSM.

Department Level

The math teachers at AMS collaborated on different aspects of teaching to get a better understanding of how their students learn. It was important for them to spend time discussing ways to enhance the learning of their students. They did this in a variety of ways. Vescio, Ross, and Adams (2008) argue that teacher collaboration should have a focus on teacher learning that is guided by student growth. They further state that it is imperative that team members take ownership of this collective learning by being decision makers and taking control of their own learning. Just as a successful jazz ensemble requires each individual to contribute and anticipate moves and changes from other members, the teachers at AMS worked hard as individuals to ensure their success. They also worked hard as a team to ensure learning took place—their own learning and the learning of their students, just like a successful jazz ensemble focuses on the group so the sound is cohesive, rhythmic, and in tune. Every month the math teachers participated in a department meeting to discuss various aspects of their teaching. During these meetings, the teachers discussed topics including student assessment data, providing more opportunities for student exploration, and encouraging each other to demonstrate the standards for mathematical practice in classroom instruction. The fact that the teachers met was not what made them collaborators: it's what they discussed, how they discussed it, and what resulted from the discussions. The math teachers at AMS collaborated for the benefit of their own learning, but also to ensure that their students would be successful collaborators and learners in their classrooms.

A clear example of when this collaborative learning took place was during two separate district led professional development (PD) meetings. During the 2014-2015 school year, the math teachers at AMS participated in two professional development sessions led by one of the district's math coaches. The first session was held in February 2015 and was about various ways to utilize collaborative groups in the classroom. The math teachers did not just participate in this PD, but rather they co-led it through their collaboration and discussions with each other. For example, the facilitator gave the teachers a mathematical task to do as a group, with each person having a specific role or responsibility, such as the recorder or the reader. The teachers worked on a problem involving three unknowns. They were to use the visual information to figure out who would win the third round in the tug-o-war. After working together as a collaborative group of students to solve the problem, the teachers spent a lot more time discussing their individual roles and responsibilities, in a way that would benefit their students in the classroom. I overheard the following take place among the teachers:

Excerpt 4.1: February 13, 2015
PD Observation

Mrs. Pavey (8th grade teacher): I see why you had us to do this. It gives us an idea of how students might work as a group or not, but also it helps us realize where and how we can scaffold if we've gone through it ourselves. I can see this even working with a small group or 2 or 3 students especially in your [looking at Mrs. Evans] class.

Mrs. Evans (other 8th grade teacher): That's true. Smaller groups work best for me. Then I am not sure how I would go about checking in with all of the different groups. There's too many to get to.

Mrs. Pavey: Well, I would suggest having smaller groups of students pair with another smaller group and that way they can kind of check each other. I know Mrs. Isaacs does that a lot with her classes.

This was an instance of the math teachers taking it upon themselves to extend the activity beyond its immediate use to help each other see how it could be used in their own classrooms. Once the activity had concluded, the teachers turned their attention directly to how to apply its use to the classroom and to find ways for it to benefit their students and each other.

A second component of the PD session included ways for the teachers to consider creating collaborative groups with their students. The facilitator showed two brief video excerpts of teachers demonstrating how they form groups in their classrooms along with a brief explanation of why they did so. One of the excerpts was of Mrs. Isaacs so the math teachers had more background knowledge beyond what they saw in the video. The other excerpt was of another teacher leader in the district, who taught at a neighboring middle school. The group watched the video excerpts and jotted a few notes. Once the excerpts concluded the facilitator asked the teachers to share some of the strategies that they noted. The math teachers discussed some of the strategies they witnessed and heard and went more in depth on how to use this information for themselves as individuals, as a collective team, and for their students.

Excerpt 4.2: February 13, 2015
PD Observation

Mrs. Hastufah: I like the rotation of the groups every so often. I can't have the same groups all of the time. They need to work with different people, right? Isn't that the whole idea?

Mrs. Pavey: You're right and that is the whole idea. I also think how you make the groups depends on what you want the groups to accomplish.

Mrs. Evans: What do you mean? You know how I make groups. I just have them either pick their groups or I have them pick members from different tables.

Mrs. Pavey: Yeah, I don't think that's always the best thing to do (laughing). Maybe that's why you don't have groups that much in your classes. I am sure Mac [Mrs. Isaacs] and I can help you with that. I have learned a lot about grouping from watching her and talking with her.

The excerpts above demonstrated that the math teachers at AMS constantly tried to help each other in various ways. During the PD on collaborative groups, the AMS math teachers took every opportunity to work with each other and to find ways to make each other better. The focus of this particular PD was to use collaborative groups in the classroom and for the most part teachers attempted to do so yet were still finding ways to improve the way they grouped students, but also in the productivity of their students. The AMS teachers worked as a team to ensure the success of each other. To connect back to the metaphor, the math teachers at AMS demonstrated a successful jazz ensemble by utilizing the strengths of the individual members and helped each other as a way to ensure their best possible sound or end result. Additional examples took place during another professional development observation.

Two months later the AMS math teachers took part in school sponsored pull-out day. A pull-out day is when teachers work on campus, but are not teaching in the classroom. Each teacher was allotted a substitute for the day in order to spend additional time preparing for state assessments, technology in the classroom, and pacing for the following school year. A component of their pull-out day included a PD session on mathematical discourse in the classroom. This session was facilitated by one of the math

coaches for the district. The facilitator stated that the objective for the session was for the teachers to review structures supporting student engagement in mathematical discourse when working in pairs, small groups, or in whole class discussion.

The math teachers watched a video of a middle school teacher using strategies to get the students talking with each other about the concept of the day. After watching the video, the teacher discussed some of the strategies they noticed and even commented on how they used some of those same strategies in their classroom. The teachers also took part in an activity themselves acting as students in a whole class setting. The facilitator acted as the teacher and demonstrated how the teachers could use some of the strategies to get their students more involved in discussion and gave them opportunities to express their thoughts. During this second activity, Mrs. Hastufah announced, “I see what the point of this is, but I’m sure you have done this before. I am not sure this is something that can be done so easily.” This comment immediately sparked a reaction from Mrs. Isaacs. She stated, “Then let’s do something about that. What do you say about us trying to do this right now ourselves? One of us leads it. Let’s take this a step further and do it ourselves.” Mrs. Pavey asked permission from the facilitator and the group performed a mock mathematical discourse discussion as they felt students would in their classes. Mrs. Isaacs stepped back from taking the lead. She allowed one of the other teachers to practice facilitating discourse in the classroom. Mrs. Pavey volunteered and the other four participants, including the facilitator, acted as the students in her class. A brief part of that scenario is detailed below.

Excerpt 4.3: April 15, 2015
PD Observation

Mrs. Pavey: Take a few minutes and write down which figure you think does not belong. Be sure to also include why you don't think that figure belongs. So, which figure does not belong and why?

Mrs. Evans: The trapezoid at the bottom left. The opposite sides, well both pairs of opposite sides aren't parallel like the other three and they are not congruent. In the other three both pairs of opposite sides are congruent and parallel, but that is not the case with the trapezoid.

Mrs. Pavey: Deb can you restate what he said?

Mrs. Isaacs: He thinks the trapezoid doesn't belong because they aren't parallel.

Mrs. Pavey: Is there anything you would like to add on?

Mrs. Hastufah: It has the most difficult formula for area. I forget what it is but I know it's the hardest one to remember.

Mrs. Pavey: Did anyone else come up with a different figure.?

Facilitator: The square. I would say that figure. It's the only one that is even. All four sides are the same length.

Mrs. Pavey: Can you add on to what she said or do you agree with her reasoning?

Mrs. Evans: I think it makes sense what she said. It's the square since all of the sides are the same length.

Mrs. Isaacs: That's exactly what I thought the square because all of the others all sides were not congruent. This is the only one that all sides are congruent.

The conversation above revealed the beginnings of true collaboration. Even though this was a mock activity, the teachers at AMS were focused on student success. This success was measured not in simply choosing a correct answer, but rather focused on the reason for choosing a particular shape. The CCSSM call for a shift in mathematical thinking. The process of getting an answer is just as important as the thinking and reasoning that

goes into getting that answer. The conversation was not about naming a shape or calculating its area or perimeter, but instead it was about coming up with an argument for choosing a shape that did not belong. DuFour (2004) states that true teacher collaboration places the focus on student learning rather than on what is being taught. DuFour goes on to further exclaim that collaborative conversations stay away from what may seem to be the easiest solution and really hones in on what is best for the students.

At this point the teachers stopped their role playing and started questioning each other on the point of an activity like this in the classroom setting. The facilitator also chimed in to lend her advice and experience. The teachers bounced some ideas back and forth and discussed how they could adapt something like this for their classroom. While the rest of the group discussed additional ways to modify this task for their students, Mrs. Isaacs and Mrs. Hastufah were engaged in a side conversation.

Excerpt 4.4: April 15, 2015
PD Observation

Mrs. Hastufah: But in math there is only one answer.

Mrs. Isaacs: Well, in this case there's not. That is the whole point. We want students to make a decision together because there is more than one answer. You may have done the calculation correctly, but your reasoning is completely incorrect. Or your reasoning may be correct, but your calculations were wrong. Which is better? Outside of math and school reasoning is going to be extremely important and that's what we want our kids to get.

Mrs. Hastufah: This kind of problem breaks you away from traditional thinking. This is the goal of Common Core; math is always going to be there. The precision part is always going to be there, but there are so many other factors that lead up to this. Like you said did we pick for the same reason? [referring to picking the shape that doesn't belong]

Mrs. Isaacs: Or can we by putting the two reasons together make it even stronger. That is one of the biggest things to get the kids to do. Just because we have different reasons for it that doesn't make one of us correct and one of us incorrect. Individually you don't have to decide whose answer is better. I could get the right answer in a calculation, but if my reasoning in choosing that calculation is incorrect even though it is a calculated correct answer, if the reasoning behind it is incorrect then it doesn't matter if I got the right answer. Then it's not really the right answer because all the way back here I had to make a different decision. Sometimes you do the calculation first and then you have to make a decision, so it's being able to value both parts, the calculation and the reasoning behind it.

Mrs. Pavey: I'm on board with that. It's true. How many times do we tell the kids it's not always about the right answer, but about the thinking and the expressions? Being reasonable is just as important. That's one of the biggest things I've learned with the Common Core.

Mrs. Hastufah: Well, that's the hardest thing for me. I just can't accept it so easily like the rest of you. It's math and numbers and that's it. Sometimes there really is just one answer. It's hard for me. You know that all. Just keep helping me with it and that's important for me. It's not easy for me but I do better with Mac and I together.

Mrs. Isaacs: Oh, don't worry about that. I'll make sure you get there too.

At first, Mrs. Isaacs and Mrs. Hastufah appear to be in different camps. Mrs. Hastufah argued that math has and should have only one answer, while Mrs. Isaacs claimed that was not always the case. She further stated there may be times when there are multiple answers and the most important thing that teachers can do for students was to get them to realize that one's approach, strategy, and reasoning outweighed a so-called correct answer. This is exactly what the CCSSM call for-critically thinking through problems and being able to strategize. Mrs. Pavey joined in and agreed with Mrs. Isaacs claiming that the thinking behind the choice is the most important part. The conversation that

ensued among these teachers said a lot about their approach to teaching in the classroom, how they work with their students, and most importantly in how they worked with each other. Although Mrs. Hastufah may or may not change her mind or be totally on board with multiple answer type activities or the idea of focusing on the reasoning of students versus the perceived correct answer, she was at least willing to listen to the other teachers and state that it was not something she had done, was used to doing, or saw herself doing often. Mrs. Hastufah's reaction was key to the collaboration of the teachers at AMS. She was a somewhat willing participant who welcomed additional guidance from her fellow teachers-thus keeping the conversation open and permitting continued discussion (Horn and Little, 2010).

Williams, Brien, Sprague, and Sullivan (2006) argue that there are many potential barriers that prevent true collaboration and community building among teachers. One of those barriers is the lack of consistency and coherence among teachers when it comes to teaching practices and instructional strategies to enhance student learning. They argue that misalignment among and between teachers when it comes to best practices is a major hindrance in a school's ability to establish an effective and goal-oriented PLC. Although the math teachers at AMS had different teaching practices they agreed on certain aspects of student learning. The collaborative nature of the teachers at AMS allowed them to come to a shared understanding of the usefulness of such activities in the classroom and to build on their understanding of potential areas to develop to ensure student growth.

Grade Level

Collaboration at AMS was evident in department meetings, but perhaps even more so it existed between teachers at each grade level. The two seventh grade teachers, Mrs. Isaacs and Mrs. Hastufah, worked closely together as did the two eighth grade teachers, Mrs. Evans and Mrs. Pavey. Although the two teams of teachers worked together, they focused on different aspects. The eighth-grade team focused on lesson planning, creating similar assessments and their results, and discussing two of the standards for mathematical practice, namely perseverance and modeling. Mrs. Isaacs and Mrs. Hastufah spent most of the time together discussing approaches to mathematical concepts, gauging student understanding of these concepts, and discussing the same two standards for mathematical practice of perseverance and modeling.

Horn (2005) discusses how teachers learn about classroom practice by the ways it is (and is not) represented in professional conversations. She refers to these representations as *replays* and *rehearsals*, both of which recount classroom events. Replays consist of detailed accounts of classroom events which student and teacher roles are often acted out by the teacher and rehearsal includes role playing as a what-might-happen scenario (p. 225). Both teams of teachers made use of *replays* and *rehearsals* in their interactions with each other and with the math department as a whole. These social interactions led to a shared understanding of teaching certain mathematical concepts, analyzing student data and determining student growth, and of the two standards for mathematical practice. The next few excerpts demonstrate the collaboration of the team of teachers on different aspects of their teaching practices.

Mrs. Evans and Mrs. Pavey spent a lot of their time focused on *how* to teach certain eighth grade concepts. One concept in particular was the standard 8.SP.4 (see Table 4.1), which is analyzing bivariate categorical data. Mrs. Evans admittedly had a difficult time teaching this concept because she had never taught it before. Mrs. Pavey provided some assistance because she had taught it before at the high school level and was going to teach it the following week. Mrs. Evans asked for some guidance.

Table 4.1 – Eighth grade content standard

| | |
|-------------------|---|
| Standard | 8.SP.A.4 |
| Domain | Statistics and Probability |
| Cluster | Investigate patterns of association in bivariate data. |
| Standard 4 | Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. |

Excerpt 4.5: May 8, 2015
Faculty Meeting

Mrs. Pavey: I remember doing that before well something similar. The kids have to know scatterplots and also bivariate data. It's not that confusing, but they sometimes can't wrap their head around it.

Mrs. Evans: I can't even do that. I know scatterplots since I have taught that a lot over the years, but the bivariate data that's new to me with the frequencies, like marginal and joint.

Mrs. Pavey: Do you want to spend some time going over it? I mean it could help me too since I'm teaching it next week too. How about you teach me like I'm one of your students and we'll see how that goes to start with?

Mrs. Pavey suggested she and Mrs. Evans engage in a rehearsal of events to help prepare Mrs. Evans for teaching the concept to her students (Horn, 2005). Mrs. Evans took about three minutes an example from the internet and briefly prepared (see Table 4.2).

Excerpt 4.6: May 8, 2015
Faculty Meeting

Mrs. Evans: [pointing to a two-way data table] Let's talk about what each part of the table represents. I can tell from the chart that the values going across represent how many boys and girls took each foreign language. What does vertical data represent?

Mrs. Pavey: It tells us the breakdown for each foreign language.

Mrs. Evans: Great. Now I know the totals are important and those are pretty easy to figure out, but what about the frequencies of those totals? That's what is messing me up. Maybe it would work better if you taught and I was the one learning, I was the student.

Mrs. Pavey: Okay we can do that. These individual numbers are important for the breakdown of each group or cell, but it is also important for us to have information for each of the total values. We want a better understanding not just of how many boys took a foreign language, but in comparison to the number of girls. That is what the relative frequency will

tell us, the amount in relation to another amount. Can you repeat that for me?

Mrs. Evans: The totals for each section are important, but it's also important to compare them to each other.

Mrs. Pavey: To find the frequencies of the total columns, which is also called the marginal relative frequency because we are comparing the margins of the table, the outer cells and the lower cells, we use a ratio as a comparison of two numbers.

Mrs. Evans: I can do that. There are 20 boys total and there are 30 girls total so that would be 20/30.

Mrs. Pavey: Not quite. We want to compare the total number of boys to the total number of students surveyed. Now that you know that, try again.

Mrs. Evans: The marginal relative frequency would be 20/50 or 40%.

Mrs. Pavey: Would you be able to tell me what percent of students took French?

Mrs. Evans: Okay, let's see. The total number of students who took French was 14 and there were 50 students in all. $14/50$ is 28%.

Mrs. Pavey: Okay as teachers now, what do you think about the different frequencies? Like what is the difference?

Mrs. Evans: Well I can tell the outside compares one variable to the total and the inside values compare two variables to the total.

Mrs. Pavey: And that's the whole idea with the bivariate tables and data. We want the kids to be able to read and analyze data and this model is one way to do that.

Mrs. Evans: That seems so much easier when you say it like that, like the big idea of it all. I was so caught up in the well each part and the terms that I guess I kind of lost that.

Table 4.2 – Two-way frequency table

| | Spanish | French | German | Total |
|--------------|----------------|---------------|---------------|--------------|
| Boys | 10 | 2 | 8 | 20 |
| Girls | 15 | 12 | 3 | 30 |
| Total | 25 | 14 | 11 | 50 |

Mrs. Evans and Mrs. Pavey engaged in role playing where one of them was the teacher and the other was the student. In a way, they acted out what might take place in a classroom setting as a class goes over an example or a problem. At first, Mrs. Evans played the part of the teacher. She soon realized that role wasn't beneficial to her learning-that she needed to play the part of the student and made that suggestion to Mrs. Pavey. They switched roles and Mrs. Evans became the teacher. It was in this setting that Mrs. Evans made sense of the standard, recognized the importance of the different

frequencies and their relationship to each other, and explained the difference between the two frequencies. Silverman and Thompson (2008) would call this rehearsal a series of pedagogical actions in the way Mrs. Evans and Mrs. Pavey developed their shared understanding of the purpose of standard 8.SP.4. The rehearsal of the standard allowed Mrs. Evans to get a feel of what things might be expected from a student perspective, such as restating someone else's ideas (mathematical discourse talk move, see excerpt 4.3), finding a calculation, and analyzing and interpreting data given a model representation. This excerpt clearly demonstrated the purpose of rehearsal (Horn, 2005). Furthermore, by discussing the standard in terms of what would a teacher need to know, do, and ask a student, Mrs. Evans and Mrs. Pavey engaged in pedagogical actions because they recognized the purpose of the standard, its importance to student growth and understanding, and connected it to their teaching practices (Silverman and Thompson, 2008).

The collaboration of the math teachers at AMS can be described as pedagogical actions. Silverman and Thompson (2008) state that a pedagogical action takes place when a teacher puts him or herself in the place of a student and attempts to examine the mindset, disposition, or thoughts that a student would need to proceed with a mathematical item. Furthermore, a teacher would have to think about things that a student would do, both logically and illogically in order to reflect on mathematical concepts. Silverman and Thompson refer to this as reflective abstraction. The math teachers at AMS found ways to collaborate with each other through the use of pedagogical actions and reflective abstraction.

All four math teachers, both at their grade level meetings and as a department discussed strategies they used in class to help students make sense of problems (SMP1). The department as a whole decided early in the year that would be one of their foci for the standards for mathematical practice. As a way to address this need the teachers decided to use the strategy of annotating to help get the students to make sense of problems. Annotating involves underlining important terms, highlighting definitions or meanings, and/or otherwise signaling where to find important information in text. The students have experienced this strategy in other subjects, namely English, Social Studies, and Science. The collaboration on annotating developed as the year progressed. A reason to use annotation as a teaching strategy is to help provide students an “in” to a problem or task. By annotating, students visually see that they know something about the problem before they get started. The math teachers at AMS equated this strategy to the first standards for mathematical practice – making sense of problems and persevering in solving them (SMP1). At first the teachers discussed how to get the students to annotate. Their solution was to model annotation in class as often as possible so the students had examples to refer to when necessary. This progressed into conversations about getting students to think and verbalize their thoughts rather than simply underlining text. The following dialogue transpired during a math department meeting in mid-December 2014.

Excerpt 4.7: December 12, 2014
Department Meeting

Mrs. Evans: This annotating this isn't really happening in my class as much as I would like. I mean it's happening I'm just not sure it's really happening so that it helps.

Mrs. Isaacs: Okay so when it is happening what is happening?

Mrs. Evans: Well, they, we go through the word problem or even the directions sometimes and they tell me what is important.

Mrs. Isaacs: So how do you know what they are thinking? Because that's what it really comes down to. We want to know what they are thinking. They need to know what they are thinking. How are you finding that information out?

Mrs. Evans: I don't think I've thought about it like that so I'm not sure.

Mrs. Pavey: I think I get what you are saying. If we go over the problem together and the kids underline or highlight important information, have we really discussed why we are underlining? It's not just that we are doing it or they are doing it, it's why, how does that information help you and how does it show you are thinking and what you are thinking.

Mrs. Isaacs: We need them to think out loud about why they are underlining or writing. It's the thinking about their thinking. That's what's going to give us information and them information. That's what we are missing here.

The math teachers acknowledged that their use of annotating in the classroom wasn't getting the students to really understand the problem. That alone wasn't helping the students make sense of the mathematical problem. By discussing it further the teachers came to the conclusion that they needed to do more. The teachers realized that it was not just about providing the students with an "in," – it was more about getting them to think about what they were doing and to be able to build an argument for their actions (SMP3).

Mrs. Pavey stated in order to figure out what the students were thinking they needed to go beyond underlining or writing words in the margins. That wasn't enough. They needed to get the students to think about their thinking. Schoenfeld (1989, 1992) alludes to this notion of metacognition in his discussion on problem solving and sense making in mathematics. He argues that self-regulation is one aspect of successful problem solving

and making sense of mathematical tasks. Students who are able to follow their own thinking, re-strategize when necessary, and look back on their work are more inclined to be better problem solvers. Through their collaborative talk, the math teachers at AMS recognized this was something they needed to work on with their students to help them develop problem solving skills. Annotation alone wasn't enough.

Recognizing what a student must understand in order to create the understanding that the math teachers envisioned took some additional time to discuss. Each team of teachers officially continued their discussions during the math department meeting in late February 2015. Mrs. Isaacs met with Mrs. Hastufah and Mrs. Evans met with Mrs. Pavey. The conversation that took place between Mrs. Isaacs and Mrs. Hastufah demonstrated the continued development in understanding what was needed for student growth.

Excerpt 4.8: February 27, 2015
Faculty Meeting

Mrs. Isaacs: I suggest to the students that they ask each other questions when they are annotating.

Mrs. Hastufah: I don't see. What do you mean?

Mrs. Isaacs: The other day I had my students working in pairs on solving multistep equations. First, they had to write them and then solve them. One of them wrote the equation and the other had to ask them at least three questions about the set-up. I'll show you what I mean. Here you do this one [gets a word problem from her desk – see Table 4.3]. You write it and I'll ask the questions like a student.

Mrs. Hastufah: [writes $\frac{1}{2}$]

Mrs. Isaacs: Why did you start with that number?

Mrs. Hastufah: I think I have half of something so I want to tell myself that. [continues to read the problem and writes down x]

Mrs. Isaacs: What does the 'x' stand for? What does it have to do with the problem?

Mrs. Hastufah: I don't know what my allowance is so I choose to use 'x' to represent that amount.

Mrs. Isaacs: Do you see what I mean now? I think it's really helped the students that I'm not the one asking questions. Besides, I think the kids ask harder questions than I would. They really want to make their partners suffer [laughing].

Table 4.3 Word problem Mrs. Isaacs and Mrs. Hastufah discussed

Multi-step Word Problem

Imani spent half of her weekly allowance playing mini-golf. To earn more money her parents let her wash the car for \$4. What is her weekly allowance if she ended with \$12?

The two seventh grade teachers took part in a rehearsal setting to get a better feel for how to work with annotation in a more engaging, thoughtful way (Horn, 2005). In their prior conversations, they realized that simply having students underline key words wasn't guiding them to think critically. As Mrs. Isaacs pointed out earlier it was just something else to have them do. The point of the strategy was to get the students to develop key entry points to a problem, provide opportunities to reflect on what they were doing, and allow others to think through the problems with them. Thinking through the problems themselves provided the teachers with metacognitive reasons for further development of this in their classrooms (Schoenfeld, 1989, 1992). They wanted their own students to be able to think through a problem, but also constantly question their moves,

thoughts, and actions and be able to redirect themselves when needed. The two seventh grade math teachers needed to think about their own reasons for having the students annotate in class, both individually and as a team of teachers. Once they were able to recognize their underlying purpose for having the students annotate they were able to strategize how that would look in the classroom. The teachers' own reflective abstraction-participation in a specific type of conversation allowing for the development of the student perspective-helped position themselves to develop such understandings.

The eighth-grade teachers took a different approach to annotation and addressing the need of eliciting student thinking in the classroom. Mrs. Pavey and Mrs. Evans discussed evidence of student annotation from a recent quiz and classwork assignment. Mrs. Evans analyzed the work of three different students. She categorized each student in terms of their annotation development. In her mind, this phase consisted of work that resembled some sense making of the material, but could also use some additional work. Mrs. Evans also looked at work from three different students. Her evidence was mixed because she considered each student to be at varying stages of the annotation process. Both eighth grade teachers discussed what they thought their evidence uncovered about student understanding of the problem or task. Mrs. Evans talked about the pieces of evidence from one student who she thought was the least successful in annotating and Mrs. Pavey shared what she considered to be a semi-successful attempt at annotation. Below is an excerpt of their conversation.

Excerpt 4.9: February 27, 2015
Faculty Meeting

Mrs. Evans: I am not sure what to think about this one [student quiz – low]. All the student did was underline a few phrases and didn't even use that understanding in creating an inequality for the system. What was the point in underlining the information then? I mean, yeah okay underlining "small candles cost" is something that is important, but there is no reference to that in the explanation or in the inequality. Makes we want to ask him why he underlined it then. He also underlined "spend more than \$80," which is good, but he didn't even reference the \$80 in creating an inequality. I just think he underlined some things to make it look like he was doing something. I mean I can't even tell what he does know from this.

Mrs. Pavey: Maybe that's the point. The kid doesn't know anything from the problem. He can't pick out information that is relevant.

Mrs. Evans: But he must know something from reading the text. I need to find a way to get that information from him. You can't just read a text and not know something, anything. If he won't give me that information I have to find a way to get it from him. I don't know. What do you have? Maybe we can talk about what Jeremiah showed to give me some ideas.

It is clear from Mrs. Evans description of the student's work that she was unclear about his thought processes. She did not have enough information from the student to know what he thought or to get an idea, if any, of what he was able to uncover from the text. The purpose of annotation was to explicitly demonstrate one's thinking, but that wasn't the case for this student. Mrs. Pavey lent her analysis from the evidence she collected as well.

Excerpt 4.10: February 27, 2015
Faculty Meeting

Mrs. Pavey: Jeremiah did a lot and some of it was actually meaningful and connected to the problem. He underlined quite a bit and then double underlined certain parts. He underlined "small candles \$3.50" and "large candles \$5.00." Then he double underlined "at least 20 candles" and "cannot more than \$80." He even put arrows to tell me more information of that. He drew an arrow from candles and wrote "parts to buy" and drew and arrow from "at least" and wrote "could do more." The last thing he

did was draw an arrow from “more than” and wrote “must be smaller.” He told me a lot. I was able to get a lot of information about what he knows from this annotation. There is a lot more I wish I knew since his inequalities don’t match up.

Mrs. Evans: What questions would you ask them now if they were here?

Mrs. Pavey: I can think of so many. Why did you underline that? How does that help you write your inequality? Maybe we put those questions as part of the assignment so we can get into their heads more. I guess we could help them break it down more so they know the kinds of questions they should be asking themselves. Perhaps model the thinking process for them a bit more.

Mrs. Pavey gathered a bit more information from this student’s annotation and notes. The student underlined and double underlined some of the text, but the additional notes were what actually provided the teacher with valuable information on what the student understood from the text. On the other hand, Mrs. Pavey wanted more information about the student and what he truly understood. The information gathered from the text and the additional information provided by the student did not result in creating a correct system of inequalities. The teacher wanted more information from Jeremiah to get a better idea of not just what he knew, but also what he was thinking.

After the two teams of teachers discussed their student work they met together to share what they learned and determined the next steps. Each team shared what they learned about their students based on their conversations and shared what they learned about their teaching, what they expected from students, and how to go about getting that information. The seventh-grade teachers discovered a way to elicit student thinking and understanding by having the students ask each other questions. It was successful for Mrs. Isaacs so she shared that strategy with her fellow seventh grade teacher, Mrs. Hastufah,

and with the eighth-grade teachers. Furthermore, Mrs. Pavey and Mrs. Evans revealed what they discovered when analyzing student work. They realized that even with students who they considered successful at annotation, they didn't really know what the students thought. Their solution was also to ask questions, but they would model how to think through a problem and what kinds of questions one might want to ask him/herself. Finally, they would include these types of questions on assignments and subsequent assessments to get a better idea of what students thought when reading through word problems.

Overall, the math teachers at AMS had multiple opportunities to learn about the CCSSM and their teaching from each other. Setting aside time during department meetings to focus on teaching strategies, analyze student data, and address pedagogical concerns when teaching certain standards/concepts allowed the teachers to develop a level of understanding about expectations of themselves in the classroom, but also of their students. The conversations the math teachers participated in clearly demonstrated their understanding of the CCSSM as a team of teachers. All four math teachers recognized the need for collaboration in the classroom setting in order to give students opportunities to discuss, strategize, and share their thoughts with another student in a comfortable, non-threatening setting. As Mrs. Hastufah alluded to in Excerpt 4.2, "isn't that the whole idea" referring to having students work in groups and discuss mathematics together. She understood part of the CCSSM to be about collaboration and working together to problem solve. Mrs. Hastufah also recognized that the goal of the Common Core was to break away from traditional thinking (see Excerpt 4.4). This realization

came through for Mrs. Hastufah partly as a result of the conversations and experiences she had with her colleagues. Together the math teachers at AMS collaborated on a regular basis and participated in meaningful conversations that contributed to their understanding of the CCSSM. Mrs. Evans, Mrs. Pavey, Mrs. Isaacs, and Mrs. Hastufah saw the value in working together as a department. They also spent a lot of time incorporating opportunities for their students to work together, either in pairs or in small groups. Just as a successful jazz ensemble utilizes each member for the greater good of the group, the four math teachers at AMS were successful in improvising toward common mathematical goals together.

Chapter 5: “I have a rapt audience every day.”

Understanding the CCSSM as Performance

As a collective group the math teachers at Alberta Middle School (AMS) made sense of the CCSSM. Together they took advantage of learning opportunities and collaborated on different aspects of teaching the CCSSM. These collaborations included discussions on using different instructional strategies and how to facilitate collaborative groups and whole class discussions. As a math team the AMS math teachers understood the CCSSM as a successful jazz ensemble. One particular teacher on the math team expressed her individual understanding in a different way. Yes, the CCSSM were about student collaboration and collaboration as a team of teachers, but Mrs. Mackenzie Isaacs understood the CCSSM deeper. The way she talked about her teaching, the students in her classes, and the content and practice standards, it was clear she had a unique understanding that resonated with her in a different way.

Mrs. Mackenzie Isaacs was in her thirtieth year as a middle school math teacher for the Wisecreek Unified School District and her thirty-fifth year of teaching overall at the time of the current study. When I asked her to share a little about herself, Mrs. Isaacs described herself as a “performer,” one who wanted to be ahead of what was coming, and someone who always wanted to be involved. She used all three of these descriptions to describe how her style of teaching had evolved over the years. All three of these designations sum up Mrs. Isaacs’ approach to and understanding of the CCSSM.

In this chapter, I argue that the understanding the CCSSM *as performance* metaphor to describe Mrs. Isaacs’ understanding of the CCSSM is useful in three distinct

ways. First, I present how Mrs. Isaacs clearly referred to her own understanding of the CCSSM in terms of what she knew about teaching math before the new standards and what pedagogies she needed to employ in order to actually teach these standards. Mrs. Isaacs' self-expression as a performer was key when looking at her role as a teacher with this new understanding of what it means to teach the CCSSM. Understanding the CCSSM as performance described her own teaching style, but it was also useful in understanding how she came to be a teacher as well as how her style of teaching has shaped over the years to what it is today.

Second, I examine how Mrs. Isaacs interpreted the CCSSM in terms of her own students and what was expected of them in the classroom. Mrs. Isaacs believed her students needed to be more active in their own learning. This active learning manifested in a number of ways in her classroom. Students communicated with each other, shared ideas, reflected on their own thoughts as well as their peers', and collaboratively worked in groups to solve mathematical problems and tasks. It was important for Mrs. Isaacs to know that her students developed as mathematicians.

Lastly, I demonstrate how Mrs. Isaacs' approach to learning about the CCSSM was what set her apart from her colleagues. According to her, Mrs. Isaacs had the same mindset for learning as she did when she first started teaching. From the moment, she realized teaching was in her future, she made sure to be at her best at all times and that included being involved and learning for herself before learning from others. Overall, the CCSSM *as performance* metaphor describes Mrs. Isaacs' understanding of the CCSSM as a teacher and as a student.

Understanding the CCSSM as Performance: Teacher Performance in the Classroom

Mrs. Isaacs was a theatre major in college and ultimately earned a degree in that field. When I asked her to explain how she got into the teaching profession, Mrs. Isaacs confessed that she knew she “needed to find another means to earn a living because she realized the entertainment world was not knocking down [her] door.” She went on to state that she still wanted to find time to enjoy her passion even though it was clear that it wouldn’t turn out to be her career path anymore. As a result, Mrs. Isaacs got involved in a children’s theatre company. She thoroughly enjoyed working and interacting with children on a frequent basis. Eventually one thing led to another and Mrs. Isaacs started working in schools with the theatre company. As she became more involved in the schools, she decided to get a degree in education to accompany her degree in fine arts. She began to make sense of her purpose in life which was to be a performer, not necessarily in the entertainment industry, but rather as a teacher. I asked Mrs. Isaacs to share a little about herself in our initial interview.

Excerpt 5.1: January 16, 2015
Interview with Mrs. Isaacs

After about five years into my studies I realized that I liked teaching so much that it was getting in the way of my performing. Ultimately what it comes down to is I have a rapt audience every day. I consider my performance to be structured. It’s like freedom. I get to choose the script every day. I have the same audience that comes back. It’s my job to entertain as well as to deliver a message. It’s kind of like that’s the way I started out.

These words clearly showed that Mrs. Isaacs connected her personal background with her current role in the classroom. Because of her prior experience with theatre and performance, she recognized that her students were her audience and in some respects,

she needed to entertain them, put on a good show, and wanted them coming back for more. Not only did she link her experiences with performance, but she also referred to her students as being part of the action (details in the second connection of the metaphor).

Mrs. Isaacs taught middle school for more than thirty years and she had come to learn that “you have to have a good sense of humor [to work with this age group] because you can’t take everything personally. Because everything is drama with them.” She went on to further state that sometimes the kids have their own side show or act going on at the same time that she is trying to teach and that an attentive teacher had to be aware of that.

A final piece that clearly links Mrs. Isaacs’s understanding the CCSSM as performance metaphor was how she described student inquiry, question asking, exploration, and the need for additional information or guidance. When I asked her to describe her teaching practices as a middle school teacher, Mrs. Isaacs started off by explaining that they have changed over the years. She attributed part of that to the fact that she had been in the same district almost her entire career and that certain changes and expectations have occurred over the years, such as re-teaching, providing pre- and post-tests, and organizing the standards into concept clusters. Mrs. Isaacs stated that prior to the CCSSM she, along with the other math teachers at her school, provided notes for students, did one or two problems together as a class and then the students would be expected to reproduce those same steps or processes by doing one or two problems on their own versus in pairs or in small groups. Mrs. Isaacs also mentioned that although she had used small groups before in her math classes, she used them a lot more now and in different ways. One of the biggest changes she saw in her style of teaching was letting

go of control and being okay with spur of the moment changes, additions, and directions. She came to expect some level of flexibility or improvisation to occur in the classroom. For example, in our initial interview, I asked Mrs. Isaacs to describe her teaching practices over the years.

Excerpt 5.2: January 16, 2016
Interview with Mrs. Isaacs

Before it was very prescriptive. I knew what I was going to do and I knew what I expected the kids to be able to do...so I really did a lot of changes to my instruction from when I first started teaching...Now I am very much into answering a question with a question as much as possible. When students ask for information, posing stuff back as redirecting questions you really have to be able to think on your feet and that's where my theatre background really helps. Because even if I am clueless they never know that. You would never know by the look on my face. They think it's a dramatic pause.

Having her students ask for additional information regarding a problem she posed to them or asking for additional information from their peers is something that Mrs. Isaacs felt was new to her understanding of the CCSSM. Following a lesson observation in late January, I asked Mrs. Isaacs about her approach to teaching.

Excerpt 5.3: January 29, 2015
Post-Observation Interview with Mrs. Isaacs

There is a lot of facilitation going on. I have to be able to work with one group and guide their learning and the very next minute I need to quickly assess and ask thoughtful questions to another group. I am doing that at the same time that all of the groups are asking me questions. It's getting to the point now where they are asking each other these questions first. That is what the CCSSM are all about.

This quote further illustrated Mrs. Isaacs's understanding of the CCSSM as performance in terms of her understanding of the CCSSM and her teaching style. She understood the

importance of a collaborative effort on the part of her students and herself, the teacher. Beyond that, it was also important that the students interact with each other. Mrs. Isaacs saw the need for her role as a teacher to continue changing as was the role of her students. She performed as the teacher and the improvisational facilitator, but her students were part of the performance as well (Remillard and Geist, 2002; Borko, 2004). They were part of the entertainment and were not just part of the audience. One shift of the CCSSM is the component of rigor. Teachers must vary the expectations of their students based on content standard, activity, and role in the classroom. The expectations she had of her students varied depending on the content and practice standard, whether the students were working individually, in pairs, or in small groups, and depended on the task that was assigned. Mrs. Isaacs' understanding of the CCSSM came through as she described how her role in the classroom as well as the students' role had progressed over the years.

Another example of Mrs. Isaacs felt her approach to teaching math evolved over the years, especially due to her understanding of the CCSSM, was how she felt she had grown as a math educator. In our final interview, held on June 5, 2015, I asked Mrs. Isaacs "What has the Common Core done for you as a teacher?" Her response was very telling.

Excerpt 5.4: June 5, 2015
Final Interview with Mrs. Isaacs

Much more of my lesson planning is about contingencies, like what's going to happen if they say this or what's going to happen if they say this? What is going to happen if they don't say this? How can I get them there a different way without directly instructing them? My instruction is real different. It becomes more facilitating and that's a lot more difficult to

anticipate all of the things that could happen...The anticipating the anything could possibly happen is exhausting sometimes...but it's what needs to be done. I have to give the best performance and that means being able to anticipate different response, approaches, calculations, and [possible] misuse of vocabulary.

Mrs. Isaacs linked the action of anticipation to her understanding of the CCSSM. One of her roles as a performer in the classroom was to anticipate students' mathematical actions and thoughts. Not only did she need to improvise at times or facilitate student learning by redirecting their questions, but she also needed to anticipate their actions to best prepare her own reactions. Remillard and Geist (2002) state that facilitators need to be able to use curriculum in a flexible manner, recognize the needs of the participants, be cognizant of possible consequences, and take action in order to balance goals and objectives. Though Remillard and Geist specifically talk about facilitators of professional development, these ideas hold true for teachers who are facilitators in the classroom setting. Mrs. Isaacs did just that-she was flexible, recognized the needs of her students, was aware of potential delays in their understanding, and took action when needed.

A final teaching performance that Mrs. Isaacs illustrated in our interviews that was evident in my observations was listening. I asked Mrs. Isaacs to summarize what she felt was the most important change for her as a teacher as a result of the CCSSM-what is something she learned that helped her be the teacher she wanted to be in the math classroom. Again Mrs. Isaacs pointed to her role as a performer in the classroom. She reiterated that as a CCSSM teacher, she had to be ready for anything, not just the anticipation or the need to be flexible, but also to listen to her students-to fully listen to them. She explained that this was something that she had really tried to focus on this

school year-that she had to learn to be a better listener for the kids. Mrs. Isaacs continued by reverting back to her role as a performer in the classroom.

Huang, Normandia, and Greer (2005) argued that communication was one of the key processes in building math understanding in the classroom. This communication included listening as well as verbally communicating. They demonstrated that strong communication skills were needed to help teachers and students develop professionally and mathematically, respectively. This was exactly Mrs. Isaacs' point. She explained that she had to model how the students should work with each other and that included being able to listen to each other, ask questions, and clarify when necessary. If Mrs. Isaacs cut a student off before they finished their thought or question, then when working in small groups the students may continue that way of interacting with others. She clearly emphasized that interrupting is not only unacceptable, but it defeated the purpose of small group work and collaboration, which Mrs. Isaacs interpreted as an important component of the CCSSM.

By fully listening to her students, she got what she needed to redirect the lesson or pose another question. She wanted this to be a part of what the students got accustomed to in their small group work. Listening was not only a huge part of her role as a performer in the classroom, but for her students as well. Listening to each other helped them realize that she was not the only one with answers, ideas, strategies, and mathematical thoughts. There were others in the class who had a role in the overall performance of the CCSSM. Listening to others gave the students and Mrs. Isaacs another way to perform in the classroom. One of the standards for mathematical practice is to construct viable

arguments and critique the reasoning of others (SMP3). Listening to others' thoughts and approaches is needed to help develop those arguments.

Understanding the CCSSM as Performance: Student Performance in the Classroom

As she mentioned before, Mrs. Isaacs got to “choose the script every day,” which was true to some extent, but as we are finding out, the students were co-writing the script as well. This leads into a second component of understanding the CCSSM as performance metaphor that Mrs. Isaacs so clearly constructed in her interviews and in classroom observations. The students were not just a part of the audience. According to Mrs. Isaacs's understanding of the CCSSM, the students needed to be a huge part of the performance that took place in the classroom. She explained that her students had come a long way this school year in the sense that they were now more comfortable talking about mathematics, sharing their ideas, and in explaining their models. Their math performance has increased. I asked Mrs. Isaacs to explain the purpose of having her students communicate and work in pairs or small groups because I noticed she requested the students work in pairs or small groups more than ten times during the three fourth period lessons I observed from January 27-29, 2015. Mrs. Isaacs illustrated what she meant by “their performance has increased” in lengthy detail.

Excerpt 5.5: January 29, 2015
Post-observation Interview with Mrs. Isaacs

One of the things about common core is being able to explain our reasoning, to critique the reasoning of others, to listen. [It] is really, really important and it overarches everything else. If a student can model, but can't tell you why they are modeling, or if a student can model but they can't explain what the model represents, then the model is useless except to them. The goal is students start to listen the way they talk to each other and really start to focus following the other person's reasoning. That was a

long time coming. They didn't want to talk to each other at all. So, we started with simple things like sentence frames. Tell your partner what the answer to this problem is, "I believe the answer to this problem is ____ because ____, or my evidence for this answer is ____." So, starting to get them to use that kind of verbiage. You will hear them now say, "You can't say that. That's not evidence." Or, "you can't say that. It's not a justification, it's something you feel. Feeling is not evidence." You will listen to them start to talk about reasoning. We have built that to the point now here they almost sit on the edge of their seats waiting to have that conversation because they know where I want them to go and they can't wait to go there. They really get excited. If you listen to the conversations, you can hear over a period of days that their understanding starts to build. That's what I'm going for. The performance tasks that they are going to have to face is far beyond all of that. It's not just making sense of the problem, but being able to explain their reasoning to the people around them. That's a culture I really try to build.

This idea of conversing with one's peers is even more evident in Mrs. Isaacs's classroom.

During several of my lesson observations in Mrs. Isaacs's seventh-grade classroom the idea of understanding the CCSM as performance became evident in the way the students worked together in small groups and in how they discussed a problem as a whole class.

During one three-day observation in January I observed Mrs. Isaacs and her teaching of math standard 7.EE.3, which involves equations and expressions (see Table 5.1). As a review of the previous day's material the teacher posed the following on the board:

$$-4x - \frac{6x - 7}{5}$$

She didn't give any specifics on the expression other than putting it on the board and asking the students to do with it whatever they saw appropriate, but no matter what they did they had to be able to justify every step. The teacher allotted approximately two

minutes for the class to attack the problem. Below is some of the conversation that ensued in Mrs. Isaacs fourth period seventh-grade accelerated math class.

Excerpt 5.6: January 27, 2015
Lesson Observation – Mrs. Isaacs

Mrs. Isaacs: (to the class) Tell me what I can do.

Esteban: I did the definition of subtraction.

Mrs. Isaacs: What did you do though to do the definition of subtraction?

Esteban: I changed the subtraction sign to an addition sign and made it a negative.

Mrs. Isaacs: Well, what's the key word? You didn't change it, but rather what did you do? You rewrote it as addition. Tell me what the rest of it looked like when you rewrote it as addition?

Sophia: I wrote it as $-4x + \frac{-6x-7}{5}$

Mrs. Isaacs: Turn to your partner to discuss this step and decide if you agree or disagree with your partner.

Table 5.1 Seventh-grade content standard

| | |
|-------------------|--|
| Standard | 7.EE.B.3 |
| Domain | Expressions and Equations |
| Cluster | Solve real-life and mathematical problems using numerical and algebraic expressions and equations. |
| Standard 3 | Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |

Mrs. Isaacs allowed the students to discuss this with their partner for an additional thirty seconds or so. During this time, she walked around the room and overheard a couple of partners who were disagreeing with each other and another set of partners who disagreed with the response of the previous student because they had something different. The following conversation ensued.

Excerpt 5.7: January 27, 2015
Lesson Observation – Mrs. Isaacs

Mrs. Isaacs: How many of you agree with your partners? (About 2/3 of the class raise their hands.) How many of you disagree with your partners? (About 10 students raise their hands.) Let's talk about what you agree with and then let's talk about what you disagree with. If you agreed with your partner tell me what you wrote next?

Paul: $-4x + \frac{-6x-7}{5}$

Mrs. Isaacs: Of the people who said they agreed with their partner is this what you have for the definition of subtraction? The majority of the students nod their heads in agreement. For those of you who didn't agree with your partners what did you have?

Gloria: $-4x + \frac{-6x-7}{5}$

Mrs. Isaacs: Okay. Does somebody have something different? Because some of you said even if you agreed with your partner, you disagreed with this.

Miriam: $-4x + \frac{-6x}{5} + \frac{7}{5}$

Mrs. Isaacs: Okay. Does anybody have something different? What did you get (looking to the back of the class)?

Wendy: $-4x + \frac{-30x-7}{5}$

Mrs. Isaacs: Okay. Does anybody have anything different than what is up here?

Zachariah: $-4x - \frac{6x}{5} - \frac{7}{5}$

Mrs. Isaacs: My next question is, “Who is right? Is there more than one right equivalent expression?” Let’s figure this out. How do we determine if two equations [she stops herself] if two expressions are equivalent and what method do we use? What is the method that they showed us in the book on how to prove if two expressions are equivalent?

Jarod: The distributive property.

Mrs. Isaacs: Nope the distribute property definitely is important, but not here. There is a method I would like you to find that tells us how to prove if two things are equivalent. There is a way and when you find it share it with your group.

About one minute passed and she told the class that once everybody in their group had it [the method] to put their hands up.

Mrs. Isaacs: What are we going to do?

Sarah: You have to plug in a value. Well you have to substitute.

Mrs. Isaacs: Yes, so you have to substitute a value in to the original expression and into the simplified expression and see which one works. Let’s all use the same value for x, so x equals two.

The class continued to work in partners while Mrs. Isaacs walked around to various groups to check in on them. The resulting argument clearly demonstrated the performance involved in their understanding of the material. Just as Mrs. Isaacs stated in her interviews, the students were able to interact with each other and not just with her in order to make sense of their choices, calculations, results, and justifications. In his work with ninth graders, Slavin (2014) proclaimed that successful cooperative groups were groups who were able to communicate with each other and problem solve together. The

students in Mrs. Isaacs' class performed on both accounts. They communicated alternate strategies and demonstrated a willingness to work together and help each other learn. They did this in a variety of ways. Students used appropriate vocabulary when discussing their approach to simplifying the expression and addressed each other's reasoning in a suitable way. For example, one partner group suggested to another that they think about the problem in a particular way so that all terms have a common denominator rather than having one part of the expression have the denominator, arguing that it was easier to add and subtract that way.

A third group chimed in and added in that if there weren't any variables that's what they would have to do anyway. The actions of the students demonstrated mathematical proficiency in terms of the way they practiced and performed mathematics. The students modeled, persevered in their problem solving, and critiqued the reasoning of others. The students in Mrs. Isaacs class worked collaboratively in small groups and as a whole class and were successful (Artz, Jacobs, and Boessen, 2016; Nokes-Malach, Richey, and Gadgil, 2015). Nokes-Malach, Richey, and Gadgil (2015) defined successful cooperative learning groups as those groups that have positive cognitive and social outcomes. In this case, the students were able to negotiate multiple perspectives (social), correct errors or misconceptions (cognitive), and complement each other's knowledge (cognitive). Though this example took place on one of the three days I observed Mrs. Isaacs in January, it clearly illustrated Mrs. Issacs' understanding of how her students needed to make sense of the material by being active participants in the classroom and in their learning. She firmly believed that her students, and all students, needed to perform

in differing ways to make sense of the subject for themselves and in order to hold meaningful mathematical conversation with others, as she believed the CCSSM would have students do.

The understanding of student performance in the classroom is key to Mrs. Isaacs' understanding of the CCSSM. She strove for her students to do more in the classroom than before. This notion of doing more came in many forms, such as allowing them to struggle, engage in mathematical conversations with their peers, formulate questions, justify their mathematical actions, reason through problems, and model their approach or strategy. Mrs. Isaacs clarified her thoughts with an example that occurred during one of the lessons I observed. She reminded me that her fourth period class was working on solving equations and inequalities. The students were solving multiple step inequalities in small groups and one student from a group of three raised her hand to ask Mrs. Isaacs a question. Mrs. Isaacs recalled this student and her group struggling with operations with inequalities and described the encounter.

Excerpt 5.8: January 29, 2015
Post-observation Interview with Mrs. Isaacs

They nailed inequalities yesterday, but what happens when you divide by a negative? I didn't tell them. I let them struggle with it. I had a girl say "-1 was less than -2" and it checked, but then she realized -1 is not less than -2, -3 is less than -2 and that didn't check." Then I said "that sounds like good information" and I walked away and she's like "wait a minute" and I said "was there a question in there somewhere?" I am kind of leaving it in her court. I am not going to pick up on it. I want them to say why is it that way?

Mrs. Isaacs also included students being able to think and formulate questions as part of their performance in her math classroom. In a follow-up interview to my lesson observations from April 27-29, 2015, I spoke with Mrs. Isaacs.

Excerpt 5.9: April 30, 2015
Post-observation Interview with Mrs. Isaacs

Branch: When you walk around the room during small group work, what are you listening for or expecting out of the students?

Mrs. Isaacs: Well, at first it was some sort of product, like a sentence justifying their outcome. Now it is more than that. I'm trying to get them to formulate the questions. I want them to actually not say I don't get this, but to say I understand this and when this happens I don't know why. They have to be able to figure it out and that is the perseverance, the understanding, the reasoning. Everything I know up to now says it should work so why doesn't it work? Well then there must be some piece of information missing so let's get that piece of information and see if it helps. I am really trying to drive them to that. I want them to stop thinking I have all the answers.

Mrs. Isaacs expected her students to be able to do more and part of that was for her to let them think for themselves, struggle with ideas and concepts, bounce ideas off each other, share their approaches and strategies, and learn from each other. She mentioned several times throughout our interviews that she believed that the CCSSM called for students to do more and based on her training and experience that's what she understood "the more" to be. She was finding ways for her students to be more active in their learning, engaged in various mathematical tasks, and to formulate questions not just for her to answer, but for their peers.

An additional example that helped illustrate what Mrs. Isaacs meant by her students doing more was evident in her interactions with her students during my three-

day lesson observation in April of 2015. I observed Mrs. Isaacs and her teaching of math standard 8.G.B.7 (see Table 5.2). Mrs. Isaacs provided the students with a mathematical task (see Table 5.3) and guided the students to work in small groups to accomplish the task at hand. She did not provide much direction to start with other than to discuss as a whole group some basic understandings before they approached the problem. I asked her about this in our follow up interview.

Excerpt 5.10: April 30, 2015
 Post-observation Interview with Mrs. Isaacs

Branch: Describe teaching this specific standard of geometry and how it has evolved for you as a teacher.

Mrs. Isaacs: I used to put a simple one on the board, tell them how to do it. Then I'd say here's another. Here's a harder one. What do you think we are going to do? I'd guide them through it and then I would put a tougher one on the board. Now what do you think we are going to do? That was the way I started. Now I put a really, really hard one on the board at the beginning and just let them mess.

Table 5.2 Eighth-grade content standard

| | |
|-------------------|---|
| Standard | 8.G.B.7 |
| Domain | Geometry |
| Cluster | Understand and apply the Pythagorean Theorem |
| Standard 7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. |

The students started working in their groups. As Mrs. Isaacs walked around the classroom listening to student conversations she realized that the students were not using appropriate math words and as a result were actually not able to communicate with each other. Being able to communicate mathematically required the use of appropriate

mathematical vocabulary (Riccomini et. al, 2015). Therefore, Mrs. Isaacs asked the class to stop what they were doing and went over some basic vocabulary words that they should probably be using in order to describe parts of the problem, such as figures, diagonal, vertex, planes, edges, faces, etc. Stopping class for a bit and going over necessary vocabulary was one strategy Mrs. Isaacs chose to assist her students in developing their communication skills (Bay-Williams and Livers, 2009). By doing this Mrs. Isaacs showed her students that she expected more out of them - that they were to communicate mathematically and not just do a simple calculation. This was further illustrated during a conversation she had with a couple of students in one of the small groups. This group raised their hands to inform Mrs. Isaacs that they had finished the assignment.

Excerpt 5.11: April 27, 2015
Lesson Observation – Mrs. Isaacs

Julia: We are finished.

Mrs. Isaacs: What are you done with exactly?

Julia: Well, we finished all of the problems, all the parts of it.

Mrs. Isaacs: That's great, then, someone explain what you did [she paused for nearly ten seconds and no one responded]. Okay how about someone show me proof of your answers [again about ten seconds go by and no one responds]. Alright, that's okay, then how about someone tell me something about your approach [complete silence and then someone spoke up].

Harold: So, we aren't done?

Mrs. Isaacs: You got it! You aren't quite done then because you should be able to show me and tell me your evidence for what you did and what you got. [To the whole class] I am walking around and what I am seeing, well what I hear is wonderful, but what I am seeing is that we are losing the

math. We've got answers filled-in a bunch of calculations all over the place, but there is nothing there to support those answers. So please do not think that you are just going to say to me it's a hundred units squared or whatever without anything to back it up. You can't say that you did it in your head. You just can't do that. I need to see the math. Just because one person did all the calculating doesn't mean you shouldn't have something that you are working with. It's really important that you have the math to back it up. You are not done unless anybody could walk over and see what you did. Get what you've got better organized. Not just answers because you know better than that.

Table 5.3 Class work task - April 25.2015

1. Draw dashed lines to show all faces of the rectangular solid.
2. Imagine that the rectangular solid is a room. An ant is on the floor, situated at point A. Describe the shortest path the ant can crawl to get to point B in the corner of the ceiling.
3. Suppose it isn't really an ant at all. It's a fly. Describe the shortest path the fly can fly to get from point A to point B.
4. If the ant's path and the fly's path were connected, what figure would it form?
5. Use a straight edge and a colored pencil to trace the ant's path.
6. Use a straight edge and a different colored pencil to trace the fly's path.
7. If the dimensions of the rectangular solid are length 8 cm, width 6 cm and height 4 cm, determine the distance the ant traveled.
8. Determine the distance the fly traveled.
9. Find the volume of the cube.
10. Find the surface area of the cube.

How Mrs. Isaacs interacted with her students clearly revealed that she expected more out of them. This example demonstrated exactly what she professed in her follow-up interview. She provided the students with a mathematical task, expected them to struggle to some extent because they may not have seen something like this before, offered guidance and scaffolding when necessary in order to give them an in to the problem, and demanded more out of them in the form of justification, communication, and modeling.

The students needed to do a lot more than just come up with a calculation. They were expected to engage in mathematical conversations with their peers using appropriate vocabulary, explain their approach, and justify their outcome using mathematical formulas and modeling. The students had a specific role to fill in the classroom and part of that role was to communicate with each other mathematically. Overall, Mrs. Isaacs' students were to expand their thinking and approach to mathematics. In Mrs. Isaacs' math classroom, students were to do more, they were to be active in their learning, and they were to be perform in various ways to become critical math thinkers. Clearly, her students were part of the math performance in the classroom. Together they wrote the script of how learning unfolded in her math class. The students and Mrs. Isaacs were acting in the play rather than the students just watching it-the students went from passive members of the audience to active actors.

Understanding the CCSSM as Performance: Teacher Ensuring her Best Performance

Finally, the third way that the metaphor of CCSSM as performance is illustrated in Mrs. Isaacs' understanding of the CCSSM is through her own involvement in coming to know about the mathematical reform back in 2011. Before the start of the 2011-2012 school year, the Wisecreek School District decided to adopt the CCSSM. Their first statement of the intent to implement was to establish math coach and teacher leader positions. The district had an open invitation to any teacher who had previously or currently held a math position in-house. Each new position was at least a three-year commitment with potential to extend. The teachers would be trained in the CCSSM and receive certification of their training. This included having someone observe their

classrooms, group meetings, team collaborations, and professional development on strategies, pedagogy, and mathematical content. Although Mrs. Isaacs had been a math teacher in the district for a long time and I knew she was the school's math chair and coach, I asked her how she got involved with the training.

Excerpt 5.12: January 16, 2015
Initial Interview – Mrs. Isaacs

So, when they were looking for people I said to my husband “well I don't really want to go back to school.” I said to him “you know me I'm going to want to be out in front.” He said “I know just go for it we will figure out family stuff later.” It was quite an experience, but I knew I had to be out front and experience it for myself if I was going to be any good at it.

Mrs. Isaacs referred to this idea of being out in the forefront of the CCSSM numerous times in her interviews (initial, post-observations, and exit). In doing so, she connected it back to being in theatre, productions, various shows and in her history with her current school district. Mrs. Isaacs explained that being a top performer meant being your best, being prepared, and this need to be better than those who were just like you in order to outshine them. This desire to perform and be the best was not about getting the recognition one felt is deserved, but rather it is about knowing that you did all that you could do to get noticed, whatever noticed means to the performer. She further clarified that getting noticed came in many forms, such as peer accolades, promising reviews from critics, standing ovations from the audience, knowing you did your best to make the show its best, and being asked to be involved in additional shows or productions. For Mrs. Isaacs, being noticed in the field of education-in her current position-was just knowing

that she had done everything she could to improve the quality of math education that her students received.

This is further exemplified when we take a look at the various roles and responsibilities that Mrs. Isaacs has had throughout her career with Wisecreek Unified School District. Mrs. Isaacs's understanding the CCSSM as performance took a deeper meaning when she explained why she had accepted various roles and performances at her school site. As a teacher with the school district, Mrs. Isaacs had numerous opportunities to get involved and be in the forefront of educational policy and changes. For example, she had been involved in an educational cable television show put on by a few local school districts, she had been a mentor to novice teachers and a master teacher for student teachers, she had been a math curriculum facilitator, and signed up to be a teacher leader and certified CCSSM coach. As Mrs. Isaacs puts it,

Excerpt 5.13: January 16, 2015
Initial Interview – Mrs. Isaacs

I just was never one who wanted to wait for somebody else to tell me. I wanted to go find out what it was. If it meant it was going to be better for my kids, my students, then I was going to do it and I was always looking for ways to be better...I don't think I've ever taught two years in a row the same way. When Common Core was coming, I knew I couldn't retire before it went through because I knew I needed to be out there. Like I said I knew I needed not to wait for somebody and I needed to do it. I guess it's the type A personality in me.

Mrs. Isaacs clearly explained her reasons for wanting to be a part of some of the math related changes at her district throughout her career. It was her need, her desire to be the best, not for others, but for herself, knowing that she did all she could to create the best teacher for her students. She felt the need to perform at her best for her children, which

meant being at the forefront of the CCSSM as a teacher leader and district and local math coach. This opening gave her hands-on training, specific feedback on instruction, and opportunities to attend and present at workshops. Together her training as well as her work with other teachers contributed to her understanding of the CCSSM. She took it upon herself to be a top performer because she knew herself well enough to know that she needed to be involved and perform her best in order to be the best teacher for herself and for her students.

Mrs. Isaacs not only wanted to be out in the forefront of math reform in order to be her best, but she also strived to get better every day in order to provide her students with the best math education they can receive from her. An additional way she talked about performing at her best was seeking out others to observe her so she can get feedback on certain components of her instruction. During several of their math department meetings, Mrs. Isaacs extended invitations to her fellow math teachers to observe her classes any time they want. The only thing she asked was even if they had their own agenda, that they took a look at certain aspects of her teaching so that she could get better. Mrs. Isaacs asked her fellow teachers to observe her on more than one occasion, a potential learning opportunity suggested by researchers (Bell, 2016; Burke, 2010; Gosling, 2014). While discussing varying math tasks in one of their department meetings in December of 2014, the following dialogue transpired around having their students annotate math problems.

Excerpt 5.14: December 12, 2014
Math Department Meeting

Mrs. Evans: I know I need more practice myself. I've done it with the kids but not consistently, so there really isn't a whole lot of it. Some kids do it and some kids don't, but I haven't been really forceful with it.

Mrs. Hastufah: I do it a lot. I'm hoping they (the students) pick up on what they see me do. I think it's been working because some of the students are doing it.

Mrs. Isaacs: Well, I'd really like it if one of you would come in to observe me for 10-15 minutes to see how I model annotating and if the kids are doing it because I need the feedback too.

Mrs. Isaacs brought up this idea of having other teachers and the principal observe her teaching so she could get a better idea of what she could improve on numerous occasions, both in their department meetings and in our interviews. She brought it up two other times during their math department meetings. On a separate occasion during the math department meeting in January of 2015 they were discussing the implementation of their new math textbook series. All of the math teachers lamented about the vast amounts of material to cover in the book, commenting that each lesson had ten to twelve pages to discuss and cover. Mrs. Isaacs mentioned their specific training on how to approach the textbook series and again suggested the team observe each other to get a better feel on how to navigate through the series to best fit the needs of their students. Mrs. Isaacs spoke with Mrs. Pavey and Mrs. Evans, the eighth-grade teachers and her seventh-grade team member, Mrs. Hastufah.

Excerpt 5.15: January 16, 2015
Math Department Meeting

Mrs. Pavey: I know Felicia (Mrs. Evans) and I just can't get through it all. We've tried to omit some of the questions and problems, but it's a challenge to figure out what is best.

Mrs. Evans: Yeah and a lot of times the book just has three or four examples of the same thing so why should I go over the same thing?

Mrs. Isaacs: I hear what you are saying. You have to think that there are reasons the publisher includes the questions and problems that they do. There has to be some sense and structure to what they were doing, so we need to do the same thing. You know I've said it before and I will say it again. If you want to come see me in my class work through a lesson in the book I am happy to have you. It will give me a chance to get feedback from another perspective, to see if there is a flow to what I am doing or not doing. And I can do the same for any of you as well.

Again, Mrs. Isaacs welcomed others to observe her class, not only for them to get a better feel for what they might want to try in their classrooms, but also so she could get feedback from others on what she could do better. She was welcoming others to critique her performance so she could grow as an educator. Peer evaluations and observations can provide meaningful feedback if it is used to promote academic development of the teacher and students (MacKinnon, 2001; Peel, 2005) rather than for compliance of school reform and policy (Shortland, 2004). Mrs. Isaacs openly expressed to her students and to her colleagues that she was not the only one that had answers. They could learn from each other and that was what she wanted from her math team-that they could learn from each other's performances in the classroom.

It was evident from interviews, department meetings, and lesson observations that understanding the CCSSM as performance was a strong and appropriate metaphor for Mrs. Isaacs' understanding of the CCSSM for teachers and students. It represented her own take on how she came to be a math teacher and described her teaching style. Mrs. Isaacs thrived on performing in the classroom, whether that was through improvisation when students asked questions that she was not sure of the response she should give

them, whether she found various ways to entertain them to deliver the message for the day, or when she chose the script for how to teach a concept and facilitated the students' learning. In addition, understanding the CCSSM as performance connects to how Mrs. Isaacs saw the role of the students in the CCSSM classroom. The students needed to perform in order to make sense of the subject matter. Simply sitting in the classroom as audience members and not being involved was not enough. Mrs. Isaacs explained that with the CCSSM students were expected to do more with their knowledge. She stated,

Excerpt 5.15: June 5, 2015
Final Interview - Mrs. Isaacs

The students have to do stuff different...What students are supposed to do with [the] content [has] changed. Before they just calculate and get the answer. Now we are asking them to communicate, share, explain, interpret, analyze, and that's hard for them. Sitting idly in the classroom isn't going to cut it anymore.

The students needed to perform as well and this performance and active participation was what will guide them and deepen their understanding of the subject and concepts. Finally, the metaphor of understanding the CCSSM as performance illustrated Mrs. Isaacs' role in wanting to be more involved with the CCSSM. Mrs. Isaacs welcomed others to observe her methods and to offer constructive criticism so she could grow and be the best teacher she could be for her students. Clearly, for Mrs. Isaacs, the CCSSM were about performing, being a performer, and giving her best performance.

Chapter 6: JSPS Math Teachers

Understanding the CCSSM as a Failed Jazz Ensemble

The four math teachers at Junipero Serra Parish School (JSPS) also discussed various components of their teaching, including analyzing student work, collaborating on teaching various mathematical concepts and standards, and finding ways to improve their teaching practices. The meaningful interactions experienced by the teachers at JSPS occurred less frequently than their teacher counterparts at Alberta Middle School (AMS), without a clear focus and specific objectives in mind, and concentrated on the individual rather than on overall group concerns. The math teachers discussed concerns in different ways and with different results than the math teachers at AMS. I argue that the teachers at JSPS believed they were meeting to learn about the CCSSM, improve their teaching practices, and to increase student learning and mathematical growth, but what resulted was counterproductive, actually fueled their misunderstanding of the CCSSM, and mirrored that of a failed jazz ensemble.

Learning as Opportunity

Cohen and Hill (2000) argue that new reform cannot be learned, understood, or implemented unless teachers and educators are given ample opportunities to explore the new policies, how they relate to their school situation, and what they mean in regards to their teaching practices. Spillane (2005) and Coburn (2001) also assert that these learning opportunities are needed to give teachers experiences to make sense of reform and change. Furthermore, Little (1987) suggested any activity that allowed for faculty and staff to improve their performance or role in the classroom, school, or district, or in this

case deanery, is a professional development opportunity. The four out of nine math teachers at JSPS who self-identified as consciously and actively implementing the CCSSM had multiple opportunities to learn about the CCSSM, improve their teaching practices, and learn about their students. All four of them expressed their desire to gain further understanding of the CCSSM and best practices through trainings, professional development, and meeting with other teachers. The teachers at JSPS participated in various learning opportunities throughout the 2014-2015 school year, including deanery led professional development on lesson plan development and teaching practices, grade level deanery meetings on student engagement, external professional development on the CCSSM and problem solving, and school-based faculty meetings designated for teacher-chosen topics.

Deanery Level

During the 2014-2015 school year, the local deanery of the Archdiocese employed a new program designed to provide their teachers with opportunities to collaborate on lesson plan development, teaching practices, and student engagement in all subjects, especially math and English. Part of the program was to implement a lesson plan design called the Core Instructional Model (CIM) and the other component was to begin a professional learning community (PLC) within the local deanery. Most of the teachers at JSPS during the 2014-2015 school year had been exposed to and incorporated the CIM in their lesson plan and classroom practices the previous school year. The CIM is a lesson plan format that gradually releases academic responsibility to the students. The model itself followed a gradual release formula where the teacher (“I”) assumed all

responsibility of the material at the beginning of the lesson. This might include showing a brief video explaining a concept or the teacher demonstrating a mathematical concept. During the middle of the lesson the students and the teacher (“We”) work together on the material. This could include discussing problems together as a whole class. Next, the students work together (“Two”) to get a better understanding of the material and to bounce ideas off each other. Finally, the end of the lesson was an opportunity for the individual student to demonstrate what they learned about the material or concept, also known as the “You” portion of the lesson. Mrs. Maureen Jackson, the principal at JSPS, had numerous discussions and meetings with the teachers the year before on the use of the CIM with their lesson plan delivery, but there were a handful of teachers who wanted more background and detail on the various components of the lesson plan model.

According to Mrs. Jackson the Archdiocese felt the need to provide professional development for local deaneries to ensure a common ground moving forward with the Common Core in English and in Math. She felt that the CIM professional development cohort was a good fit with her school especially since some of her teachers already expressed interest in wanting to know more about the CIM. Therefore, the starting point or focus for the 2014-2015 school year was for the schools in the deanery to use a common lesson plan model, the CIM, and use that model as the focus for subsequent PLC meetings. As a result, Mrs. Jackson decided to join the other elementary schools in the deanery for the CIM professional development cohort provided by the Archdiocese.

Two months into my research I asked Mrs. Jackson about the teachers' interest, understanding, and use of the CIM in their classrooms. She stated that some of them were still unsure of its purpose, connection to research, and daily use for every lesson.

Excerpt 6.1: October 28, 2014
Interview with Mrs. Jackson (principal)

Branch: And how are the teachers responding to the CIM lesson plan and the new standards? [Throughout the interview, she mentioned quite a few of the teachers and their thoughts on the CIM. I include those below].

Mrs. Jackson: [Ms. Cheng] was a little apprehensive about the model. I remember her saying something about the fact that it didn't match up with what she had been taught recently in her education courses... Mrs. Perrault had a lot of issues with the CIM model. I guess the main thing she wanted help with was how to do all four aspects in every lesson. She wasn't sure that it was possible and even conducive to her teaching style... Jackie was all over the place telling me about her use of CIM. I am not even sure she knows what it is... Mrs. Brown pretty much teaches this way, but she did mention that she thought it might be helpful to learn more about it. Basically, she would try to take advantage of the opportunity... Don will do whatever is asked of him. I remember him saying that he didn't have much of an issue with it-that he was using it and it wasn't much of a problem, though he recognized he could know more about it to be better at what he does.

The first professional development session offered by the Archdiocese on the CIM and the use of PLCs occurred on October 24, 2014. It was led by an external facilitator associated with the Archdiocese who did not hold a position in the front office with the Archdiocese. I was a participant-observer throughout the all-day meeting. The agenda for the day included additional background on the CIM lesson plan format, the purpose, usefulness, and benefits of PLCs, and the vision of joining the two ideas throughout the 2014-2015 school year.

In order to understand professional learning communities (PLCs) it is necessary to breakdown the term into its parts. The word *professional* implies a person or group of people who have a set of skills or abilities that when used correctly can assist them in doing their job appropriately. *Learning* suggests that the set of skills these professionals have is constantly increasing or improving-that what they know is ever changing. This constant learning is an expectation of the profession. The term *community* proposes a tight knit group of people who share responsibilities, goals, resources, and who learn from each other (Koellner-Clark and Borko, 2004). Therefore, a *professional learning community* consists of members who work together, who strive to learn more about themselves and their craft for the sake of improving each other, themselves, and the profession to which they belong.

There are many definitions and characteristics of PLCs in the current literature. Though researchers do not agree on all aspects, there are overarching similarities of what constitutes successful PLCs. One is that learning must take place. DuFour (2004) suggests that PLCs focus on the learning of students and ensure their academic growth. He argues that student learning is the number one goal of the field of education and therefore should be the first focus of any PLC. On the other hand, other researchers argue the focus should be on the learning of the teachers (Vescio et. al, 2008) and that this can only happen with teacher collaboration (Newman, 1996; Seashore, Anderson, and Riedel, 2003; Vescio et. al, 2008; Brouwer et. al, 2012).

The PLCs envisioned by the Archdiocese appeared to share some of these same characteristics. During the October 24, 2014 meeting introducing the idea of having PLCs

throughout the 2014-2015 school year, the facilitator expressed such features to the participating teachers. He stated that the goal of the PLCs was to improve the quality of their professional practices. The archdiocese felt this could be accomplished by meeting with grade level teachers regularly, sharing and analyzing student work, collaborating on lesson plan and presentations, and discussing successes and failures in hopes of improving one's teaching practices. The October session was divided into three parts. For the first part the facilitator provided a brief history of himself and the research behind PLCs. He also described the purpose of working in PLCs throughout the year and the vision of the archdiocese. The second part of the meeting he explained the components of the CIM in further detail and provided an opportunity for each participant to work with grade level or subject matter colleagues to discuss their understanding of each component of the CIM (objective, methodology, and assessment). The last part of the day included a breakout session where each participant collaborated with colleagues and created a lesson plan based on their understanding of the CIM. Each group chose a subject (such as math or language arts), a specific standard, and worked together to create a lesson that each of them could go back to their school site and deliver. Then they would follow-up with their PLC members and discuss what worked, what didn't, and share the videos of their teaching.

I wanted to get an idea of how the JSPS teachers welcomed the opportunity to work with colleagues from other schools both from the October 24, 2014 meeting and from their follow-up PLC meetings. I interviewed some of the JSPS teachers after the initial meeting and a couple of months later after their second PLC to get a better

understanding of their experiences. During the interviews, I asked each teacher the same question, “Tell me about your experience at the deanery meeting held on October 24, 2014.” Below are some of their responses and my thoughts are interspersed throughout.

Excerpt 6.2
November 20, 2014

Ms. Cheng: We had a speaker...who was phenomenal and inspiring, he came and talked to us about our new lesson plan model, the CIM. To be honest, this is something that I am really excited about and think is a positive thing. Part of my challenge like I said before when I started here was the fact that I didn't have anybody to network with. We'll see how it goes because I recognized all the data and research he gave us so I am interested in how it progresses and if it truly adheres to my experiences when I was getting my masters.

Ms. Cheng mentioned that she was excited to have the chance to work with other teachers at the same grade level. She had this experience before when she was a student teacher and when she was a long-term sub for a public school. Ms. Cheng also stated that she had recently graduated with her masters and was a bit unsure about the direction of the archdiocese and the use of the CIM. Overall, though she seemed open to the idea and excited to see what the experiences might produce. On the other hand, the sixth-grade teacher had a different take on the meeting.

Excerpt 6.3
November 5, 2014

Mrs. Brown: I think there were too many schools in the huge forum that it's really easy to stop paying attention when you feel like half of the information doesn't apply. If everybody was split up into their specialty areas and then a specialist of say Common Core or the lesson plan or the structure of classroom they want to have implemented went in and actually demoed a lesson. There was no lesson demonstration. It was just presented information on a power point that everyone could read. Even though the person speaking it seemed they knew what they were talking

about, they just didn't convey it in a way to show the teachers of the group what to do. I feel like since I haven't been out of school very long and I do go out on my own and research what things should look like or how things are changing, a lot of the other men and women in that room don't do that. Some of them have only taught at Catholic schools for 20+ years so they really have no idea what this is even supposed to look like. I mean it doesn't mean that they aren't willing to learn, but I think it would have been a lot more effective if actual lesson demonstrations were given. I feel like the whole point was sort of missed with just a bunch of jargon.

Mrs. Brown felt that the meeting was a huge waste of time. In her opinion there were too many people to really get anything accomplished at the beginning of the meeting.

Furthermore, she felt that the Archdiocese could have selected a different speaker to focus on a variety of other topics that might have been more useful, such as classroom experience with the lesson plan format, Common Core and lesson planning, or structures in the classroom. In addition, Mrs. Brown felt that some of the teachers in the auditorium didn't have a strong understanding of what a CIM lesson should look like in the classroom and that they may not have much to offer during future PLCs. Overall, it is clear that Mrs. Brown had a neutral to negative outlook on future collaborations with her grade level colleagues.

Excerpt 6.4
November 12, 2014

Mrs. Perrault: I like having someone else to go to for ideas being that JSPS is only one class per grade, I don't have other fourth grade teachers to collaborate with, or to bounce ideas off of, or to get new ideas off of. I like that we kind of have what public school teachers have just within their school where they have multiple classes so they can collaborate and plan together.

Mrs. Perrault recognized that teaching at a private school didn't allot her certain professional experiences. One of those experiences included working with a fellow grade

level teacher. A lot of public schools have more than one class per grade and that allowed for teachers to work with their grade level partner. Mrs. Perrault welcomed this opportunity and looked forward to collaborate with others, get ideas from them, and to share her ideas. It seemed Mrs. Perrault was excited for what the PLCs might offer her.

Excerpt 6.5
November 5, 2014

Mrs. Barclay: Well we'll see. I am not sure what to expect. I mean it was fine. The presenter talked a lot, mostly for the first half of the day and didn't give us much to go on. I wish we had more time to work in our groups because I think that could be good. I feel like it could be a good group because we shared some ideas, kind of agreed on what to do, and seemed excited about it. But, you never know. I am not convinced all of them will follow through because I have seen that before enough times. Well, I guess I shouldn't be so negative because who knows they might surprise me.

Mrs. Barclay had mixed emotions about the meeting. She stated that she isn't sure what to expect and part of the reason for that was because the beginning of the meeting wasn't very productive. The presenter spoke the majority of the time and didn't provide many examples that the teachers could learn from. On the other hand, she did mention that her time with fellow colleagues was somewhat productive because members of the group shared their thoughts and experiences, agreed on some aspects and the approach to their lesson plan, and were excited about what was to come. In addition, though, Mrs. Barclay admitted that she wasn't too thrilled about things because she had experienced this before where things are said, but are not followed through. Overall, some of the JSPS teachers looked forward to the CIM training and PLC meetings and others did not. Ms. Cheng and Mrs. Perrault stated they were excited about the opportunity to learn and collaborate with

others, Mrs. Barclay was somewhat neutral and Mrs. Brown was closed-minded about working with others.

Following the CIM training and first PLC on October 24, 2014 each grade level had two follow-up PLCs with their grade level colleagues. For example, third grade teachers met with other third grade teachers in the deanery and middle school science teachers met with other middle school science teachers in the deanery. I followed up with six of the teachers on their PLC experience after the initial training, which was within one week of their individual PLCs. I focus on Mrs. Perrault, Mrs. Brown, and Mr. Mejia for a number of reasons: 1) all three of them talked about their initial experience with their PLC group in positive ways, 2) expressed their surprised interest and cooperation, and 3) shared that they were looking forward to additional meetings. Some of the teachers also mentioned how they felt the PLC meetings went throughout the year- that it wasn't very organized or structured, that not everyone was on the same level, and that it felt many of the participants didn't have the same goal and focus in mind for the group.

In describing her positive experience with her PLC group, Mrs. Perrault used phrases such as "shared ideas," "good discussion," "move forward," "asked for suggestions," and "the goal..." Mrs. Brown expressed favorable experiences with her PLC group using the following terms "comfortable with," "expressed concern," "shared experience," and "learn from." Mr. Mejia also shared his feelings about his follow-up meeting with his PLC group. His comments include such words as "helped each other," "discussed together," "shared ideas and strategies," and "comfortable." All three teachers

appeared to have a positive disposition toward working with their respective PLC group. Each teacher described working with their group members as a collaborative effort. To get a clearer understanding of the experiences of these teachers I go more in-depth on Mrs. Perrault. The initial experiences she had with her PLC group revealed the potential for learning about the CIM, the Common Core, student engagement, and effective teaching practices.

Mrs. Perrault expressed enjoyment when she discussed working with her PLC colleagues. More importantly she talked about this experience and opportunity in collaborative terms. Mrs. Perrault stated that the group “shared ideas,” that group members and she had “a lot to offer,” and that members of the group “listened” to each other. Her description of the meeting indicated that the PLC group functioned well together. Mrs. Perrault went into further detail about the interactions she had with her group members and explained the lesson plan they came up with and discussed.

Excerpt 6.6
January 27, 2015

Branch: You’ve talked about your group a little bit. I’d like to know a little more about what you did at your meeting.

Mrs. Perrault: The whole point was to video tape the lesson and show an excerpt of it with our team. I taped my lesson, which was a science lesson and not a reading lesson, but I didn’t show it because other teachers offered theirs. We talked about the lesson and what we thought went well and what we thought the teacher could focus on in the future. It was a little hard because it was just an excerpt of the video, but the teacher explained more to give us an idea of what took place. The rest of us talked a little about our own lessons and areas of improvements for certain components like the modeling or the assessment piece. I remember a few times I asked for suggestions on my teaching and others were interested in my thoughts too. It’s nice to work with teachers who teach the same grade as you. I feel like this could be good if we all do our part. Overall I think we met

the goal of the meeting, which was to discuss the good and the bad of our lesson and think about what we want to do for next time.”

Mrs. Perrault’s description of the time she spent with her PLC group resembled what researchers define as key aspects of a true professional learning community. Hord (1997) asserts that in a professional learning community it is vital that teachers feel supported, included, and valued. Specifically, she proclaims that all members should be included regularly in conversations and group work and that the experience and expertise of each member is valued. The PLC group that Mrs. Perrault belonged to demonstrated some of these aspects of a PLC. Mrs. Perrault stated that each teacher had a chance to talk about their own lessons (included) and that the teachers as a whole discussed potential improvements (supported, valued). Hord also argues that all members should trust that their needs, questions, and concerns are supported and valid parts of the growth of the group as a whole. This is exactly what Mrs. Perrault described in her second meeting with her PLC group. The teachers shared their experiences, assisted each other in recognizing strengths and areas of improvement, and were given a chance to express their concerns for future growth.

Huffman (2003) expressed that professional learning communities need to have shared values and a common vision to be successful. It is important for these communities to focus on learning and the growth of the community. Based on Mrs. Perrault’s interviews her PLC group met the goal they initially set out to achieve and that was to plan a joint lesson, discuss that lesson and how it played out in their respective classrooms, and decided on a goal for next time. According to Mrs. Jackson, the

principal at JSPS, the goal or vision of the Archdiocese is for the PLC groups to learn more about their teaching practices and the CIM lesson plan to provide students with enough opportunity to increase their academic ability. For all intents and purposes it appeared that Mrs. Perrault's PLC group was working towards their goal as well as towards the goal the Archdiocese had in mind.

The other teachers at JSPS also expressed similar occurrences in their respective PLCs and initially described interactions with their colleagues as favorable, beneficial, and positive. As the interviews continued throughout the school year some of their comments shifted to more neutral and non-favorable interactions that are not at all conducive to productive collaborations and community gatherings. Mrs. Perrault, Mrs. Brown, and Mr. Mejia changed their tone by the end of the school year. Phrases used by Mrs. Perrault included, "not all teachers," "unfavorable to the rest," "didn't match our goal," and "not sure what we will do." Mrs. Brown added such things as, "wouldn't work," "waste of time," "too many individuals," "not together," and "stuck in own ways." Furthermore, Mr. Mejia also discussed experiences with his PLC group using phrases like "keep to myself," "do their own thing," "not focused on the point," "worried about themselves," and "lack of improvement." The teachers appeared to experience a lack of togetherness in their respective PLCs, where members would rather do their own thing, much like a failed jazz ensemble would focus on their own solo instrumental piece and not take into account the melody, rhythm, and harmony of the group as a whole.

Unfortunately, the experiences these teachers had with their PLCs did not produce a culture of collaboration in which others' acknowledged members' contributions to the

field or commitment to learning. I take a closer look at Mr. Mejia's experiences with his PLC group to expose the kinds of interactions and opportunities, or lack thereof, which he encountered with his group members. Overall, his experiences represent and demonstrate the missed opportunities these teachers had to truly collaborate on such concerns as the CCSSM and student learning.

I was a participant-observer of the math PLC meetings in December 2014 and Mr. Mejia was a participant. During this meeting the teachers discussed their lesson plan on standard 8.EE.B.5, which included graphing linear equations (see Table 6.1). One of the teachers shared an excerpt of his taped lesson. In this video excerpt the teacher was standing at the front of the room modeling how to graph a line when the line was written in slope-intercept form. Rather than discuss the components of this teacher's lesson plan, the other teachers talked about what they did and compared it to what was in the video. Below is an excerpt from the December 2014 math PLC meeting. The excerpt demonstrated some productive talk among the teachers.

Excerpt 6.7
December 9, 2014

Mr. Ortiz (demonstrator): I didn't do much in this part, but I wanted everyone's thoughts on my "I" portion of the lesson. That's why I showed you this part. I wasn't sure if I was clear enough and used strong examples. There's just so much I wanted to talk about that I had to choose.

Mrs. Twain: It was interesting. I liked how you asked the kids to help you even though it was the "I" portion and you were modeling. When I taught this lesson, I chose different examples. I wanted my students to graph a negative slope and see what they would come up with. They struggled, but figured it out eventually.

Mr. Thomas: My kids were the same way. They didn't get it at first. I ended up having to spend three days on it.

Mr. Ortiz: So, what did you guys do for the “we” part? I just did more examples and had them walk me through them.

Mr. Mejia: I showed them different graphs and had them guess which one was positive, negative, a zero slope, and had an undefined slope. That was my introduction so kind of a “Two” first.

Mrs. Twain: What part of the lesson was the most difficult for you (referring to the whole group)?

Mr. Thomas: It’s always the “we” for me. It just seems that the “I” and the “We” run together. I’d like to work on that and find ways to make more separate components.

The group continued to discuss the lesson on graphing linear equations for another twenty minutes. Some of the talk appeared to be productive and focused on the components of the CIM lesson plan. The teachers talked about different ways to incorporate partner work from informal work, such as a strategy called think-pair-share to more formal work with a strategy one of the teachers referred to as double-down. The

Table 6.1 Eighth-grade content standard

| | |
|-------------------|---|
| Standard | 8.EE.B.5 |
| Domain | Expressions and Equations |
| Cluster | Understand the connections between proportional relationships, lines, and linear equations |
| Standard 5 | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. |

double-down strategy is when two students work on a problem separately to start, but at a designated time the two students switch papers finishing each other’s work. Other talk was less productive, focused on specific students, was not goal-oriented, and was not conducive to teacher learning. Another teacher who hadn’t spoken up yet, asked the

group what they thought about teaching quadratics and factoring. Within seconds, the teachers shared their previous experiences teaching that standard focusing more on issues with specific students, issues with their textbooks and other resources, and the difficulties surrounding the CCSSM.

Excerpt 6.8
December 9, 2014

Mr. Foley: I'm sure I speak for all of us when I say let's move on. We have already taught this lesson so what is the point in talking about it since we can't change it? I know what's coming up in a couple of week and that is quadratics and factoring. How do you all feel about that?

Mrs. Twain: My kids can never get that. I used to look forward to teaching it, but it is such a hassle now. I can't ever find good examples or lessons already out there that work. I mean the book is fine, but it just doesn't do anything for the kids.

Mr. Mejia: I don't teach that standard. That's Algebra isn't it? I only teach sixth through eighth grade math.

Mr. Ortiz: We don't have a strong math program at our school. The kids don't really have much success with it. I am not sure why that is the case. It's a problem here. More than half my class is in the 40% percentile on their standardized tests. I just don't get why they can't get it.

Mr. Thomas: What drives me crazy is the kids who don't even try. How am I supposed to teach you if you don't have a pencil or paper? Or if you don't even do your homework. It's like come on kids, give me something to work with here.

Additional talk by the group appeared to be more neutral or negative, and unproductive in terms of the goal of the PLC meeting. This kind of talk occurred more often in the December meeting. Teachers in the group would get off topic by doing any number of redirections. In excerpt 6.8, Mr. Foley didn't want to talk about the lesson the group worked on and taught because it already occurred. The teacher would rather discuss

something that was to come, such as quadratics and factoring. Another redirection occurred when Mrs. Twain answered Mr. Foley, but then she made it about her unhappiness and lack of enthusiasm for the resources rather than the content and the teaching. In addition, Mr. Ortiz reacted in terms of his own teaching and students. He made the comment about his students and their lack of understanding and cooperation. Lastly, Mr. Thomas expressed how his students didn't even come to class prepared. Excerpt 6.8 is an example of how the math teachers continued to redirect the conversation to focus more on them as individuals rather than on the needs of the group and toward the goal and objective of the day. The deanery teachers who participated in this PLC did not spend much time discussing components of their lesson plan, critiquing the video excerpt of Mr. Ortiz, and collaborating on future lessons.

Mr. Mejia described interactions he had with his PLC group members initially as something that was positive. He shared that they helped each other, discussed together, and shared ideas. The excerpt above revealed talk that wasn't productive nor focused on the group. I asked Mr. Mejia about his experience with his PLC group at the end of the school year. I wanted to get his take on how he felt the meetings went after the three meetings.

Excerpt 6.9
June 1, 2015

Branch: What are your overall thoughts on the PLC meetings and the professional development this school year?

Mr. Mejia: I have mixed feelings on the PLC meetings. I really wanted it to be something more powerful and meaningful for everyone because it was such a great opportunity to share and learn and grow. You can't force things on people though and the PLCs weren't any different. Over time I

learned to keep to myself. I tried to get help from others because there were times I wanted ideas on getting my students more involved or to think more. I soon realized that wasn't going to happen. It's sad, but everyone just wanted to do their own thing. At first it wasn't like that because I looked forward to working with others and learning more about CIM and the CCSSM. After the second meeting, it felt like it was more of a chore to work together, to agree on a standard and how to approach teaching it using the CIM. No one wanted to make suggestions, share their experiences, or ask for guidance. The last few months it was not focused and we weren't focused on the point, which was to work together to create a lesson using the CIM lesson plan. People just did their own thing. I felt like it wasn't a group effort and everyone was worried about themselves. It really could have been great, should've been great. We never get to work with others like that, but I saw the potential in us. I don't know. I'm just rambling. I guess it didn't do what it was supposed to do because I didn't see much improvement.

The experiences Mr. Mejia had with his PLC group are far from collaborative, goal-oriented, and being focused on teacher growth or student growth. One of the first things that Mr. Mejia refers to in this excerpt is the opportunity of PLC meetings. Having a chance to work with others was not something that the teachers were used to doing and perhaps that is part of the reason it wasn't successful in his eyes. The teachers did not know how to work together to benefit each other and to benefit the group. Hill (2001) pointed out that simply having discussions with colleagues does not automatically mean there will be a common understanding even when discussing items that are of common interest. Hill argues that teachers may have their own goals or agendas in mind that outweigh the perceived goal of the group. Based on what Mr. Mejia described this might be what took place in his PLC meetings. Mr. Mejia stated that "everyone just wanted to do their own thing" and that they "weren't focused on the point." Coburn (2001) also argues that having opportunities to work with and discuss with colleagues isn't always

enough. The opportunities that Mr. Mejia and the other JSPS teachers had needed to be more focused and group centered and revolve around each other rather than on the individuals. As Coburn points out these opportunities to work with others should focus on specific goals, content or be subject oriented, and rich in meaning and purpose (Coburn, 2001, p. 158). Coburn argues that “collective sense-making...is shaped by two factors: (1) the patterns of interaction among teachers, specifically who is talking with whom and in what setting, and (2) the character of conversation, specifically the extent to which conversations are structured to provide conditions for engagement and reflection” (p. 151-152). The math PLC group conversation was shaped by the pattern of their interactions, namely that individuals were not staying on topic, making topics centered on themselves, and not focused on the objectives of the day. Furthermore, the character of the conversations was not structured for engagement and reflection, but rather were formatted for negativity and continued isolation. The math teachers at JSPS, including Mr. Mejia understood the CCSSM as a failed jazz ensemble. Although some individuals had visions of working with others and feeding off of their strengths, the majority of the PLC teachers remained as individual teachers more focused on their own experiences rather than on the experiences of the group. The professional learning communities provided by the deanery were one type of professional development for the math teachers at JSPS. The math teachers also had opportunities to attend external professional development training and seminars.

External Professional Development

The teachers at JSPS had numerous opportunities to attend professional development provided by an external source. Over the course of the 2014-2015 school year the principal mentioned thirteen possible seminars for the teachers to attend. The teachers learned of these seminars from word of mouth, through flyers, or from emails. These seminars included all-day meetings during the week, half-day on Saturday, or online modules to complete at one's own pace. Topics ranged from the CCSSM and technology to engaging learners in all subjects to CCSSM and problem solving. Of the thirteen seminars for the teachers to attend only two were funded by JSPS. Although the teachers at JSPS were given information about professional development and training, eleven of the thirteen were out-of-pocket for the teachers. A total of four teachers attended two of the external professional development sessions. Two primary teachers attended professional development on the use of iPads and the Common Core and two intermediate teachers attended professional development on the CCSSM and problem solving. I focus on Mrs. Barclay since she was one of the four teachers who stated she actively and consciously implemented the CCSSM. Mrs. Barclay, along with a fellow intermediate grade teacher and I, attended the professional development session on problem solving.

Professional development is one way to assist teachers in increasing their knowledge in a variety of areas, such as content development, engaging students, or improving students' critical thinking (Desimone, 2009). Some scholars define professional development as any situation where teachers are learning. This learning can

occur formally or informally, such as in the hallways, in the classroom, in a school community, or at an educational workshop (Borko, 2004). Mrs. Barclay and her JSPS colleague, the fifth-grade teacher Mrs. Eckart, attended a formal workshop on the CCSSM and problem solving. Although this was a one-day seminar, Mrs. Barclay and Mrs. Eckart met several times to work on how to incorporate some of the strategies from the workshop. Furthermore, the two teachers shared what they found at a faculty meeting and presented a follow-up to their JSPS colleagues on what they attempted in their respective classrooms. The professional development seminar, a faculty meeting, classroom observations and two interviews with Mrs. Barclay and Mrs. Eckart reveal the understanding that the two teachers gained from their experiences.

The professional development on the CCSSM and problem solving took place on November 13, 2014. Twenty-six teachers, including myself, from surrounding areas attended the session from 9 o'clock to 3 o'clock. The facilitator provided each participant with a handbook filled with activities, strategies and additional resources. Throughout the session, the facilitator referred to the handbook numerous times. The structure of the majority of the session included a description of an activity, a discussion on a strategy, the participants working together through an activity, followed by a discussion on the potential benefits of the activity. The facilitator explained that the objective of their time together was to get an understanding of how certain kinds of activities could utilize different strategies and mathematical practices to help students developed their problem-solving skills. I interviewed Mrs. Barclay and Mrs. Eckart together a few days after the session and again after they presented to their JSPS

colleagues. I also observed Mrs. Barclay's math class three times in late February. I argue that Mrs. Barclay developed her understanding of the CCSSM and learned from her participation in the session, but her understanding was only surface-level and did not contribute to her overall implementation of the CCSSM. Overall, Mrs. Barclay's minimal understanding of the CCSSM represented and demonstrated the understanding of the other teachers at JSPS.

Mrs. Barclay and Mrs. Eckart were very involved in the professional development meeting on problem solving. They asked a lot of questions, participated in discussions, worked on the activities, and reflected on how they could use the strategies and activities in their own classroom. Garet et. al (2001) refer to this kind of professional development session as a workshop. In a workshop, participants tend to take place outside of the teacher's classroom, involve a leader with a specific expertise, and last for a couple of hours to a full day (p. 920). Furthermore, workshop type sessions are widely criticized for being highly ineffective in providing enough time, content, development, discussion, and knowledge to create any amount of teacher change in classroom practices (Borko, 2004; Guskey, 2003; Loucks-Horsley, Stiles, Mundry, Love, and Hewson, 2009). All of the teachers in the room worked on a question that involved elapsed time. The facilitator suggested the teachers work on the problems individually and then discuss their approach with the person next to them, while not necessarily focusing on the answer. Mrs. Barclay and Mrs. Eckart worked together on this activity. The strategy suggested by the facilitator was to use a number line to model the elapsed time given in the word problem. Mrs.

Barclay and Mrs. Eckart were puzzled as to how using a number line would be an appropriate strategy.

Excerpt 6.10: November 13, 2014
The CCSSM and Problem Solving PD

Mrs. Barclay: I am not sure how this [the strategy of using a number line to model elapsed time] is going to work. I've never used this to show my kids how to count time.

Mrs. Eckart: I don't know either. I am not even sure what we are supposed to do here. Is this to find the time we started or how much time it took? I am not sure. What do you think?

Mrs. Barclay: You've got me on that one. I'd like to see how she does this because I don't see how this is going to help me let alone help my kids.

Mrs. Barclay and Mrs. Eckart continued to banter back and forth about the appropriateness of using the number line as a strategy to model elapsed time. It was not until the facilitator came by their table did either of them attempt the problem.

Excerpt 6.11: November 13, 2014
The CCSSM and Problem Solving PD

Mrs. Barclay: [to the facilitator] I don't even know where to begin here. I can do the problem, but using the number line to show my work is stumping me.

Facilitator: How do your kids use number lines in class?

Mrs. Barclay: Usually they use it to show skip counting.

Facilitator: Okay, so they are used to using the number line to show skip counting. Well that's exactly what this is except with time intervals instead of using intervals of tens, fives, and ones. Students would use different intervals that would coordinate with what they know about time.

Mrs. Barclay: Got it. We can do this Jackie [Mrs. Eckart]. I'll show you.

Mrs. Barclay asked the facilitator a question and with her response they went about the task. For the next three minutes, Mrs. Barclay and Mrs. Eckart worked on the time-elapsing problem. The facilitator then brought the whole group together to discuss the activity and the strategy used to complete the activity. She allowed time for the group to share their thoughts. Below is some of the dialogue that took place.

Excerpt 6.11: November 13, 2014
The CCSSM and Problem Solving PD

Facilitator: Tell me what you thought. Have you used the number line as a strategy before for time elapsing? What do your models look like? How do you feel about your students attempting this in your classrooms? Whatever you would like to share.

Ms. Anderson: Can I come up there and show everyone? [Facilitator nods in agreement] This is what I did. Since the problem mentioned that the rider left at 3:50 that's where I started my number line. I knew there was no point in including any time before that time. Then I want to get to a full hour so I made my next tick mark at 4:00. So, it's been 10 minutes. From there I just counted off three more hours until I got to 7:00. Now it has been 3 hours and 10 minutes. Since the rider reached her destination at 7:37 I just add an additional 37 minutes for a total of 3 hours and 47 minutes.

Facilitator: What questions do you [the group] have?

Mr. Boulders: So, what do you do with the kid who wants to tick off every minute? That doesn't seem like that would be very conducive to effective problem solving.

Facilitator: I'll open that up to the group. What do you all think?

Mrs. Barclay: I would tell the kid to do some mental math. You know it's only ten more minutes until the top of the hour. You don't need to show every minute.

Ms. Carlson: Well, as long as the student isn't ticking off every single minute what does it matter? The student is modeling the problem and using their prior knowledge and resources to solve the problem.

The facilitator continued to let some participants show their model and discuss the problem. Next, she specifically directed the conversation to using the number line to model the problem as a way to problem solve. Mrs. Barclay and Mrs. Eckart did not engage in conversation with the whole group, but rather had a conversation amongst themselves.

Excerpt 6.12: November 13, 2014
The Common Core and Problem Solving PD

Mrs. Barclay: I am totally going to use this in my class. I think my kids would get elapsed time better than how I have been teaching it. No harm in trying it at least, but I think it'll do us both some good. Them and me.

Mrs. Eckart: We don't really do elapsed time in fifth grade or even that many word problems. I will suggest it to some of my students. They'll like showing me that they know how to do something new.

Mrs. Barclay: It's a struggle for my kids so anything that will help them sounds good to me. I wasn't sure about this, but it makes sense now so we'll see.

The seminar continued with various activity demonstrations by the facilitator and participant volunteers. Mrs. Barclay and Mrs. Eckart worked through the tasks, engaged in discussions with each other and other participants, including myself. It appeared that the two grade level teachers from JSPS utilized their time together at the problem-solving session and gained some valuable information to use in their classroom.

I met with Mrs. Barclay two separate times after the problem solving professional development session. I also observed her math classroom three times and was a participant-observer in the faculty meeting where she and Mrs. Eckart shared some information with their JSPS colleagues. At the request of the principal, during the

December 12, 2014 faculty meeting, Mrs. Eckart and Mrs. Barclay shared what they learned from the problem-solving session. Mrs. Barclay commented that she enjoyed all of the different activities that they had a chance to go over, that she looked forward to incorporating some of them into her classes, and that she knew she was definitely going to demonstrate some of the problem-solving strategies that she learned because she thought her students would think they would be helpful. The following conversation ensued among the JSPS faculty.

Excerpt 6.13: December 12, 2014
Faculty Meeting

Mrs. Eckart: The day was successful. I really felt like we got something out of it.

Ms. Cheng (2nd): So, what were some components of problem solving that you went over, or that you can share with us? I'm curious because since it was grades 3 through 5 I am sure that I could benefit as well.

Mrs. Barclay: Well, we went over how to use a number line for elapsed time. I thought that was really helpful. I had never seen that strategy before so that was new to me.

Ms. Perrault: All right so correct me if I'm wrong, but the whole session was about problem solving with number lines?

Mrs. Barclay: No, no, no. That was just one aspect of it. There were other things that we did too, like do activities with decks of cards and decimal games.

Ms. Cheng: Then what other problem solving type things were there? It couldn't have been just about number lines, cards, and games. [Mrs. Jackson, the principal] said it was about the CCSSM and problem solving, so what was the CC part, in your opi-?

Mrs. Barclay: I'm not sure if this is right or not, but I think the whole point about it being CC related was because we were problem solving. We were using different strategies and approaches to understand the task or activity and then working together to come up with a solution.

Mrs. Eckart: Right, that's what we did the whole time. We worked together, thought things through, and then talked about it.

Mrs. Jackson: Well, I think now would be a good time for you to demonstrate something from your seminar. We could probably get a better idea of what you are talking about.

Mrs. Eckart demonstrated one of the card activities and Mrs. Barclay demonstrated the number line strategy for elapsed time. In both cases, the two teachers told their colleagues what the activity was, what strategy they were to use, and walked them through it. The demonstrations took a total of nine minutes with little discussion by the other teachers. Mrs. Barclay and Mrs. Eckart appeared to rush through their demonstrations and talking points. I asked them about their presentation the following week during a formal interview.

Excerpt 6.14: December 16, 2014
Interview with Mrs. Barclay and Mrs. Eckart

Branch: Tell me about your presentation at the faculty meeting.

Mrs. Barclay: I don't know how you feel about it [Mrs. Eckart], but I feel like it was a waste of time.

Branch: How so? Why did you think it was a waste of time?

Mrs. Barclay: Well, [Mrs. Jackson] only asked us to share three days before the meeting and we didn't have much time to sit down together to talk about what we were going to do. We met twice and did the best we could.

Branch: How did you decide what you were going to discuss and demonstrate?

Mrs. Eckart: We decided to talk about the activities because we thought that was the most helpful part of the whole session.

Mrs. Barclay: Well, [Maureen] said we had fifteen minutes to share what we learned. When [Mrs. Eckart] and I sat down together we couldn't even figure that out. I mean, we had a good time at the meeting, but it wasn't like it was earth shattering and made me a better math teacher because of it. I didn't take away a phenomenal amount of things. Was it good, was it engaging? Yes. Did the time flyby? Yes. Did I have a good time? Yes. If that's the message she wanted to get across to us that that is how math should be then great. Did it make me a better common core math teacher? Not necessarily just except that now I think I feel a little more confident about it because I know a little more about what it is.

Branch: And what is it?

Mrs. Barclay: It's that the CC makes math more meaningful for kids. Common core is more about problem-solving skills and I believe providing new and different approaches or strategies of how to solve a problem. I also feel that it is more focused on the what you did, how you did it then the answer to the problem. Other than that, I am not too sure. Things haven't really changed. I still teach a lot of the same concepts about multiplying and dividing, and becoming familiar with place value and I teach them much the same way.

Mrs. Barclay's comments point out a couple of things about her understanding of the CCSSM. Mrs. Barclay stated that she didn't know what to present at the faculty meeting because there wasn't much that she learned about the CCSM from that one session. She claimed that the information wasn't earth shattering, but that she was entertained and had a great time. Mrs. Barclay interpreted the purpose of the professional development seminar as something that may have been to entertain and keep one engaged, but that she didn't learn much about the CCSSM other than confirm her thoughts that word problems were a big component compared to previous standards.

Making sense of new material in terms of one's previous schema is a common interpretation of standards reform (Spillane, 2005). Spillane argued that the sense that

individuals and groups make “depends on the sense [they] already have” and that familiarity is what some stakeholders cling to in their understanding of new policy. This seemed to be true for the teachers at JSPS. Overall, the math teachers at JSPS understood the CCSSM as a failed jazz ensemble for a couple of reasons. First, the teachers understood the CCSSM in terms of what they already knew, just as members of a failed jazz ensemble play what they are comfortable with rather than role with the rhythm and melody of the group. Mrs. Barclay suggested the CCSSM was only different because it required more real-world connections. Mrs. Perrault recognized that the CCSSM was similar to previous standards except that students needed to work together more, but she didn’t fully define what that meant with the CCSSM. Second, the teachers’ experiences with their PLC groups suggested a focus on individuals rather than on the group and their goals as a whole team. The JSPS teachers, and to some extent the other teachers in the deanery, attended their respective PLC meetings, but with little regard for the group as a whole. Members came to the meetings with their own agenda rather than coming with an open mind and a willingness to focus on the needs of the group. This parallels that of a failed jazz ensemble in the sense that individuals were more concerned about their own success and interest rather than on the success and shared vision of the group. In the next chapter, I go into detail about one individual math teacher, Mr. Mejia, and his understanding of the CCSSM.

Chapter 7: “I can be myself at a Catholic school.”

Understanding the CCSSM as Intermediary

Mr. Don Mejia was in his seventh year of teaching for Junipero Serra Parish School (JSPS). The 2014-2015 school year was his third year as a middle school math teacher. When I asked him to share a little about himself, Mr. Mejia described himself as a “follower,” one who wanted to be appreciated for doing what he was told, and someone who does his best in order to help others. He used all three of these descriptions to define himself as a person/professional, but these three self-designations also expressed his approach to his teaching practice, being a good teacher, and contributed to his understanding of the CCSSM. I use the metaphor of understanding the CCSSM as intermediary to describe Mr. Mejia’s understanding of the CCSSM. This metaphor is useful in two distinct ways. First, Mr. Mejia clearly referred to his faith formation and development in terms of being a follower of Christ. Mr. Mejia’s self-expression as a follower was key when looking at his membership in the Catholic faith and in connecting his relationship with God with how he approached his role as a faculty member at a Catholic grade school. Second, understanding the CCSSM as intermediary also described his approach to teaching, lesson planning, and implementation of the current math standards. This metaphor helped link his philosophy of teaching, faith, and approach to understanding the CCSSM.

Intermediary is a term used to describe the middle period between two events or happenings. It also refers to someone or something that is the go-between. Mr. Mejia was just that. He was the go-between. Mr. Mejia acted as this link between the CCSSM and

others, namely his students. He was a link between the students and strengthening their Catholic identity through his actions and words as a Catholic school teacher (detailed later this chapter). Mr. Mejia was also a link between his students and their understanding of the CCSSM. He used specific approaches that he believed help his students be more comfortable with math including prior knowledge, vocabulary, and doing the math himself. Mr. Mejia used his resources as an intermediary tool to demonstrate his adherence to employee responsibilities. He used these resources to help in the mediation process, but also as a way to confirm that he was a responsible and strong employee.

From primary grades to middle school math

Mr. Mejia taught second grade for a few years prior to being a middle school math teacher. Although he enjoyed teaching children at that grade level, he struggled with having to teach multiple subjects, including writing and science. He mentioned to some colleagues that he enjoyed math and would be interested in teaching math in the future. While still a second-grade teacher, Mr. Mejia started tutoring some of the middle school students at JSPS in mathematics. This continued for two years and during the 2012-2013 school year, Mr. Mejia was offered a middle school position teaching mathematics and religion at JSPS. When asked why he decided on the switch, Mr. Mejia stated:

Excerpt 7.1: November 24, 2014
Initial Interview with Mr. Mejia

Mr. Mejia: Well, I mentioned to the principal at the time that it was definitely something I was interested in and could see myself doing. Even though I have a multiple subject credential, I knew that I would be happier teaching math instead of teaching everything. I really enjoy math, I was good at tutoring the middle school students, and why not do something

where I can highlight that. I really thought it would be best for me as a teacher and I have a good relationship with those kids so it seemed like a good fit.

Branch: Explain what you mean when you say that you were good at tutoring middle school students. What is it that you were good at?

Mr. Mejia: The first thing that comes to mind is that I knew the math and I think that I am pretty good at explaining it to kids so that it makes it easier for them. But, there's more to it than that. I am good at helping the students who just don't get it to really get it. It's a difficult subject to learn and I help them overcome this. I think the main thing is that I help them build a better foundation so they can then move forward in their understanding. Soon enough I think they realize that math is not something to fear or dislike, but it is something they can understand and get better at.

In this passage, Mr. Mejia highlighted his ability in mathematics and how this ability helped him have a good relationship with some of the middle school students he tutored. He went on to state why and how this relationship developed. Mr. Mejia felt that his ability to help students build a stronger foundation in their mathematical understanding is what allowed him to develop good relations with some of the middle school students. Furthermore, Mr. Mejia clarified later that some of the students that he tutored at the intermediate and middle school level were former students he had as second graders. The relationships that were built had already existed, but were further developed with a mathematical connection. Mr. Mejia felt he was able to further connect with the students he tutored because he made math accessible to the students and helped them overcome some of their fears. With his help the students that he tutored were able to triumph over their preconceived low abilities in math. He continued to develop this rapport with some

students over a two-year period and during the 2012-2013 school year he officially made the jump from a second-grade teacher to a middle school math and religion teacher.

In the classroom

During the time of this study, Mr. Mejia was in his third year as a middle school math teacher. He taught sixth through eighth grade math and sixth and seventh grade religion. During our initial interview, I asked Mr. Mejia to tell me about his teaching practices and how he approached the teaching of mathematics. He stated that he typically did the same thing every day because it was important for the students to have a routine and know what was expected of them. This routine included checking the homework, going over the homework if he felt it was necessary, getting into the lesson for the day, and then answering student questions before giving them opportunities to demonstrate what they knew. Mr. Mejia continued to explain what a typical lesson might look like:

Excerpt 7.2: November 24, 2014
Initial Interview with Mr. Mejia

I start off with the ‘I can’ statement of the day so they know what they should be able to do by the end of the lesson. Then I get into the math. That could mean going over some vocabulary for the day, doing a lower level problem so they recognize that they already know some of the math already. I do this so they aren’t afraid of what’s coming as a way to show them look you got this since you have seen it before. From there I do some example problems for them to give them an idea of the steps involved or the things that they need to think about.

There was a lot to be said about this excerpt. Mr. Mejia stated that he introduced a lesson by starting with the student objective, or the “I can” statement so the students knew what they were expected to be able to do by the end of the lesson. He also mentioned later in the interview that posting this statement or the essential question of the day was

something that administration requested the faculty do for each new lesson. I asked him to elaborate on what he did when he introduced the statement and he mentioned that he put it on the board and the students knew to copy it down. On a few occasions, they went over the statement or question as a class to clarify, if needed.

Once Mr. Mejia introduced the student objective of the day, he stated that he introduced vocabulary or started the lesson with an easier, but related concept. I asked him to give me an example of how he might go about doing this. He added that he might go over finding the average when working on finding the median or constructing a box-and-whisker plot or simplify fractions when working with the multiplication of fractions. Once Mr. Mejia introduced vocabulary or started with a simpler concept, he noted that in a typical math lesson he would go over the lesson of the day by working out a few examples and then gave the students a chance to show what they knew. I refer to some excerpts of lessons I observed to get a clearer understanding of what he meant by going over a lesson and the introduction of vocabulary terms and simpler problems.

I observed Mr. Mejia eight times during the 2014-2015 school year. During the beginning of May, I observed Mr. Mejia's seventh-grade math class and his teaching of standard 7.G.B.6 (see Table 7.1). The first lesson I observed Mr. Mejia focused on vocabulary and helping the students recognize that they already know something about the concept for the day. He started the lesson by showing the students a few examples of three-dimensional objects, specifically prisms. A few of these objects were located on his desk at the front of the classroom and others were scattered around the perimeter of the classroom. All of these objects were rectangular prisms, including tissue boxes and

Table 7.1 Seventh-grade content standard

| | |
|-------------------|--|
| Standard | 7.G.B.6 |
| Domain | Geometry |
| Cluster | Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. |
| Standard 6 | Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. |

cardboard boxes with and without lids. He asked the students to write down anything they knew about the objects. Mr. Mejia gave them roughly ninety seconds before he called on someone.

Excerpt 7.3: May 6, 2015
Lesson Observation with Mr. Mejia

Mr. Mejia: Tell me something about these objects.

Ramón: They aren't flat.

Mr. Mejia: (writing responses on the board) What else?

William: Some are tall and some are short or small.

Mr. Mejia: Anything else? Just say it. I know you know something about them.

Grace: You can look at them from different sides or the top. Like I can see a corner really well, but like Francisco can't see the corner I can see.

Francisco: I can't even see a corner of that one.

Mr. Mejia: Okay. Good. There is a lot going on here. So, let's get into some of the vocabulary that we need to start off this next lesson. You already said some things that are helpful. That tells me that you already know things that we can build from. Ramón said that these objects weren't flat. Good. So, we can say that we are dealing with three-dimensional figures, specifically here we are dealing with a prism since we have identical bases. Did anyone notice that all of the parts you can see are shapes that you already know? I see squares and rectangles all over the

place. These parts of the figure are known as the faces of the figure. Today we are going to talk more about those faces. I know that you guys all know how to find the area of those shapes, right?

Mr. Mejia introduced the lesson by getting the students to state something they already knew about a topic. He provided them with an entry point, a way to access information and reveal that one already knew something about a topic or problem. The students showed that they knew some important characteristics of three-dimensional figures even though they were not using mathematical terms to describe their knowledge. Mr. Mejia highlighted that the students knew important details to help them get started. I asked Mr. Mejia about this during our follow-up interview.

Excerpt 7.4: May 11, 2015
Post-Observation Interview with Mr. Mejia

I did this so the students would see that they know things. They know things that are helpful and with my help they can know more things and attach more meaning to them. They have some basic knowledge that gets them started mostly, but I help them fine-tune that knowledge and make it more mathematical.

Mr. Mejia introduced the topic by providing the students with a chance to recognize that they knew some things about the topic and then briefly connected that understanding with some basic vocabulary. Math vocabulary development is key to conversing as a mathematician and, according to the CCSSM, is necessary in becoming a proficient mathematician. Thompson and Rubenstien (2000) suggest several strategies to developing math academic language during classroom instructional time. One such strategy is to build conceptual understanding first and then attach vocabulary to solidify ideas and depth of understanding (p. 570). Mr. Mejia attempted something similar as he

introduced a topic and connected that concept with some vocabulary. The lesson continued with Mr. Mejia helping the students access prior knowledge combined with examples that the students could build on.

Excerpt 7.5: May 6, 2015
Lesson Observation with Mr. Mejia

Mr. Mejia: So, those shapes that are the faces of these figures are squares and rectangles. Let's look at just one of these side or faces (places the object on the document cam and traces the face onto the whiteboard so it is now two-dimensional or flat). What shape do we have here now? Is it a square or a rectangle?

Vicki: Rectangle since they aren't the same all around.

Mr. Mejia: Perfect. So, let's talk about how we can find the area of this flat shape of this side of the prism. What do you remember about the area of a rectangle? How do we find the area of a rectangle? (Mr. Mejia waits about ten seconds). It has something to do with the length and the width. Who can tell us?

Laura: It's the length and the width. You have to times them.

Mr. Mejia: Right. You have to multiply them to get the area. So, let's say the length is eight and the width is five. Then what is the area?

James: It would be forty squared because it's area.

Mr. Mejia: Yes. It would be forty units squared. Let's do that for all of the faces including the top and the bottom. (Mr. Mejia continues to demonstrate this for the remaining five faces. After about six minutes he calls on a student). What would we get if we added up all of the areas that we just found?

Marisa: When I add them all up I get 122 units squared.

Mr. Mejia: Good. What did someone else get?

Chris: I got the same thing.

Mr. Mejia: Good. So, all we did was find the area of all of the faces of the prism and add them all up, right? That was pretty easy I think. We all

knew how to find the area of a rectangle so we just did that six times and added them all up. Well, there's a name for this. Guess what we just found?

Trisha: It's the area of all the parts. I know this. Something about the surface. Like the surface area or something like that. I don't remember exactly, but I think that's it.

Mr. Mejia: That's it. It's called the surface area. That's what we found. So, the surface area is just the area of all the faces of the prism.

Mr. Mejia provided the students with additional entry points into the lesson. In this excerpt, he introduced the concept of surface area by connecting it to the area of two-dimensional objects. He connected the surface area of three-dimensional objects with what the students already knew, which was how to find the area of two-dimensional objects, such as rectangles. He started this off revealing how the face of the prism was actually just a flat surface on its own. Even though it was part of a three-dimensional figure, the face was simply a rectangle. He drew this on the board to show the students this and guided them into finding the area of the rectangle. During our follow-up interview on this standard I asked Mr. Mejia about this component of the lesson specifically and about his approach to the vocabulary terms in general. He stated, "I basically try to do this all of the time. I get the students to see they know things by not focusing on the specific vocabulary or standard. They have some level of prior knowledge so I try to feed off that information. It's a very non-threatening way to deal with math." As a result of his comments, the following ensued:

Excerpt 7.6: May 11, 2015
Post Observation Interview with Mr. Mejia

Branch: Yes. I've noticed this in many of the lessons I observed. Tell me about this approach. Have you always done this or is this something new for you?

Mr. Mejia: A little bit of both I think. I didn't really do it when I taught second grade. There wasn't much prior knowledge to get at, but sometimes it worked just with their interest and things. I think I do it more now with the middle school students probably because of my Masters coursework. That was really something they stressed during my time there. The focus was always on the students and finding ways to make the subject matter more accessible. There's a lot of different things to do, like pop culture related, using their names, something so it's more personal or connected to them. I just figure whatever I can do to show the kids that math isn't that bad if you know some basic things already and if you find a way to make it every day. That's what I do or at least that's what I try to do. I think (name of University) helped me do that and I realized I can do that for them.

Mr. Mejia bridged the mathematics for the students. According to him, with the help of his master's program, he was able to help the students make connections with mathematics. He took the math standard or concept for the day and presented it in a way that the students could get the basics. In the previous excerpts on vocabulary and concept introduction, Mr. Mejia revealed his approach to teaching mathematics. He felt that math was best approached when it was presented in a way that was "non-threatening," and the best way to do this was by providing the students with opportunities to show what they already knew, or to build on their previous knowledge.

Unfortunately, by presenting the material in this non-threatening manner, Mr. Mejia missed the opportunity to develop his students' math vocabulary. Developing students' mathematics vocabulary is a key component to the CCSSM. Many researchers demonstrate the need for strong academic vocabulary in being able to communicate in a content area, whether in mathematics, the sciences, or language arts (Kieffer and Lesaux,

2007; Kinsella, 2005; Nagy, Townsend, Lesaux, Schmitt, 2012; Rubenstein and Thompson, 2002; Thompson and Rubenstein, 2000; Townsend, Filippini, Collins, Biancarosa, 2012). Thompson and Rubenstein (2000) suggest teaching the development of academic language through various instructional strategies, such as orally, in written form, and using visual cues and clues. Mr. Mejia felt his students were better off being introduced to topics through lower level prior knowledge connections. He was the intermediary between the students and their understanding of the CCSSM. Mr. Mejia did not strongly focus on the vocabulary development in his class, but rather tried to help students connect what they knew to formal mathematical definitions.

He was the intermediary in his math classroom because with his help the students were able to recognize that they already knew things, that math was something to build on, and that with the way he presented math in the classroom his students could be successful because he was helping them realize math was not something to fear, but rather it was something to learn and overcome. Mr. Mejia was there to help them overcome this subject. He was the intermediary between the CCSSM and their learning. By helping struggling students make math connections, build their mathematical foundation, and present math concepts in a non-threatening way through lower level prior knowledge problems and loosely linked vocabulary, Mr. Mejia demonstrated his role as intermediary to the CCSSM.

Teacher doing the math

Mr. Mejia acts as an intermediary in the math classroom in other ways. During several of my lesson observations in Mr. Mejia's sixth-grade classroom understanding the CCSSM as intermediary became more evident in the way he interacted with the students and how the lesson transpired. Throughout my three-day observation in the beginning of March I observed Mr. Mejia and his teaching of math standard 6.SP.B.4 (see Table 7.2). He told the class that they would be working with data sets for the day and that they should be familiar with things such as mean, median, and mode. He introduced the concept by posing a few questions to the class:

Excerpt 7.7: March 2, 2015
Lesson Observation with Mr. Mejia

Mr. Mejia: Who worries about their grade, raise your hand? If we want to find out the average of all our test grades what do I do? How do I find the average? Let's say I have a 70, 85, 100, and 90. How would I find the average of my overall test grades?

Emilio: Add them up.

Mr. Mejia: Yes and then I would divide them by the number of tests I added, so in this case I would divide by four. When I do that, I get eighty-six and a quarter. So, that is my average. (Mr. Mejia adds the scores up and divides using pencil and paper.) Okay so what did I just do?

Marissa: You added and then divided.

Mr. Mejia: Exactly I found the sum and then I divided to find the quotient or in this case the answer refers to our average or the mean.

A few minutes later, Mr. Mejia provided the students with another example. This time, instead of an example on finding the average in a subject, he provided a sports example. The layout of the class dialogue is quite similar and revealed a lot about Mr. Mejia's approach to the teaching of mathematics in his classroom.

Excerpt 7.8: March 2, 2015
Lesson Observation with Mr. Mejia

Mr. Mejia: Who here plays a sport, either for the school or for another team? (10 of the 16 students raised their hand). What do you play?

Daria: I play volleyball here.

Thompson: Soccer.

Rebecca: Softball.

Mr. Mejia: Great. Okay one more. What do you play Isaiah?

Isaiah: Football.

Mr. Mejia: Does anyone here play basketball for the school or for another team? (two students raise their hand). Do you know how many points you usually score?

Kristen: I got eight points last time. I remember because my mom said it was the most so far this year.

Mr. Mejia: Well good job! What about you David?

David: I'm not sure, maybe six points I think. I think I made two 3's last time and that's it.

Mr. Mejia: Great. We can also use what we did for our grades to help us find the average we score in a basketball season. Let's say in five games you scored 8 points, 6, 10, 4, and then 7 points. We could use that to find the average or mean points you score in a game. What's the first thing we need to do?

Eddie: Add em.

Mr. Mejia: Then we have to divide. Who remembers what we divide by? Five, right? So, that would be 35 divide by 5, which is 7. The average points you scored in those five games as 7. We add the values up and divide by how many values we added. The answer to that is then called the mean or the average.

These excerpts revealed a few things about Mr. Mejia and his teaching of math. First, he introduced a concept by posing a question to show the students that they already had a way into the lesson for the day -- that they already knew something about what they were learning. He demonstrated that by posing a question that may be a familiar feeling students have regarding their grade in math or other subjects-that was how a grade was calculated. This related back to what Mr. Mejia noted in our initial interview that he tried to introduce a concept by linking it with something the students already knew, whether that was a conceptual connection or a personal connection.

Table 7.2 Sixth-grade content standard

| | |
|-------------------|--|
| Standard | 6.SP.B.4 |
| Domain | Statistics and Probability |
| Cluster | Summarize and describe distributions. |
| Standard 4 | Display numerical data in plots on a number line, including dot plots, histograms, and box plots |

Second, how the concept unfolded revealed something very important about how Mr. Mejia viewed the teaching of mathematics. In the previous excerpts, Mr. Mejia did all of the math. He found the sum of the values and he divided the values by the number in the data set to find the average or the mean. He did not ask his students to do the problem, he didn't ask for their sum or quotient, and he didn't check to see if any students were attempting the hypothetical problem that he posed. Simply put, Mr. Mejia did the math. He introduced the concept by demonstrating the connection to the objective of the day. This happened quite a bit during my lesson observations. During that three-day observation period Mr. Mejia asked dozens of questions, including procedural and calculation questions, definition of vocabulary terms, and clarification questions. Only

about one in five questions asked were students actually given opportunities to provide an answer or elaborate on a given thought. Mr. Mejia did most of the math, usually answered his own questions, or did not give students much opportunity to have their voice heard in the classroom. Many times, I noticed that he rarely asked the students for any input, suggestions, or results until he gave them questions to do about thirty minutes into the class period. The first part of the period was spent on his ability, his direction, his perceived ability to help students make connections by connecting the dots for them.

Mr. Mejia was an intermediary of the math for the students by either providing an entry point to the lesson, perhaps a real-world example, or by doing the math for his students to show its simplicity and that they had the skills necessary to complete the task. By doing the math, Mr. Mejia acted as information provider or one who is eager to perform. Todosescu, Popescu-Mitroi, and Greculescu (2015) argue that teachers whose instructional strategies were mostly linked to direct instruction and self-proclaimed experts in their content area, were less successful in developing the interest and performance of their students.

Another example illustrates this even further. Mr. Mejia continued with the lesson on data sets. After going over the mean he spent a few minutes on finding the median. The last thing he focused on was finding the mode. He did not spend any time discussing the purpose of knowing the mode of a set of data, nor did he talk about its potential relationship with the mean or the median. He went straight into finding the value with minimal contribution from the students. He posed the following on the board:

Excerpt 7.9: March 2, 2015
Lesson Observation with Mr. Mejia

2, 1, 8, 0, 2, 4, 3, 4

Mr. Mejia: Now let's find the mode. You know that-it's the number that appears the most in the data set. (Mr. Mejia waits about ten seconds). What number appears the most in the data set?

Paul: 3

Mr. Mejia: Well, not sure how you got that. Anyone else?

Sasha: 2 and 4, maybe he did the average of them. I don't know.

Mr. Mejia: Is that what you did, Paul? Remember the mode is the number that appears the most. We don't have to add or divide or do anything else, just find the number that appears the most. Can we have two modes? We haven't talked about that, but we can have two modes. We can also not have a mode or we can have one mode. This is a case where we have two modes.

Ike: So, they are both the mode, then?

Mr. Mejia: Yeah. We can have two modes. So, 2 appears twice and 4 appears twice, which is more than 0, 1, 3, and 8. We can have two modes. So, two modes, let's add that note at the beginning of our notes. The two modes are 2 and 4. So, if a number appears the most and it ties with another number that also appears that many times, you can have two modes. Does that make sense? Two modes are okay to have, but not two means or two medians.

Mr. Mejia explained and did most of the math in this excerpt. When he posed questions to the class he either answered them himself or provided students with an opportunity to chime in, but did not elaborate on their response, nor did he give the class a chance to expand or reevaluate. Mr. Mejia defined the vocabulary term, explained why there were two modes, and explained why having two modes was acceptable in a set of data. Furthermore, he informed the students that two means or medians was not acceptable, but didn't go into depth as to why this was the case, nor did he allow the students the

opportunity to figure this out for themselves. Mr. Mejia was the one doing the math, not the students. He defined terms, calculated values, made decisions, and explained his results. Mr. Mejia demonstrated his understanding of the CCSSM as a doer of math and as a result was the intermediary in the classroom. He was the go-between for the students and the CCSSM. This point was made clear in a follow-up interview.

After this initial three-day observation, I sat down with Mr. Mejia. In a follow-up interview to my lesson observations from March 2-5 I asked him about his approach to teaching mathematics and particularly in teaching standard 6.SP.B.4 (see Table 7.2).

Excerpt 7.10: March 6, 2015

Post-Lesson Observation Interview with Mr. Mejia

Branch: In your lesson on mean, median, and mode – describe your teaching of this particular standard.

Mr. Mejia: Well, I will say I am not used to teaching this standard to sixth graders. I have taught it before, but it was to seventh grade. Regardless, I teach it the same way pretty much. I don't think of it as a difficult concept and it is pretty simple to connect to the students' lives with grades and sports. Plus, I didn't want to spend too much time on finding the measures because I thought they would need more help with displaying the data. You probably saw that too on the third day.

Branch: When you go about planning for a lesson, how do you decide what it is that you are going to do and what it is that the students are going to do? In particular, with this lesson on mean, median, and mode?

Mr. Mejia: Well they need to be able to find those things and apply them. For instance, the example that I gave them on their test scores. I said if you received let's say for example a 20%, 70%, 85%, and 100% how would I find the mean or the average of those scores? So, they had to be able to do those. I want them to be able to take knowledge from this class and apply that to real life...So we talked about a real-life example that would help them understand their test grade in class for instance. They figured it out and understood why. I want them to see me modeling how to find that information and then be able to do that on their own and figure out how would that apply to my life. How do I use that math and what

does it mean to me? They can do math and see how it is useful to them. I think an example like that does just that.

How Mr. Mejia described what transpired during his class period revealed a lot about how he understood mathematics and student learning, but it also shed light on who was doing the math in his class. Mr. Mejia explained that he needed to provide real life examples for his students to help them make sense of math concepts. At the same time, he stated that “we talked about a real-life example,” that “they figured it out and understood why,” and that he wanted “them to be able to take knowledge from this class and apply that to real life.” Mr. Mejia used pronouns for the students, such as “they,” “we,” and “them” to show that the students were the ones figuring things out and doing the math, yet the transcripts of the lesson show otherwise. Mr. Mejia chose the examples, worked through them, and made sense of them, not the students. The students were not the ones making sense of the material. In fact, Mr. Mejia was the one making sense of the material for them, making connections to real life situation for them, and coming up with reasons why certain values or answers would or would not make sense. Mr. Mejia was the one doing all of the math. He was the buffer for the students. In other words, he stood between the students and the material, the CCSSM. Mr. Mejia was the intermediary between the students and the CCSSM. Unfortunately, by being the buffer or the intermediary, Mr. Mejia did not provide his students with enough opportunities to deepen their understanding of material and strive towards being proficient mathematicians.

Making use of resources

The metaphor of understanding the CCSSM as intermediary described Mr. Mejia's approach to teaching. He enjoyed math, appeared to be good at it, and used that to bridge math concepts and standards to his students. According to Mr. Mejia, he took the material in the book or the standards and helped the students understand it better by presenting it in a way that was not so confusing, convoluted, or difficult. Mr. Mejia was the intermediary between the students and the CCSSM. The resources he used, such as the textbook and other curricular materials, his colleagues, and the lesson plan format adopted by the deanery were also intermediaries, or buffers, between him and being viewed as a good teacher and employee.

In our initial interview, I asked Mr. Mejia how he first heard about the CCSSM. He mentioned that he first heard about them through his master's coursework at a local university, which was in 2012. Mr. Mejia explained to me that he knew then that they would be something he would have to incorporate into his classrooms and that he felt he was doing that currently.

Excerpt 7.11: November 24, 2014
Initial Interview with Mr. Mejia

Branch: So, you learned about the CCSSM from your coursework?

Mr. Mejia: Yes, a little bit. That's where I first heard about it. Then the following year I heard about them being implemented at my work for that next year, so a couple of years ago. That was pretty much it though...Not much has been done around here in my opinion about helping us with that. I didn't understand what Common Core was at first and I feel like I still don't thoroughly. Now that we have new Common Core textbooks I am seeing how different it actually is then what I was originally told and explained, but that is something I have tried to figure out on my own a little bit. Now since we have new books I have never been instructed on how to teach in the Common Core fashion. No one has told me to change my teaching style along the way so I must be doing something right. I am

just gathering what I can based on how the books are written and how I need to teach it. I try to use the book as a guide and not do it word for word and page by page. That has kind of taught me how I need to change my teaching style just by reading the textbooks I am supposed to be using. It's kind of whatever I can teach myself based on information I have gathered online and then as well as the books.

Mr. Mejia revealed that he did not feel like he truly got what the CCSSM were about, yet even though he was not sure exactly what it was, no one had asked him to teach differently or change his teaching style. He viewed this as a success. Mr. Mejia believed that what he was doing was what he was supposed to be doing; he wasn't specifically told to go through the book, omit problems, and find things online, but it seemed to be working for him. What he gathered about the CCSSM came from a few different places, one being the textbook that he used in class. Other resources included additional curricular materials, online resources, his fellow colleagues, and the lesson plan design adopted by the deanery (see Chapter 6; additional details about these resources are forthcoming). In the excerpt above he mentioned that the textbook he was using was common core aligned. I asked him what he meant by this.

Excerpt 7.12: November 24, 2014
Initial Interview with Mr. Mejia

Branch: Now when you say you see things differently because the textbooks are Common Core. Tell me what that means to you.

Mr. Mejia: Well the school got new math textbooks last year and they are Common Core aligned. The book has a little ribbon or something like that on the corner of the cover that says it is Common Core aligned for the state of California. Each lesson has a description of the standard that it covers. I noticed that it also includes a lot more word problems, critical thinking problems, and multi-step problems. There's even a section in the teacher edition that suggest to discuss strategies, compare vocabulary terms, or like that. A lot of chances to really talk about the math. That's

not something I am used to seeing in a math text book. There's probably more than there needs to be, but at least I know that if I'm doing those things then I am doing the Common Core.

Mr. Mejia clearly stated that he believed he was teaching the CCSSM because he utilized a textbook that was Common Core aligned. His main reasons for this were due to the fact that the textbook series included the name of the standards, provided a breakdown of concepts or clusters for each chapter, and a ribbon on the front of the text that read Common Core aligned for the state of California. Furthermore, he believed that he was teaching the CCSSM because "why else would the school adopt the book if it wasn't." He did make some valid points to his argument. According to Mr. Mejia, he must be teaching and utilizing the CCSSM in his classes because he was using a textbook that was aligned with the standards. The last part of the excerpt Mr. Mejia mentioned that he was not used to seeing those types of things in the math textbook and that he knew he was doing the CCSSM if he attended to those things. This statement tells a lot about Mr. Mejia and his role in implementing the CCSSM not only as a math teacher, but also as a math teacher at JSPS. Mr. Mejia thought he was altering his teaching by utilizing the resources provided to him, such as the CCSSM aligned textbook (Marx and Collopy, 1995; Polly, Wang, McGee, Lambert, Martin, and Pugalee, 2014; Richardson, 1990). He felt his students were responding in a good, positive way and therefore felt that he was being successful in implementing the CCSSM.

Collopy (2003) studied two upper-elementary mathematics teachers and found that their interaction with curricular materials was self-navigated based on their teaching beliefs and practices and therefore limited due to a lack of professional development on

the materials themselves and their intended use. This self-navigated interaction with the materials included enacting instruction, reading the materials, and using their understanding of the materials to inform their teaching practices. Mr. Mejia's interaction with the new textbook series through self-navigation was hindered by his teaching beliefs and practices. He wanted to incorporate components from the textbook, but did so in an uninformed manner, without specific mathematical direction and intent, and therefore, limited actual implementation of CCSSM material and instructional shifts.

Mr. Mejia's use of the "Math Talk" component of the textbook series illustrated his self-navigation and limited attempt in utilizing CCSSM material. Mr. Mejia stated that he wasn't used to seeing certain types of questions and approaches to math in the current text series used by JSPS. Mr. Mejia referred to such questions that were labelled as "Math Talk," multi-step word problems, and critical thinking problems. The "Math Talk" questions provided opportunities for the teacher and the students to discuss concepts more thoroughly, think about a topic in way they hadn't before, reveal understandings or uncover misunderstandings, or even to link topics and ideas. An example of a "Math Talk" question from the textbook was "Why wouldn't it make sense to have two means or two medians?" Mr. Mejia had an opportunity to have his students discuss this in class, but chose not to for some reason. Rather, he told his students that having two modes was acceptable, but not two means or medians. He didn't get into the reasons as to why this was the case. Mr. Mejia mentioned before that he brought this up in class and did so because it fit in with the example that he was doing, but also because it was a "Math Talk" item in the textbook. He wanted to bring it up because it was in the

book and he felt it was something that was important to note. In other words, the question was in the textbook so it was probably something that was closely related to the CCSSM especially since it wasn't something he had been used to, but also by bringing it up in class, Mr. Mejia felt that he was implementing the CCSSM into his classroom practices. He was using a textbook that was Common Core aligned and he was actively including its components into his math lessons. Furthermore, Mr. Mejia felt that by doing so he was being a good math teacher. He utilized his resources, the Common Core aligned textbook, and provided additional information for the students to help them get a better grasp on the material. In addition, Mr. Mejia used a resource provided to him by the school. This resource was something he was expected to incorporate into his math classes. He was not only being a good math teacher by implementing Common Core ideas, but he was being a good JSPS math teacher by incorporating a given resource into his classroom. He was doing what he was expected to do. Mr. Mejia followed directions as an employee of JSPS (more details on this aspect of intermediary to follow).

Mr. Mejia gave additional reasons why he believed he was teaching the CCSSM in his math classrooms. During the 2014-2015 school year JSPS and the deanery embarked on a new professional adventure. The ten principals in the deanery decided to have their teachers work together in professional learning communities. This would take place a few times during the school year where each grade level teacher would meet with other grade level teachers and middle school subject specialty teachers would meet with other subject specialists to discuss student achievement, the standards, and the new lesson

plan model adopted by the deanery, among other things. During our second interview, I asked Mr. Mejia about these meetings and his math teacher cohort.

Excerpt 7.13: March 6, 2015
Post-Observation Interview with Mr. Mejia

Branch: Our last meeting you mentioned something about working with other math teachers. I know that you had a couple of meetings since our last interview. Tell me a little about that and how it is going.

Mr. Mejia: It's been going pretty good actually. I've met with my math group a couple of times now. I really like how we talk and share. At first I didn't want to share about my struggles, but I think that it helps us all.

Branch: What kind of struggles?

Mr. Mejia: Well things I've shared with you before but mostly about the Common Core. I talk about teaching concepts to students that I haven't taught before. That's been helpful because other teachers have taught it before in different years or something so I get their help or suggestions. Another thing is, well, I've learned to keep my mouth shut and just listened mostly. A few times I brought up the Common Core and getting my students to really do the math and not just calculate something, you know to actually think about what they are doing and why they are doing it. It's something I should probably do more. I notice it a lot in the book, but I don't attend to it as much as a probably should. One teacher told me I should just be happy that they do it, that they are trying. Another teacher mentioned that she doesn't worry about the Common Core because her school is focusing on the English only right now. I told them that I had looked up some resources online through our textbook publisher and other things on the state website to get some ideas. I thought to myself, wow, at least I am trying to implement the Common Core and doing what I can to learn more about it and these teachers don't even seem to care about it or feel that it is something they need to worry about. I quickly got the feeling that they didn't like the Common Core. I felt like I was the only one trying to be a better teacher and do my job by implementing it in my math classroom. I realized that no one else was in to it so I kind of toned it down a little bit because I get the feeling it's not a big deal to other people. I've brought it up a couple of times and those are the reason I don't anymore.

Mr. Mejia disclosed a lot in his response. He stated that he spoke with other math teachers in the deanery about his struggles of getting his students to really understand why they are doing something. Mr. Mejia wanted his students to not only understand the math, but also to get students to think about what they were doing and why they were doing it. According to the CCSSM, these were two key components in mathematics that moved kids beyond being good math students and into being proficient mathematicians. Unfortunately, Mr. Mejia did not work this kind of learning into his classroom practices. When he brought this concept up with the other math teachers they did not want to engage in this conversation. They told him not to worry about it and that he should just be happy that the students were trying. Additionally, another teacher proclaimed that she was not focusing on the CCSSM because her school was focusing on the English standards instead.

Mr. Mejia felt that he was attempting to teach the CCSSM because he brought it up to others and they deferred the conversation and avoided talking about it. There were other math teachers in the deanery who were not implementing the CCSSM into their classroom practices (Le Fevre, 2014; Terhart, 2013; Van der Heijden, Geldens, Beijaard, and Popeijus, 2015). Terhart (2013) summarized potential barriers to school reform and found that teacher refusal to change as a prominent factor. He added that teachers put their unwillingness to change on policymakers and school leaders due to a lack of teacher training, resources, and support. Although these reasons are not the focus of this study, Mr. Mejia alludes to them as possible reasons his colleagues chose not to implement or learn more about the CCSSM.

In comparison of his work to his peers, Mr. Mejia mentioned that he talked to a friend of his who taught at JSPS about the CCSSM. Mr. Mejia stated that Mrs. Wendy Barclay, the third-grade teacher at JSPS, said that he (Mr. Mejia) did more than she (Mrs. Barclay) did and that he should be happy that he was doing what he could. Mr. Mejia believed he was incorporating the CCSSM into his classroom because he used a textbook that was Common Core aligned and because he was actively trying to incorporate Common Core strategies and problems where other teachers and schools were not. Moreover, he exclaimed that “I am attempting, trying. It may not be perfect or right, but it’s doing what I have been asked to do and it’s more than I know others are doing so that counts for something.”

Mr. Mejia also believed that he was teaching the CCSSM and incorporating it into his classroom based on additional conversations with colleagues at JSPS. Mr. Mejia shared some information regarding a conversation he had with Mrs. Barclay near the beginning of the third trimester around the middle of April. He stated that he was talking with Mrs. Barclay about her teaching and how far she had gotten in the textbook. Mr. Mejia was concerned because she had only gotten to chapter 5 and she was afraid that she would only get to finish chapter 7 by the end of the school year if she was lucky. Mr. Mejia didn’t seem too concerned about his progress with his sixth and seventh grade classes. He mentioned that he felt he was working through the book at a good pace, skipping lessons when he needed to and that he would probably hit all but the last chapter with his math classes. I asked Mr. Mejia specifically about this conversation and his coverage of the textbook.

Excerpt 7.14: May 11, 2015
Post-Observation Interview with Mr. Mejia

Branch: And how do you feel about teaching all of the grade level standards to your students?

Mr. Mejia: Well. I think it is going pretty well. I am m---, okay I am not sure exactly what you mean?

Branch: You mentioned the textbook and getting through most of it. I wanted to know more of what you meant by that.

Mr. Mejia: Oh, okay. Well, things are going well. You saw what we were doing a couple of weeks ago. That was chapter 8 I think, not too sure. I get it confused with the other book I used before. For the most part, we should be able to get through the next three chapters. I might not hit the last one, though. I think that's pretty good for the first time through the book. So, I am teaching most of the standards. Well, even more than most of them. That's a pretty great accomplishment considering where everyone else is at.

Branch: How so?

Mr. Mejia: I found out from Mrs. Barclay that other teachers weren't that far in their math book themselves. I guess that some of the teachers she talked with were barely halfway through the book by the end of the second trimester. I guess they still have time and might get through more, but if you haven't gotten through half and it's two-thirds through the school year, you probably aren't getting much farther if you ask me. That's too bad. The students are missing out because the teacher isn't getting to all of the standards of the CCSSM.

Evidently, Mr. Mejia felt his colleagues were behind. He expressed that he not only taught Common Core material, but he also taught more material. Later in the interview, Mr. Mejia stated that he followed through with his teacher responsibilities more so than some of the other teachers, referring back to this conversation. He utilized the CCSSM resources more so than other teachers and had more of a positive attitude with its implementation. Clearly, Mr. Mejia felt that he was a better math teacher because of the

amount of the CCSSM material that he covered and because he was actually doing his job.

A third reason Mr. Mejia gave for feeling that he was doing the Common Core was based on the deanery's adoption of a lesson plan format. This lesson plan format was called the Core Instructional Model (CIM). Mr. Mejia brought this lesson plan structure up several times during our conversations. In our initial interview, I asked him to tell me about his teaching practices.

Excerpt 7.15: November 24, 2014
Initial Interview with Mr. Mejia

Branch: Tell me about your math classes. What are your teaching practices in the classroom?

Mr. Mejia: So, for my math classes they are pretty typical. I have been asked to implement the new style of lesson plan which is the I-We-Two-You format. Depending on what we are doing I usually do two or three examples for them, then we do two together. After that I have them do one or two in partners and then I end with them doing one on their own. I think I have a good handle on this format. When I do the problems myself to start off the lesson I talk through it out loud so the students get a feel for the things that I ask myself. I say things like I know how to do this because I learned this one thing before so I can apply it to this situation, or I don't even need this information to figure this out. I don't know why they gave it to me. Things like that. I try to struggle out loud for them to minimize their struggle later. Then when we do questions together I do the same thing. Sometimes I'll have them help me with those questions, or suggestions on how to approach a problem, or how I can I show that I know something already before we get started. By the time they do this task with a partner they have seen it enough times that they know what to ask or how to get started so they don't struggle as much because we have done that part together already. I think this lesson format works well with everything else that I am doing with my students so it's pretty typical in all of my classes.

Branch: What do you mean by that? That it works well with everything else that you are doing.

Mr. Mejia: The lesson format works with how I run my class and with the Common Core. I'm guessing that is why the deanery decided to adopt it. Maybe they felt they went together or they by doing one we are doing the other. I don't know. All I know is that I am doing what I am told and that it works for me.

Mr. Mejia used the deanery adopted lesson model in his math classes. He stated that he typically follows that lesson plan format when introducing a new concept or even reviewing an idea. Mr. Mejia believed that the lesson plan format matched really well with how he approached the teaching of math and it worked well for him and his students. He even went further and stated that the lesson plan format must be compatible with the Common Core because he did not understand why the deanery would adopt the format if it did not work with what they were to do with the Common Core. Therefore, by using the lesson plan model in conjunction with the Common Core aligned textbook he was doing his job and implementing the Common Core. Furthermore, by doing these things he was being a good employee by basically doing what he was told and being responsible for the covering material (standards) and presenting lessons using the assigned format.

In our final interview, Mr. Mejia brought up the lesson plan model, the deanery, and the Common Core again, but this time on his own. The purpose of the final interview was to get some things clarified from observations and previous interviews. I asked Mr. Mejia to explain if the Common Core had helped his teaching this school year. He responded with a few typical comments, but then he added something that I wasn't expecting. Mr. Mejia stated,

Excerpt 7.16: June 3, 2015

Final Interview with Mr. Mejia

I feel I get the Common Core now. Before it was confusing to me, but it's becoming clearer. I think I had to figure a few things out for myself, mainly because no one else was telling me what to do. I used the textbook to get a better understanding of it and really sticking to the lesson plan model helped. It gave me a focus and a way to bring the Common Core to the students in an easy, non-threatening way. I used what I was given and I did what I was told. What else could I do? What else should I do? I wasn't given much else to go on.

Mr. Mejia made it clear that he felt the Common Core and the lesson plan model went hand in hand. That using the information in the textbook with the structure of the lesson model meant that he was doing the Common Core in his math classrooms. He also stated that he didn't know otherwise. No one told him he was doing anything wrong or that he needed to do things in a different way. According to him, he was using the materials and resources that he was given and told to use. He was being a good teacher, following instructions, and doing what he was told to do.

Mr. Mejia stated that the principal observed him twice from the beginning of the school year. He never heard anything about those observations. There was no feedback other than a post-it note that read, "Great job on the 'We'. Keep it up." He took that to mean that he was doing what was needed to be done. Other than the two classroom observations from the principal Mr. Mejia didn't have much else to go on. He brought up a few conversations that occurred in faculty meetings. Other teachers were concerned about the Core Instructional Model lesson plan format. The principal stated that the teachers were to use that format in all of their classes and subjects-that they were to write down what they would be doing in their lesson plan books and give a copy to the

principal. Four of the teachers complained about the time that would be involved with creating five to seven lessons each day. The principal stated that they could turn in an abbreviated version of the sections. She wanted them for a couple of reasons. One, to ensure the teachers were thinking about their lesson presentations in a certain way, but also to get an idea as to what the teachers would be working on daily. Mr. Mejia showed me his lesson plan book in which he wrote down notes for each component (I-We-Two-You) of the lesson plan format. He had it filled out for weeks and weeks. Mr. Mejia told me that he knew he was doing what needed to be done because he always gave the principal a copy of his lesson plan book on a weekly basis. He knew that she was aware of his approach in the classroom. Mr. Mejia was convinced that he was doing right by the principal and therefore being a good employee.

Mr. Mejia was an intermediary in the classroom for his students as they “get used to” this way of learning math. He was also an intermediary as an employee of the school. Mr. Mejia was an intermediary to the CCSSM because he was using his resources to demonstrate he was a good teacher. He was keeping the peace with his students by providing them with guided struggle and limited opportunities to struggle on their own. Mr. Mejia felt that his students needed to get used to this new way of learning math and he wanted them to be successful. He was keeping the peace with his colleagues because he was limiting his input on the CCSSM. There were times when he brought it up because he wanted advice on how to introduce a topic or to learn from other teachers. His colleagues weren’t interested for a variety of reasons. Finally, Mr. Mejia used his resources as an intermediary between the CCSSM and his principal. He demonstrated

that he was implementing the CCSSM in his math classrooms because he was using a textbook and its supplementary materials that were Common Core aligned. He was also utilizing the lesson plan format that was adopted by the deanery. Mr. Mejia stated that he felt these two work together to help him be successful in teaching the CCSSM to his students. Mr. Mejia was doing what he had been told to do and he used the resources that he was given. Not once had he been told that he needed to change his teaching style. He hadn't been formally trained on the CCSSM so he felt that what he was doing must be sufficient and good enough-that ultimately, he was a good CCSSM teacher. The resources that Mr. Mejia used, such as the textbook, the lesson plan format, and his colleagues were the intermediary between him and showing that he was a strong employee who followed directions, did what he was told, and taught math. Ultimately, Mr. Mejia understood the CCSSM as intermediary.

The Catholic Identity of Mr. Mejia

Mr. Mejia understood the CCSSM as intermediary. He found ways to soften mathematics for his students through his teaching practices. Mr. Mejia was someone who his students could go to as a guide, someone to show them the way, so to speak. Thinking of Mr. Mejia as an intermediary to the CCSSM makes even more sense when taking a deeper look into his beliefs, not just as a teacher, but his religious beliefs.

Mr. Mejia brought a lot to JSPS. Not only was he a self-proclaimed devout, practicing Catholic, he felt he had a good relationship with the students, their families, and with his colleagues. He considered himself to be more than a teacher. He was a Catholic role model for his students and others on campus, someone who strove to help

develop strong Catholic values in the student body, and someone who firmly believed that being a Catholic school teacher was not just a job, but rather was a calling, a ministry, and his vocation. Throughout the rest of this chapter, I argue that Mr. Mejia's Catholic faith guided his teaching identity and practices in two particular ways: (1) as a Catholic role model for his students Mr. Mejia actively participated and lived his Catholic faith inside and outside of the classroom and (2) as a nurturer of his students' Catholic identity and character he encouraged his students to develop their relationships with others. Mr. Mejia was also a firm believer that teaching at a Catholic school was his vocation. Mr. Mejia's Catholic identity and the school culture at JSPS allotted him an avenue to profess not only his faith in Catholicism, but also shaped his teaching instruction.

Culture of JSPS

To get a clearer picture of how Mr. Mejia's belief in Catholicism guided his teaching it was necessary to look into the school and faith culture of JSPS. School culture, sometimes referred to as school ethos or character, as established by its leaders, including the principal, faculty, and staff, varies among school districts and even between schools within a school district. This variation also occurs in Catholic schools. There may be an overarching focus on faith, academics, and service (Benson and Guerra, 1985; Morris, 1998; Ozar and Weitzel-O'Neill, 2012), but each school within a deanery has its own unique character and tenet. Coleman and Hoffer (1987) discuss two orientations to schooling seen in the public and private sector. The first orientation sees school as a means to enter society. In other words, school is a place to develop the necessary skills to

become a contributing member of society by learning various subject matter and developing certain skills. Coleman and Hoffer suggest that this orientation is primarily seen in the public-school sector. On the other hand, the second orientation to schooling views school as an extension of the community – the local community and familial community. This orientation, as argued by Coleman and Hoffer, is primarily seen in the private sector, such as in Catholic school communities. Other researchers stress the importance of community and togetherness in Catholic schools arguing that sense of community is what sets Catholic schools apart from public schools (Convey, 2012; Cook and Simonds, 2011; Hobbie, Convey, and Schuttloffel, 2010). In his study of Catholic School Administrators and teachers, Convey (2012) found that teachers and administrators felt that “the most important component of Catholic identity in a Catholic school is the school’s culture or faith community” (p. 210). He argued that a Catholic school’s Catholic identity stemmed from one’s relationship with God/Jesus and others, one’s call to service, and a sense of togetherness, all of which Coleman and Hoffer claim as the second orientation to schooling.

A sense of community and togetherness were not the only potential characteristics that separate Catholic schools from public schools and from one orientation of schooling to the next. Additional characteristics included a rigorous curriculum (Ozar and Weitzel-O’Neill, 2012; Bryk, Lee and Holland, 1993; Coleman and Hoffer, 1987, Valli, 1990), familial involvement (Morris, 1998), a call to the service of self and others (Youniss, Mclellan, Su, and Yates, 1999) and institutional integrity (Hobbie, Convey, and Schuttloffel, 2010). All of these aspects together– community, rigorous curriculum,

familial involvement, institutional integrity, and educating the whole student were what some researchers stated were characteristics of what separated Catholic school culture from public school culture. Valli (1990) provided a great example. Through an interpretive lens, Valli (1990) uncovered the meaning of curriculum differentiation at Central Catholic High School (CCHS). She noted that the culture of the school overshadowed what academic program students were a part of. Regardless of the academic track of a student, the school's culture of "effort" played a huge role in how students were treated. Effort, according to Valli, is evident throughout all aspects of CCHS's school culture, classroom interactions, institutional policies, and communal relations. Valli noted that the school was organized in such a way that it promoted success, regardless of a student's track, course, or grade level. Valli showed that it was the school's culture that truly defined the academics for CCHS.

According to Deal & Peterson (2010) a school's culture constitutes and influences a number of factors. These factors can be divided into three categories, consisting of symbolic, behavioral, and material manifestations. Symbolic manifestations of culture can be expressed through beliefs, values, and assumptions. In this case, for example, this might mean assuming all students are Catholic (Bryk, Lee and Holland, 1993), valuing parent and familial involvement (Hobbie, Convey, and Schuttloffel, 2010), or believing in a common set of standards for all students (Camarena, 1990). Behavioral appearances of culture are distinguished through various rituals and traditions, such as school assemblies or ceremonies, after school clubs or activities, or sporting events (Lesko, 1988). Material indicators of culture can be observed through architecture, artifacts, or

other tangible items, such as yearbooks, the school newspaper, or the school mascot. One way to get a grasp on a school's culture is to take a look at different subsets of the participants and their interactions with each other (teachers, students, administration, parents, etc.).

For JSPS, symbolic manifestations of culture included the belief in developing student's spiritual relationship with God and valuing Scriptural messages. Behavioral appearances of culture are distinguished through various rituals and traditions, such as school assemblies or ceremonies, after school clubs or activities, or sporting events. JSPS exuded many behavioral manifestations of culture. Some religious events included all school Masses, re-enacting the Stations of the Cross, and bi-monthly prayer services. Other behavioral manifestations of school culture included such happenings as monthly school-family meetings, Mission Frolic, and celebrating Catholic Schools Week with daily activities. Material indicators of culture can be observed through architecture, artifacts, or other tangible items, such as yearbooks, the school newspaper, or the school mascot.

JSPS displayed their academic and athletic awards and trophies in a glass case as you enter the main building of the school. There was a tremendous amount of artwork that filled the halls of the school, such as small cardboard cutouts of people dressed as students complete with uniforms and cutouts of the school mascot, photos of school faculty as well as photos of the local bishop and the current pope, and posters of inspirational quotes and Bible passages. JSPS had a strong Catholic identity that was

evident through its various manifestations (Deal and Peterson, 2010), conceptual structures (Erickson, 1987), and communal relations (Coleman and Hoffer, 1987).

One way to get a grasp on a school's culture is to take a look at different subsets of the participants (teachers, students, administration, parents, etc.). Mr. Mejia, one of the junior high teachers, teaches math and Religion. Prior to teaching junior high at JSPS, Mr. Mejia was the second-grade teacher for three four years. He has been at his current position going on seven years.

Mr. Mejia as Catholic Role Model

Mr. Mejia was born and raised Catholic. Both of his parents were Catholic as well as his sibling. When I asked about his educational history he responded, "I went to Catholic school since kindergarten even through college and my Masters too. I have just always felt a part of that community and wanted to be a part of it as long as I could. I think that's partly why I teach at a Catholic school. It's just in me, it's part of me." This comment truly reflected Mr. Mejia's outlook on education and teaching at a Catholic school. He used terms such as *community*, *belonging*, and *fit it* more than thirty times in interviews, informal conversations, and classroom interactions. I asked Mr. Mejia to elaborate on what he meant when he said "It's just in me, it's part of me." He paused for a moment, shifted in his chair, and responded with the following:

Excerpt 7.17: November 24, 2014
Initial Interview with Mr. Mejia

Branch: What are you referring to when you say, "It's just in me, it's part of me?" I'm curious to know what that means to you.

Mr. Mejia: Well, it's simple, really. I really enjoyed my time at (name of grade school). I had really good friends there. People who I am still

friends with today and really close to. The same goes for my high school and college. I have just always felt like those were places for me. I am a strong believer. I mean yes there are things in my life that I struggle with, but I have a strong relationship with God and I feel like that is because it has developed over the course of my school-age years and as an adult. But, it all started in those days. I grew up with a family who was very faithful and I was surrounded by others who were open about their faith. So, that's what I mean. It's always been a part of my life so when it isn't there I am a bit out of touch with who I am. It's just part of me.

Mr. Mejia felt belonging to a Catholic school community was part of him. It was something that he was meant to do. It was his calling. Mr. Mejia's experienced with Catholic schooling parallels what many researchers claim about Catholic school; that they strive for and value togetherness and exude a faithful communal feeling (Coleman and Hoffer, 1987; Convey, 2012; Cook and Simonds, 2011; Hobbie, Convey, and Schuttloffel, 2010). By understanding the culture of JSPS and how Mr. Mejia's teaching and faith fit into and are a part of that culture, we get a better sense of how he operated as a math teacher of the CCSSM.

Being a strong Catholic role model was not something Mr. Mejia set out to do, but rather it was just something that had developed during his time at JSPS. Mr. Mejia actively participated in the Catholic faith by being a part of the faith community. He attended the all-school Mass regularly every Friday without exception. This Mass attendance was required of all homeroom teachers, so was not required of Mr. Mejia as he was not a homeroom teacher. Yet he was only one of four teachers on staff (4 of 12 full time teachers) who attended every Friday Mass during the school year. Mr. Mejia actively responded during Mass, sang along with the cantor, and encouraged his students

to do so as well. In fact, Mr. Mejia stated the following when I asked about his participation during Mass:

Excerpt 7.18: March 6, 2015
Interview with Mr. Mejia

Branch: I noticed during Mass you are quite active with your responses. In fact, I don't recall a time where you didn't respond.

Mr. Mejia: (Smiling and laughing) You got me there. I'm sure it's part subconscious, but also because I enjoy it and want to be involved in the Mass as much as I can. Some of these kids only go to Mass with their class and the school on Fridays. They don't attend Mass on the weekends with their family. That's one of the reasons I go over the readings for Sunday Mass during class on Thursdays. Otherwise they may not be exposed to it and how Scripture can be a form of prayer. But, when we go to Mass together I try to show them it's okay to respond and sing, that it's important to be a part of the Mass and not just attend it.

Mr. Mejia's example went beyond simply attending and participating during Mass. He was actively engaged in these Masses and in other aspects of the faith community. Every First Friday of the month there was a celebration of the Eucharist, referred to as the Blessed Sacrament, in which those left after Mass recited the rosary and honored the Blessed Sacrament of Jesus on the altar. Mr. Mejia set an example for the students and the JSPS community by taking part in this. He prayed the rosary with the rest of the parishioners and encouraged his students as well as the rest of the student body to join in. During an interview, Mr. Mejia stated that he did this because he wanted students to make their voice known during these times. They were members of the Church too and he felt like they should do more than just be there in attendance, but also participate and demonstrate their faith and build their relationship with God.

Mr. Mejia's active involvement in the faith community went beyond weekly Mass. He also took an active role during the Lenten season. The Lenten season started on Ash Wednesday and culminated with Easter Sunday. Every Friday during the Lenten season the school community re-enacted the time before Jesus' crucifixion, known as the Stations of the Cross. There were six Fridays during the Lenten season that the school was in session. Of these six Fridays, Mr. Mejia took the lead on two of them. He worked with his Religion classes to come up with skits and a mini prayer service to reenact the Stations of the Cross for the whole school. He spent hours in and out of the classroom preparing the students and getting the materials ready. I asked him about this during one of our informal conversations. He mentioned that he didn't mind doing it twice since he had two different classes he could work with, but also because he believed it was such an important part of the season. He felt it was important for the kids to be involved so they could get a better understanding of the true meaning of Lent and the sacrifices that Jesus made for His people. Mr. Mejia volunteered himself and his students for two weeks. He demonstrated his Catholic faith beyond the walls of the Church. He extended his beliefs to the classroom and the school.

Mr. Mejia also shared his faith with his students during the school day. I observed Mr. Mejia during his math classes, but I also spent some time in one of his Religion classes. What struck me was how he incorporated religious aspects in his math classroom. Clearly, he spent a lot of time working with his students on developing their faith during Religion class and during religious events, such as Mass and the Stations of the Cross, but he also found time to do so during his math classes. Mr. Mejia started

every class period with a prayer. It didn't matter if it was math class or Religion class. In passing I asked him about this and he stated that it was something that the principal had asked the faculty to do before every class period, regardless of what subject they were teaching. He stated that he knew many of his colleagues didn't do it because they told him so, but also because the students mentioned to him that his was the only class that they prayed beforehand, with the exception of Religion class. I asked Mr. Mejia about this more specifically in a follow-up interview to one of my lesson observations.

Excerpt 7.19: March 6, 2015
Post-Lesson Observation Interview with Mr. Mejia

Branch: You and I have talked about this before briefly, but I'd like to know a little more about it. Tell me about the beginning of the period. I noticed you started with a class prayer.

Mr. Mejia: I start off every class period whether it is Math or Religion with a prayer. It doesn't have to be anything drastic or lengthy. Just something to get the students to be relaxed, in the moment, and to invite Jesus into their hearts. I think it's perfect especially when I have the students right after their snack break. It gives them a chance to settle down a bit, focus, and be peaceful. It's something we were asked to do and I believe it has a place in every subject. There doesn't have to be a designated time for one's faith. It can be in math class too if we want. A lot of times I ask the kids if anyone wants to lead us in prayer for the day. Someone usually volunteers. I think it's great. Who says there can't be Religion in Math? There is faith and belief in anything. The kids are used to it. In fact, I think they kind of like it. I have forgotten a few times and they are quick to remind me.

During this particular math class observation, Mr. Mejia asked if any of the students would like to lead the class in prayer. Seven of the students raised their hands. He called on one of them and this student said a brief prayer asking for love in everyone's heart. It was simple and short, but it was a great way to start the class period and settle the students in order to begin the lesson for the day as they just came in from recess. Praying

before math class was just one way Mr. Mejia actively lived his Catholic faith and was a role model for his students and others. He attended and participated in Mass on a regular basis, prayed with the students, facilitated and created prayer services for the school, and was a daily example of professing one's faith.

Mr. Mejia's actions were something that occurred the moment he was on campus and others noticed. Throughout the school year there were a handful of times that teachers or the principal mentioned Mr. Mejia and his work with the students in terms of their faith. For instance, when meeting with the third-grade teacher, Mrs. Barclay, to discuss her use of the CCSSM, she acknowledged her work with Mr. Mejia when he was the second-grade teacher. She stated, "Mr. Mejia should be the middle school religion teacher. He was so good with the second graders and most of them know how Catholic he was and they respect that about him." She went on to further state that she believed Mr. Mejia was so good with the second graders during their preparation for First Holy Communion and Penance that she was impressed with them when they came to her as third graders. Mrs. Barclay wasn't the only teacher who felt Mr. Mejia was the perfect candidate to teach Religion to the middle school. The eighth-grade teacher, Mrs. Angela McElroy also made a few comments. These comments were shared in passing during one of the Stations of the Cross prayer services that Mr. Mejia led. She mentioned that Mr. Mejia was as Catholic as they come and that it was clear in how he carried himself that he was a firm and strong believer, but not in just an outward sense. She went on to further say that you could tell by being in his presence that he had an inner peace about him. Later that year she even jokingly said that he was an old priest trapped in a young man's

body. Clearly Mrs. Barclay and Mrs. McElroy saw the faith of Mr. Mejia not just in his actions, but felt that it was a part of him and his daily life.

Lastly, I met with the principal, Mrs. Maureen Jackson, to discuss the history of bringing the CCSSM to JSPS and the Western Association of Schools and Colleges (WASC) accreditation document. During the interview, Mrs. Jackson discussed a bit about the teachers and how the majority of them were Catholic. She mentioned that this was something the WASC team mentioned in their last evaluation-that the school had great Catholic identity even though there were a subgroup of teachers and staff that weren't Catholic. Mrs. Jackson mentioned Mr. Mejia specifically.

Excerpt 7.20: October 28, 2014
Interview with Mrs. Jackson (principal)

Branch: I've read through some of the WASC document and committee report, a lot of good things mentioned about language scores, Catholic identity of the school. Tell me more about that.

Mrs. Jackson: Two of our homeroom teachers and one of the subject specific teachers aren't Catholic. Then there is Mr. Mejia. He kind of makes up for that (laughing). Mr. Mejia is our resident Catholic. I mean that in a good way. We have a lot of Catholic teachers on staff, but I would say he is the Catholic-i-est of them all. He lives it on a daily basis and makes it a point to show them (the students) the way to do things. You know like forms of prayer, how to interact with others, how to be active in the faith, and how to read the Scripture for inspiration and guidance. He is great with the students in that regard always has been even as the second-grade teacher. I am glad that we decided to put him with the middle school students. They really thrive and grown in their faith from someone like him.

When others talked about Mr. Mejia, such as Mrs. Barclay, Mrs. McElroy, and Mrs. Jackson, it was clear that his actions were common place for him. His colleagues talked about him being a role model as though it came natural to him. His actions were not

forced or out of the ordinary. His actions and ways of being Catholic were everyday occurrences for him. The fact that Mrs. Jackson and others recognized Mr. Mejia's commitment and contribution to the Catholic faith spoke volumes about Mr. Mejia's ability to be a Catholic role model for his students and the staff at JSPS. These instances of praying in math class, being active participants during the celebration of Mass and the Blessed Sacrament, and facilitating and guiding his students to re-enact the Stations of the Cross demonstrated Mr. Mejia's devotion to his faith for himself and for the spiritual development of his students.

Nurturing a Catholic Character

Providing opportunities for his students to witness Catholic behavior was important to Mr. Mejia. During our conversations, he stated more than ten times how he hoped his actions would inspire his students to be more active in their faith. Though he thought this was important, it was also important for him to give his students more than mere opportunities to observe the actions of someone else. He wanted his students to be active in their faith themselves (Belmonte and Cranston, 2009). Mr. Mejia wanted to foster the spiritual development of his students and to give them opportunities to develop their relationship with God/Jesus. This became evident when Mr. Mejia reminisced about becoming the second-grade teacher.

Excerpt 7.21: November 24, 2014
Initial Interview with Mr. Mejia

Branch: Tell me how you became a teacher at JSPS?

Mr. Mejia: There was an opportunity posted on line on the LA Archdiocesan website. I came in to the interview not knowing what grade the position was for. It just said primary and I interviewed and during the interview I was told it was 2nd grade and I thought that was perfect given

my student teaching. I graduated college in April was when I was hired I graduate in May and I started teaching here in August. I loved the fact that second grade was so faith based. I feel like it was meant to be given where I was at in my faith and the fact that second grade is so faith based with the sacraments and all. I thought it was an opportunity for me to expand my faith and for me to grow my faith and for me to share my faith. I couldn't wait to help my students start their journey. It was a position I couldn't pass up.

Mr. Mejia was excited to be offered the position of second grade teacher because it afforded him opportunities to not only develop his faith, but also to share his faith with his students and to guide them in their faith development. He went on to further state that he saw the position as a challenge since being a new teacher was difficult enough; he also had a huge responsibility to his students and their families. Mr. Mejia made it clear that this was not something that he took lightly.

Excerpt 7.22: November 24, 2014
Initial Interview with Mr. Mejia

Branch: I'd like to know a little more about the idea of teaching second grade as being a "huge responsibility."

Mr. Mejia: Well, I guess I realized that more so after I was hired. The entire school year is devoted to getting the students ready to receive their first Holy Communion. I enjoyed this part of being a second-grade teacher. I looked forward to guiding the hearts of my second graders as they prepared for their first Holy Communion. It was always such an honor to be a part of that sacrament with them. They learned so much about their faith and what the host means. It is really an honor to be a second-grade teacher at a Catholic school. You really get to walk the faith with your students and be a guide to them in what to believe. If it wasn't for teaching all of the subjects I probably never would have moved to the middle school.

Even when he moved to the middle school, he still believed it was his responsibility as a Catholic school teacher to help foster his students' spiritual development. Mr. Mejia

proclaimed that teaching Religion and math in the middle school grades was the next best thing. I asked him what he felt the main difference was between teaching Religion in the primary grades to teaching Religion in the middle school. He said that he got to be with the older kids when some of them might be questioning their faith. Mr. Mejia felt it was a good time to be around them to help guide them.

Excerpt 7.23: May 11, 2015
Post-Lesson Observation Interview

Branch: How is teaching Religion and preparing second graders different from teaching Religion to middle school students and focusing on a more holistic approach?

Mr. Mejia: It's sad, but some of these kids don't seem to have much faith other than what they are told. They are old enough to start really developing a personal relationship with God and I try to help them with that. It's not about believing what you are told just because you are told to do so. There's more to faith than that. I show them that there is a whole other dimension and that is building a relationship with God, just like with anyone else. It shouldn't be a one-way street and this can be done in a lot of different ways. Through prayer, quiet thoughts, reflection, being positive, helping others and I want to guide them in those ways. I really enjoy that part of teaching Religion. I just don't do it in Religion class. It is all the time.

Although Mr. Mejia enjoyed teaching Religion in the middle school, he also recognized that it was a huge responsibility as it was teaching second grade. He felt that kids were more vulnerable during their middle school years-that this was an age when they may start questioning or developing some doubts about certain previously accepted beliefs.

Mr. Mejia claimed that this was something that he spent time on in the classroom and that developing one's character needed to go beyond what was in the textbook and Religion standards. The news, politics, and pop culture involved a lot of contradicting opinions on

such matters as gay marriage, infidelity and premarital sex, and abortion. These are just some of the things that kids might be hearing and seeing in their lives and they start to have questions. Mr. Mejia felt that it was something that he shouldn't shy away from, but at the same time he had to make sure that he provided the students with the Catholic belief, mainly because that was what was expected of him, but also because he owed it to the students.

Excerpt 7.24: May 11, 2015
Post-Lesson Observation Interview

Even though I don't get to spend all year with the students to prepare them for their first Holy Communion like when they were in second grade, I do spend a lot of time with the middle school students for Religion class. Some of what I teach is by the textbook, but I also try to be real with them. They have a lot of questions and I try to nourish their curiosity, but in a way that promotes the beliefs of Catholicism. They need to be shown the way of the Church and it is part of my job to do that for them.

Mr. Mejia mentioned several times that you can't just teach Religion from a book or from a list of standards¹. The Religion standards for middle school are organized into four main concepts: Scripture/Christian Life, Sacraments/Worship, Morality/Social Justice, and Christian Faith and Practice. Though the Religion book series adopted by JSPS included various activities for students to engage in, such as discussions and connecting Scripture passages to their personal experiences, Mr. Mejia felt it was important to give his students opportunities to develop their relationship with God/Jesus in his Religion classes in ways that went beyond what the curriculum resources suggested. He stated the

¹ <http://www.la-archdiocese.org/org/dcs/curricula/Documents/religion/Grade7RelEdCurriculum.pdf>

same for the list of standards that he was to be sure to cover. Mr. Mejia claimed that building a relationship with God/Jesus required more than just memorizing some prayers, reflecting on some passages, and praying for others. Two of the standards he referred to were:

- Experiences a relationship with God in individual prayer, including meditation and spontaneous prayer, and
- Recognizes and experiences belonging to a community that prays with and for each other

Mr. Mejia took these standards to heart. He made sure his students had opportunities to pray for and with others and experienced a relationship with God in various ways. One way he did this was through having his students create their own prayers in class, share it with others, and give it personal meaning. I observed part of Mr. Mejia's seventh grade Religion classes on January 20, 2015. As I entered his classroom I immediately noticed the students were writing in their journals. I looked up to the front of the classroom to see directions written on the white board: "Choose an emotion and write a universal prayer." I walked around the room to glance at what some of the students were writing. I didn't get too close because I didn't want to intrude on private thoughts. Mr. Mejia asked if any student wanted to share what they had wrote. At this time, I had been in the room for a little over 5 minutes. Not one hand went up. Mr. Mejia volunteered himself. He stated the emotion that he chose and read what he had written. That was all it took. Jacqueline commented on what Mr. Mejia wrote and said that she would like to go next. Four more students volunteered. Afterward, Mr. Mejia asked the students to take what they wrote and find ways to make it more personal. He asked the students to spend some time

quietly reflecting on their first draft, to think about their relationship with God, and to rewrite their prayer so it reflected their connection and relationship with God. I left the room after twenty minutes passed. I asked Mr. Mejia about this lesson during an informal conversation we had after school.

Excerpt 7.25: January 20, 2014
Informal Conversation with Mr. Mejia

Branch: What a lesson in Religion! Having them write their own personal prayers.

Mr. Mejia: Right? It went much better than I envisioned. The kids were so receptive to it. I think they enjoy these kinds of things, not pre-chosen activities or reading from the book, but actual real-life getting-to-know God through prayer, reflection, meditation, that kind of thing. I was impressed by how much of themselves they put into it. I didn't expect them to share, but I was thrilled when they wanted to do so. Amazing! I've done this kind of thing before as a group where we created our own class prayer, but I wanted to give them chances to be one with God, to develop in their relationship one-to-one.

Another example of how Mr. Mejia provided students with opportunities to nurture their spiritual growth was during a holy day of obligation Mass in December. The JSPS student body attended Mass in the morning and Mr. Mejia sat with the seventh-grade class. As noted above, Mr. Mejia participated in the Mass in various ways by singing hymns, responding, and taking communion, etc. and he continued to encourage his students to do so, but on this particular day Mr. Mejia took this encouragement to another level. On three different occasions, I heard him urge seventh graders to make a deeper connection during Mass. The first happened during the sign of the peace. Mr. Mejia turned to a few students and gave them the sign of the peace and then he walked a couple of rows toward the front of the Church to another group of seventh graders. He stood

behind a few of them and told them to “Remember the true meaning of receiving the Eucharist. Feel Jesus’ presence in you and grow in your relationship with him.” He stood there for a few moments and then returned to his original pew. Moments later I heard him say something else to another group of seventh graders. As his row was preparing to walk toward the front of the Church to receive communion he said to another small group of seventh graders, “When you accept the Eucharist, be sure to accept Jesus’ healing power and let it guide you this week.” When Mr. Mejia returned from receiving the Eucharist he sat with a different part of the seventh-grade class. This time he was kitty-corner to the right of me. Mr. Mejia took another opportunity to say a few words to some of the seventh graders as they were waiting for the rest of Mass to continue. I didn’t hear his exact words, but it was something to the extent of suggesting to the students that they take this silent time as an opportunity to be one with God.

At the time, I didn’t realize, but the comments made by Mr. Mejia during Mass had a specific purpose. He revealed that purpose later that day throughout the seventh-grade Religion period. As the students entered his class he asked them to sit in similar groups as they sat in church that morning. I recognized that students sat in small groups organized in much the same way as they were seated at Mass earlier that morning. There were six small groups of four students each. Mr. Mejia then directed each small group to write down what he had shared with them at Mass. He then asked each group to write what they had up on the white board:

- Meditate in the glory of God’s goodness.
- Feel Jesus’ presence in you and grow in your relationship with him.
- Take care of Him and He will take care of you.

- Accept Jesus' healing power and let it guide you this week.
- Enjoy the silence and be one with God.
- Let Him in body, mind, and soul.

Each group was to take a saying different from what they wrote and explain what it meant to them as a group. After each group had some time to interpret the line they chose, other groups were encouraged to chime in and share on what it meant to them. After class Mr. Mejia explained to me why he decided to have his students do this task. He told me that at first it was just something he wanted to give students to think about individually at Mass. He explained that sometimes he felt that Mass was seen as a group experience when it should really be viewed as a personal experience with God as well. That was his intention of sharing those thoughts with his students during Mass. It gave them something to focus on individually-to grow in their relationship with God/Jesus as an individual. He then stated that faith should also be seen as something all Catholics share and that is why he extended it to class. Mr. Mejia wanted to give the students another opportunity to grow in their spirituality as a group of Catholic Christians thinking together about what those lines could mean as followers of Christ. This is another example of how Mr. Mejia encouraged his students to nurture their Catholic character and grow in their spirituality and relationship with God/Jesus.

Cook and Simmonds (2011) and Cho (2012) discussed components of Catholic identity in schools. Cook and Simmonds (2011) presented a framework for thinking about Catholic identity. They argued that building relationship with one's self, God, and others was a huge component of this identity. Mr. Mejia exemplified all three of these

relationships. Mr. Mejia developed his faith relationship with his students and God. He developed his own relationship with God through his involvement at Mass, time of prayer and devotion, and personal reflection. Furthermore, he also developed his relationships with his students through his interactions with them during religious activities, such as Stations of the Cross, First Friday Mass, and Catholic School's Week activities. Mr. Mejia acted as the intermediary in developing his students' faith, commitment, and relationship with God. He lived the Catholic faith in his actions and his words (Cho, 2012).

Through his actions and words, Mr. Mejia also made it clear what kind of math teacher he was and how he understood the CCSSM. Mr. Mejia acted as an intermediary in two ways when it came to his students. As a math teacher, he found ways to make math non-threatening through the way he introduced topics focusing on students' basic mathematical vocabulary and their prior knowledge. Unfortunately, by doing so he missed opportunities to further expand their vocabulary development, extend their understanding of concepts, and engage in mathematical tasks that expanded their thinking. Mr. Mejia did his best to get his students to realize that math wasn't a subject to fear, just as God wasn't an entity to fear. As a religion teacher and an active member of the Catholic Church, Mr. Mejia acted as an intermediary in different ways to lessen the fear of God. He worked with his students to develop their spirituality and relationship with God and the Church by finding ways to incorporate religion into all aspects of school life. Mr. Mejia not only understood the CCSSM as intermediary, but also understood his role as a teacher as intermediary.

Chapter 8: Discussion, Implication, Future

Summary of Study

The goal of this study was to learn about practitioners' understanding of the CCSSM, specifically looking at middle school math teachers at a public school setting as well as intermediate and middle school math teachers at a Catholic school setting. Learning about their respective resources provided insight about their understanding of the CCSSM and how it shaped their classroom instruction. The CCSSM have been implemented in California since 2014-2015. Wisecreek Unified School District, and therefore the teachers at AMS, started the transition in 2013-2014 by making the implementation of the SMP optional and making training on state assessments available. On the other hand, the local archdiocese did not officially offer any implementation guidelines for schools or teachers. More specifically, JSPS attended information meetings on CCSS in English-Language Arts, but had not begun implementation on the CCSSM. Furthermore, administration at JSPS stated implementation commenced during the 2013-2014 school year with the adoption of CCSSM aligned textbooks.

Using *professional learning communities* and *teacher inventory* frameworks, I focused my attention on the collaborative effort of teachers and on their individual utilization of personal and professional resources in order to understand the CCSSM. I designed a qualitative case study to answer my research questions:

1. How do teachers understand the Common Core State Standards for Mathematics? What informs these understandings?
2. How are the Common Core State Standards for Mathematics being implemented by teachers?

3. How do these understandings shape teachers' practice in math instruction in classrooms?

The results of the study indicate that teachers' personal beliefs, prior experiences, and professional collaboration shaped their understanding of the CCSSM and their teaching practices. Collaboration in the form of professional learning communities provided teachers with opportunities to grow and learn about the CCSSM. Those opportunities developed the understanding of the CCSSM of the math teachers at AMS, yet hindered the understanding of the CCSSM of the math teachers at JSPS. In addition, the prior experiences of one math teacher at AMS, Mrs. Isaacs, contributed to her understanding of the CCSSM and what it meant for her as a teacher and for her students. Furthermore, the personal and religious beliefs of one math teacher at JSPS, Mr. Mejia, shaped his understanding of the CCSSM and his teaching practices.

Discussion

This study took place in one public school and one Catholic school in an urban setting in Southern California. The public school was a seventh and eighth grade school that had two math teachers for each grade level. The Catholic school was a grade school with students from transitional kindergarten to the eighth grade. There were self-contained classroom teachers who taught math and two junior high teachers who taught math. The teachers at both schools experienced the CCSSM in differing ways.

Alberta Middle School

Understanding the CCSSM as a successful jazz ensemble defined the understanding of the CCSSM for the math teachers at AMS. The math teachers at AMS had several learning opportunities to become familiar with and understand the CCSSM.

They participated in a few professional development sessions on productive collaborative groups and developing mathematical discourse. The math teachers at AMS engaged in pedagogical actions and reflective abstractions (Silverman and Thompson, 2008) through their conversations and skits. The teachers took it upon themselves to model or rehearse additional times on what it would be like as a student in their classes. It was important for them to understand from a student perspective how to develop their students' understanding. Researchers have demonstrated that students benefit when teachers work together with a focus on student learning (Joyce and Showers, 2002; Darling-Hammond, Wei, Andree, Richardson, and Orphanos, 2009; Horn, 2005). That is exactly what the teachers at AMS did, not only in professional development settings, but also in their bimonthly math department meetings.

The four math teachers at AMS also met twice a month as a math department. During those meetings, they always set aside time to discuss their teaching practices and student learning. The grade level teachers brainstormed and modeled ways to develop student understanding and critical thinking in order to be more successful in solving problems. By engaging in replays and rehearsals (Horn, 2005) the math teachers analyzed student work, increased their understanding of and teaching of mathematical concepts, and made sense of two of the standards for mathematical practice. Mrs. Evans, Mrs. Pavey, Mrs. Hastufah, and Mrs. Isaacs worked together to understand components of the CCSSM, such as specific content and practice standards, and their students to develop their pedagogical practices in the classroom. Moreover, Mrs. Isaacs had a

unique understanding of the CCSSM and what it meant for her as a teacher and as a student in her classroom.

Mrs. Isaacs' personal experience prior to becoming a middle school math teacher assisted her in understanding the CCSSM. For her, the metaphor of understanding the CCSSM as performance explained her understanding of, approach to, and teaching of the CCSSM. Before becoming an educator, Mrs. Isaacs was a theatre major and loved to perform. It was important to her to be able to act, improve, share, pretend, and engage others in her performance. She took this same approach to the teaching of mathematics. Mrs. Isaacs teaching practices were shaped by her approach to the CCSSM. One specific change addressed by Mrs. Isaacs in her teaching was listening to her students. She mentioned that she had to listen more carefully not only to model to the students, but also so she could get a better understanding of what they knew and possible misconceptions. Listening to students is a key component to her performance in the classroom, but also to the performance of her students (Schultz, Jones-Walker, and Chikkatur, 2008; Lawson and Lawson, 2013). Approaching the teaching of the CCSSM as a performer allowed her to be flexible in the classroom (Remillard and Geist, 2002) and help facilitate student and teacher learning (Carpenter, Fennema, Peterson, Chiang, and Loef, 1989; van Es, Tunney, Goldsmith, and Seago, 2014).

Mrs. Isaacs believed her students needed to be performers in the classroom as well. In order for her students to be successful and develop into proficient mathematicians, her students had to be active in their learning. There were multiple ways she expected her students to be active or to perform in the classroom. This included

asking meaningful questions, engaging in mathematical discourse with their peers, and modeling their understanding. Reeve and Tseng (2011) argue that there are four ways for students to be engaged and active in the classroom. The authors state that students engage behaviorally by being attentive and listening, take ownership of their own learning by asking questions and offering suggestions (agency), cognitively by making connections and creating their own examples, and emotionally through their curiosity. In Mrs. Isaacs' class students listened to each other and to the teacher because it was necessary to be able to defend one's position and argue others' thinking (SMP3). Students also asked clarifying questions to their teacher and to each other Mrs. Isaacs expected her students to perform in these different ways to demonstrate their level of proficiency, understanding, and mathematical understanding. Mrs. Isaacs' understanding of the CCSSM included her students being active and performing in the classroom.

Junipero Serra Parish School

Understanding the CCSSM as a failed jazz ensemble explained the understanding of the CCSSM for the math teachers at JSPS. The teachers at JSPS also took part in professional learning communities during the 2014-2015 school year. The experiences of the individual teachers at JSPS varied, but there was a common thread. That common thread was a lack of trust, lack of supportive conditions, and a lack of shared vision (Vescio et. al, 2008; Huffman, 2001, 2003; Louis, 2006; Gallimore, Ermeling, Saunders, and Goldenberg, 2009). The grade level teachers at JSPS publicized their inability to communicate and trust the members of their respective PLC groups. Mrs. Perrault, the fourth-grade teacher at JSPS, mentioned that she felt her meetings were unproductive

because people were off topic, didn't come prepared, and were concerned about their own class rather than the group as a whole. Mrs. Brown, the eighth-grade teacher at JSPS who taught 5th and 7th grade math, stated that her group was just a bunch of individuals who she didn't feel comfortable with because she felt they were stuck in their ways and wouldn't budge to grow as teachers. Vescio, Ross, and Adams (2008) argue for teacher collaboration and individual contribution in professional learning communities. They state that a common theme in productive professional learning communities was the ability of teachers to work together toward a common goal and that each member contributed to the overall growth of the group.

The math teachers at JSPS did not grow in their understanding of the CCSSM in their PLC meetings. In fact, their understanding of the CCSSM was hindered, minimized, and at times prevented. PLC members did not want to engage in conversation about the CCSSM, student discourse, or the mathematical practices. The lack of growth and achievement of the PLC groups during the 2014-2015 school year could be for a variety of reasons, such as a lack of continuity (Gallimore & Santagata, 2006; continuous DATA) or lack of strong leadership within the groups (Morris & Hiebert, 2009; Elmore, 2000). For the JSPS teachers, especially Mr. Mejia, understanding of the CCSSM came from other personal and professional resources. Mr. Mejia did not learn about his teaching, his students, and the CCSSM from his experiences in his PLC group. His understanding and interpretation of the CCSSM came from another source.

Mr. Mejia was a man of faith. He attended Mass regularly, worked on his relationship with God and others consistently, and believed that he was someone who

was an intermediary between the CCSSM and his students' learning, just like a priest might be viewed as a mediator between God and His people. Mr. Mejia felt the need to soften the CCSSM for his students by doing the math himself in class as a way to demonstrate how easy it can be. In other words, if he could do it, so could his students. Mr. Mejia also provided his students with easy entry points into concepts, topics, and standards by starting a lesson with foundational concepts. He did this to show the students that they already knew something about the topic, that they were familiar with the material, and that it was something they could do. Furthermore, Mr. Mejia allowed his students to use common phrases and terms for mathematical concepts rather than using appropriate mathematical vocabulary as a way to demonstrate to the students that CC Math wasn't difficult. Mr. Mejia was the intermediary for the students to the CCSSM. In his eyes, he was providing the students with the necessary information and standards, but in a way that was non-threatening. According to Mr. Mejia he was teaching the CCSSM because he was following suggestions from the CC aligned textbook, teaching the standards, and no one was telling him to do otherwise.

Remillard (2005) stated that often times teachers avoid interpretation of curriculum reform especially when their school adopts a program, curriculum materials, or a published textbook series. Rather than interpreting reform, teachers and other educators use the textbook and other material as a way, and sometimes the only way, to understand reform and to provide instruction (Lloyd, 2002; McHenry, 2016; Remillard and Bryan, 2004). The textbook becomes the reform and teachers see the reform only through the eyes of the textbook and the materials that they are using. Therefore, their

learning is hindered and at times prevented because the commercially available textbook may not have the instructional shifts of the CCSSM embedded and highlighted throughout (Wu, 2011). McHenry (2016) found that one teacher, Jeannie Thompson, enacted lessons produced by others. She approached the teaching of the CCSS as “delivering the same content to students using a different method” (p. 176). This was partially the case for Mr. Mejia. He used some of the suggestions in the textbook, such as “Math Talk” items and critical thinking questions, but he didn’t use them in ways that allowed for students to analyze, argue, and build their mathematical sense and understanding. He utilized those components because he felt in simply doing so he was implementing the CCSSM. What Mr. Mejia didn’t realize is by acting as an intermediary in the math classroom, he was actually hindering his own understanding of the CCSSM and obstructing the mathematical development of his students into proficient mathematicians.

Implications for this Study

Teachers at the two school sites understood the CCSSM in terms of their own personal experiences and beliefs. Making these connections between their previous career experiences and religious beliefs shaped their classroom instruction and teaching practices in different ways than professional development and training has seen. In previous studies on teacher beliefs (Richardson, 1996; Rutledge and Mitchell, 2002; Schoenfeld, 2011; Smagorinsky, 2004; Stipek et. al, 2001; Swan, 2006) researchers focus on beliefs about teaching and student learning, but Richardson (1996) argues that teachers’ beliefs come from personal experience, professional experiences, and

experiences with formal knowledge (p. 105-106). Much of the research on teachers' beliefs does not take into account personal experiences, such as previous careers and religious beliefs. The teachers in my study connected their non-teaching experiences, such as involvement in theatre and the church, with how they interacted with students, the curriculum, and colleagues. Such connections have implications for the professional development and training of math teachers which suggests a focus on personal and real-world connections, rather than solely focusing on content. Overall, this study highlights current practices of math teachers and supports the need to further examine how teachers make sense of reform beyond professional training and development.

Professional Learning Communities

Professional learning communities are one way to help make sense of and understand reform. Unfortunately, these communities are not all productive and collaborative. Researchers state that effective professional development need to give teachers opportunities to share their experiences in a trusting environment, have supportive colleagues, a goal of collective learning, is focused on student learning, incorporates reflective dialogue, and revisits objectives regularly (Vescio, Ross, and Adams, 2008; Koellner-Clark and Borko, 2004; Newmann, King & Youngs, 2000; DuFour, 2004; Newman 1996; Williams, Brien, Sprague, and Sullivan 2006; Huffman, 2001; Little, 1990). The teachers at AMS exhibited signs of effectiveness in their professional learning community, such as a focus on student learning and engaging in reflective and meaningful dialogue. Furthermore, the math teachers at the public school

were close and trusted each other, but also had a shared vision for what proficient math students looked like in the classroom.

Not all professional learning communities exhibit these characteristics. Simply putting a group of teachers together and calling them a professional learning community does not automatically make them one. The teachers at JSPS believed they were part of a PLC with their grade level teachers, but these communities did not portray these necessary characteristics of effective professional learning communities. The PLCs the math teachers at JSPS were a part of lacked important characteristics. An important component of the PLC process is revisiting what was useful and effective and what was not part of the PLCs for the JSPS teachers (DuFour and DuFour, 2010). This is not something new to the literature on professional learning communities (Koellner-Clark & Borko, 2004). School leaders should make sure PLC time is utilized for lesson planning, evaluating student work, focused on student achievement, and in understanding and implementing best practices.

The teachers at each school site had differing experiences within their PLCs. The teachers at JSPS worked with more teachers in their PLC who came to the meetings with different agendas, were focused on individual goals, and who lacked mutual trust and respect for each other. Quite the opposite was true for the teachers at AMS. Their experiences and collaboration resembled a PLC more so than the teachers in the deanery. I suggest schools and districts either design smaller professional learning communities, such as professional learning units or professional learning teams and/or make the

professional learning community experience, goals, and objectives more explicit and collaborative so members know exactly what is expected of them and each other.

Professional Development

In order to successfully implement the CCSSM teachers need access to quality, long-term, personalized professional development (Borko, 2004; Cohen and Hill, 2000; Ball, 1996; Scribner, 1999). McHenry (2016) found even when teachers participate in professional development, the groups or facilitators of the professional development may not have the same understanding of the standards, strategy, or material as each other or of the teachers they are leading. For the teachers at AMS it was clear the facilitator and the teachers had the same basic understanding of the CCSSM. The teachers at AMS had access to in-house professional development that appeared to focus on their school and teacher needs. Although these sessions were considered to be one-time workshops, the teachers themselves kept revisiting the main ideas and worked together to ensure their understanding and incorporation into their teaching practices. This was not the case for the teachers at JSPS. Their involvement in PLCs and PDs were inconsistent, lacked structure and collaboration, and did not focus on student growth. In addition, the one-time PD on problem solving and the CCSSM was not conducive to effective professional development.

Teachers at both schools could have benefited from PD that focused on the standards for mathematical practices. Although the SMPs are not new to mathematical standards as they were structurally a part of the previous set of mathematical standards (NRC, 2001; NCTM, 2003), teachers need guidance in understanding how to address

these skills for their students in the classroom. Implementing new skills is difficult for teachers (Fuller, 2001). Districts and schools need to provide teachers with opportunities to develop their understanding of the SMP and how to incorporate them into their teaching practices. This is one major component missing from the CCSSM. What the Common Core Standards in Math do not do is define practice methods or materials; define the practices needed for students who are well above or below grade level, have special needs, or are English Language Learners; nor do they dictate specific teaching methods and strategies to accomplish such mathematically proficient students.

Implications for Future Research

Framing this study around teachers' personal beliefs and experiences highlighted background information not previously looked at to understand teachers' classroom and teaching practices. Studying teachers' personal background, and not necessarily their schooling background, provided insight into teacher understanding of the CCSSM. Further research should be conducted to examine teacher personal histories as a way to understand reform and the practice of teaching.

In addition, the current study did not look at student perspectives of understanding the CCSSM and how their role in the classroom may or may not have changed. A follow-up to the current study would be to investigate student understanding of the CCSSM and their development into proficient mathematicians. Furthermore, given that this study focused on the understanding of intermediate and middle school math teachers I encourage researchers to investigate the understanding and interpretation of the CCSSM of high school math teachers. Lastly, though the Catholic school in this study partnered

with the local public school district, they had limited resources to assist them in understanding the CCSSM. Further research should be conducted to examine the resources of Catholic schools that are implementing educational reform and how these schools could utilize their current resources to better benefit their teachers and students.

There are some limitations of this study that concern length of time and generalizability. As with any qualitative case study, researchers need to spend a certain amount of time in their study's context in order to become familiar with all members, not just those participating in the study (Freeman, deMarrais, Preissle, Roulston, and St. Pierre, 2007; Miles and Huberman, 1994). Although this study took place during the 2014-2015 school year, the noted implementation of the CCSSM for both school sites began beforehand. The teachers at AMS stated implementation of the CCSSM began during the 2013-2014 school year and I started gathering data in December of 2014. Teachers and the principal at JSPS claimed that since they adopted new CCSSM aligned textbooks during the 2013-2014 school year, that is when the implementation officially got underway. I started gathering data at JSPS in August of 2014. The CCSSM continue to be implemented, interpreted, and understood by the math teachers at AMS and JSPS. Had the study continued through the following school year, 2015-2016, additional information would have allowed me to provide a more robust analysis. Moreover, additional time to learn more about the teachers and their understanding of the CCSSM would be beneficial from policy, research, and practical viewpoints.

This study took place during the 2014-2015 school and therefore, captured the perspective, beliefs, and understanding of the participants at a specific moment in time. I

remind the reader that nine teachers at JSPS initially took part in the study, yet five of them stated that they believed they were actively and consciously implementing the CCSSM. The collective understanding of these five teachers and the individual understanding of one teacher make up part of the analysis of this study. Furthermore, the four math teachers at AMS took part in the study and their collective understanding was analyzed as was the individual understanding of one specific participant.

Although the teachers I spoke with, interviewed, and observed were quite candid in their interpretations, descriptions, and accounts, the study involved a limited sample of teacher perspective and understanding and I caution the reader not to generalize such understanding to other teachers in the local area, district, and deaneries. The collective understanding of the teachers at their respective school sites mirrors much of the research on effective and even unproductive professional learning communities. It should also be noted that the personal beliefs and background experiences of these teachers is inimitable and provides a unique look at math practitioner understanding of the CCSSM.

The CCSSM are being implemented in California schools. The implementation of standards reform can take districts, schools, and teachers up to a decade to fully implement into the classroom (Collins, 1997; Porter, Fusarelli, & Fusarelli, 2015). As a current math educator and promising researcher, I am interested in how these standards and their implementation will play out in the years to come.

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