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Middle School Mathematics Teachers' Perceptions of Opportunities and Challenges

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Abstract

This study investigates the perspectives of opportunities and challenges of middle school mathematics' teachers. To gain these perspectives, an ethnographic study was conducted by interviewing four middle school mathematics teachers in central Illinois. The results of this study imply that teachers of different backgrounds and teaching environments have varying perspectives about challenges and opportunities in the classroom. Limitations of this study include but are not limited to, the researcher having one year to conduct the research, only four teachers from two schools being interviewed, interviewees teaching different grade levels, no rural setting involvement, one educator having little teaching experience, teachers' perceptions, and interviews taking place via telephone instead of face-to-face. The significance of this study for school personnel and researchers raises awareness of the importance of teachers being prepared to enter the classroom, educators receiving ample professional development to stay on top of changing standards, school districts receiving adequate funding to provide quality resources, and administrators and instructional coaches offering support and creating a positive, trusting environment. This study has revealed what resources and support the interviewed educators feel is valuable in their teaching success.

Dedication

I dedicate my work to my husband, Jason, and my children, Jake, Paisley, and Jase.

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I want to thank Dr. Bickford, Dr. Anderson, and Dr. Bartz for their support throughout this process. Your valuable ideas, feedback, and guidance have greatly impacted my knowledge and allowed me to complete my research in a meaningful manner. I want to thank Dr. Bickford for dedicating many hours to helping me navigate this project and supporting me in my research and writing. I would not have gained as much knowledge had it not been for your encouragement. Thank you to my family, who had confidence in the success of my project and continually shared their support.

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Introduction

Mathematics is a web of various topics creating a coherent body of knowledge and should not be seen as a group of concepts independent from one another. Mathematical teaching practices and standards should be carefully designed to progress and connect learning from one grade level to the next. Teaching mathematical standards does not involve teaching new events, but instead involves building upon prior knowledge for students to continue developing their conceptual understanding (Common Core State Standards Initiative [CCSSI], 2018). Cognitive understanding, along with the recent implementation of new standards and initiatives, has shaped the views and practices of mathematical education of the present.

The effectiveness of mathematics education comes from the educator knowing students' prior knowledge along with what they need to learn while challenging them to learn the information well (National Council of Teachers of Mathematics [NCTM], 2014). In order to accomplish this, teachers must have a deep understanding of the content they are teaching and be able to draw upon that knowledge to relate the information to students in meaningful ways. The success of teachers correlates with the support received from their school district to acquire resources and opportunities to develop, improve, and restore their knowledge (NCTM, 2014). Even though there are many supporters for improving teacher knowledge and effectiveness, the research supporting its usefulness is not strong (Phelps et al., 2016). The lack of evidence to directly correlate professional development to student achievement makes it easier for districts and law makers to be hesitant of spending funds, which can have a detrimental impact on teachers' advancement and students' learning.

Literature Review

This study involves four middle school mathematics teachers in central Illinois. Mathematics is an engaging subject that is at the forefront of change in response to standards-based initiatives. Some educators teaching the subject have not been trained to teach mathematics and are teaching out of their certification field (Darling-Hammond, 2001). This study provides awareness to the perspectives of middle school mathematics teachers and what they feel makes their teaching more effective.

Teacher Preparation Before the First Year of Teaching

Teacher preparation starts even before educators have their own classroom. Pre-service teachers develop their professional and content understanding before they receive a diploma. It is crucial for teacher education programs to provide quality instruction that produces the best outcomes for future educators. While it is important for teachers to have content knowledge, the ultimate goal of education programs is to improve student learning. To achieve student success and understanding, pre-service teachers are taught to use and develop meaningful activities related to problems that connect with the students' worlds (Koestler, Felton, Bieda, & Otten, 2013). While research states the main influencing factor of instructional practices stems from prior schooling experiences, in-service training comes as the second greatest influencer of the ways teachers view and carry out instructional techniques and practices (Harbin & Newton, 2013).

Why are teacher preparation programs important? Teacher preparation courses prepare classroom teachers to implement effective teaching practices. Pre-service teachers are taking topics discussed, content explained, and instructional practices explored into their own classroom. It is important for teachers to have knowledge related to the field of learning along

with specific domains, such as the effects of teaching strategies, curricular approaches, and assessment of student understanding (Darling-Hammond, 2001). A positive and significant relationship exists between teachers' certification, degree, and student achievement. Teachers have to hold mathematical content knowledge and use best practices to engage students in their teaching. Even though having a deep understanding of mathematics does not guarantee that one will be an effective mathematics teacher, teachers who do not possess content knowledge will be restricted with what information they can provide their students (Hobbs, 2012). The teachers' knowledge of mathematics is vital in their ability to assess student achievement, implement instructional materials, and make thorough decisions about best practice, presentation, and sequencing (Evans, 2011).

Teaching experience is vital to a pre-service teacher's early success in the classroom. Clinical experience opportunities, which include observations of and working in school settings, have more positive influence on pre-service teachers' teaching quality than content preparation does (Hiebert, Miller, & Berk, 2017). Programs effective for pre-service teachers place them in school districts with adequate support and learning opportunities, while also offering quality coursework. These placements help innovate pre-service teachers' classroom teaching practices (Kelly, Gningue, & Qian, 2015). Subject matter courses during teacher preparation programs and teacher performance in the classroom have small correlations (Floden & Meniketti, 2005). On the other hand, studying mathematics concepts extensively attributes to better performance when it pertains to a teaching task on the same concept up to six years later. If pre-service teachers do not gain mathematical knowledge of teaching (hereafter, MKT), they cannot apply their understanding when educating students (Hiebert et al., 2017).

What do preparation courses need to include? Many factors create a quality education program that provides pre-service teachers with knowledge they can use to engage students and help them succeed. NCTM along with the Council for the Accreditation of Educator Preparation (CAEP) created standards for teacher preparation programs (2012). These six standards include important skills and knowledge that must be understood to be a successful mathematics educator. Content knowledge of mathematics is required of an effective teacher, and pre-service teachers must demonstrate understanding of mathematics concepts, procedures, algorithms, varied contextual applications, and connections between mathematical domains (NCTM, 2012). Mathematical practices are also important for effective teachers to be able to solve problems, reason, and make connections throughout mathematical content. Content pedagogy is equally important as it allows the effective educator to perform mathematics while incorporating multiple instructional strategies and meaningful assessments (NCTM, 2012). An effective teacher must also learn to create a mathematical learning environment that acknowledges pre-adolescent learning and behavior to create learning practices where all students can build off of prior knowledge and are held to high expectations. Impacting student learning by engaging students in mathematical experiences that produce conceptual understanding, adaptive reasoning, and applications to various mathematical content is also crucial. The standards stress the importance of maintaining professional knowledge and skills through lifelong learning by teachers participating in professional development and reflecting on their teaching (NCTM, 2012). These standards are necessary to include in pre-service teachers' instruction to be successful mathematics teachers in the middle grades.

Mathematics teaching preparation programs play an important role in the effectiveness of the classroom teacher. Research has been performed on mathematics preparation programs and

classroom teaching from program graduates. One particular study reviewed four video analyses of teaching from pre-service teachers the semester prior to graduation and also the three summers after (Hiebert et al., 2017). Pre-service teachers were exposed to MKT coursework, based on NCTM standards, on the topics of multiplying two-digit numbers, dividing fractions, and subtracting fractions, but they were not exposed to any coursework for finding the mean. The teachers' exposure to mathematical practices of the three target topics increased student performance. However, students' performance did not increase when working with the concept that was not a target topic, finding the mean (Hiebert et al., 2017). The reason these differences occurred was because pre-service teachers developed MKT to the mathematics topics they were exposed to during their freshman year in the education preparation program. Being exposed to teacher preparation coursework that impacts MKT has a positive influence on teachers and students in the classroom.

Much research has been conducted on how mathematics preparation for pre-service teachers could be improved, specifically on MKT and the effectiveness of mathematics teaching and learning (Cardetti & Truax, 2014). MKT involves mathematical content knowledge (M-CK) and mathematical pedagogical content knowledge (M-PCK). Unfortunately, there is no consensus on the best approach to prepare pre-service teachers to achieve M-CK and M-PCK. Research conducted focused on MKT research and studied the influences of pre-service teacher mathematics courses. The courses studied were called IMPACT (Impact of Mathematics Pedagogy and Content on Teaching) and focused on teacher attitude toward M-CK and M-PCK. The results of the study found that IMPACT courses resulted in confidence in M-CK and gains in attitude toward M-PCK. Compared to students who did not take IMPACT courses, the students that did could create a mathematical foundation that allowed them to engage more

effectively in teaching methods and received enhanced M-CK and M-PCK (Cardetti & Truax, 2014).

It is vital to understand how mathematics content courses affect pre-service teacher attitudes toward M-CK and M-PCK. IMPACT courses offered influenced pre-service teacher attitudes and if those influences resulted in a change in their learning experiences. How much the classes strengthened pre-service teachers' M-CK and M-PCK could directly affect their teaching and their students' achievement. Pre-service teachers' attitudes toward teaching mathematics was measured by using the Fennema-Sherman Mathematics Attitude Scales (FSMAS), which have been used in research and proven reliable for over 20 years. Items were strategically chosen from the FSMAS Confidence subscale and Effectance Motivation subscale to measure mathematics attitudes. The semester-long IMPACT courses that students voluntarily took developed an understanding of mathematical concepts which form core aspects of mathematics curriculum. Students who took at least one of the IMPACT courses before the methods course were labeled as the content (C) group, and students who did not take an IMPACT course were labeled non-content (NC) (Cardetti & Truax, 2014). According to the pre-methods mean scores for attitudes on M-CK and M-PCK, C group started the methods course with much higher confidence than the NC group in M-CK, which showed that the IMPACT course positively influenced pre-service teachers' M-CK. There were no significant differences between the C and NC group for M-PCK, which suggests that the IMPACT course did not influence students' M-PCK attitudes. At the end of the methods course, it was found that group C had significantly higher attitudes towards M-CK and M-PCK than the NC group (Cardetti & Truax, 2014). This showed that, along with the methods course, the IMPACT course resulted in a significant increase in attitudes for M-CK and M-PCK (Cardetti & Truax, 2014).

Before taking an IMPACT course, similarities in students' attitudes in both the C and NC group were found. This finding shows that IMPACT courses influence student attitudes of M-CK before and after taking a methods course, and the course also increased student attitudes for M-PCK during and after the methods course (Cardetti & Truax, 2014). The results found are consistent with studies (e.g., Ball, 2003; Ball, Lubienski, & Mewborn, 2001; NCTM, 2003) that describe the importance of M-CK and M-PCK for pre-service teachers. Teacher preparation programs should allow for participation in mathematics courses that are specifically designed for kindergarten through eighth grade teachers to develop positive attitudes for mathematical concepts before taking their methods courses. Having gained M-CK can aide in pre-service teachers' ability to focus and build on methods and student learning instead of putting attention toward developing M-CK. Some limitations found were that this study focused on just one teacher preparation program, and there could be differences among various programs. Also, it would be beneficial to take more data in the students' future studies than just the three samples collected (Cardetti & Truax, 2014). This study proves that pre-service teaching programs can be very influential in teacher and student success.

Much research suggests that MKT is important to enable educators to teach mathematics effectively. Knowledge of teaching mathematics effectively is significantly related to student achievement, and improving teacher knowledge will improve student understanding (Hill, Rowan, & Ball, 2005). The increase of the number of mathematics courses pre-service teachers must take in their undergraduate degree will only improve the quality of teaching mathematics if the pre-service teachers learn the content in a way that pertains directly to their work (Ball, 2003). Teachers who are comfortable with their MKT are more confident with what they teach and the mathematical practices they use (Cardetti and Truax, 2014). It is important for teachers

to have mathematical understanding to keep up with changing standards, practices, and initiatives.

State and National Initiatives

The focus of improving mathematics education has been evident for many years through the implementation of state and national initiatives. United States federal and state policy first used standards-based strategies in an attempt to increase mathematical understanding in 1965 with the passage of the Elementary and Secondary Education Act (ESEA) (Tran, Reys, Teuscher, Dingman, & Kasmer, 2016). The purpose of ESEA was to create clear student achievement goals by implementing a series of standards and assessments, retrieving and using data to improve teaching, introducing incentives to reward districts for growth, and providing poor performing schools with assistance (Goertz, 2009).

The reauthorization of ESEA, the No Child Left Behind (NCLB) Act of 2001, furthered standards-based reform in the American school systems and required educational systems from kindergarten through twelfth grade to implement standards and assessments that monitored student learning if they were to receive federal funds (Tran et al., 2016). In return, states individually created grade-specific mathematics standards, aligned assessments, and proficiency targets. The goal of these standards and assessments was to raise student language proficiency in arts and mathematics by the 2014-15 school year (Goertz, 2010). Because these standards were created individually by each state, there was little coherence in the content taught or at what grade level it was taught (Smith, 2011). Due to this inconsistency, the National Governors Association Center for Best Practices and the Council of Chief State School Officers pushed for the creation and development of the Common Core State Standards for Mathematics (CCSSM) in 2009 with final documents released in 2010 (Confrey & Krupa, 2012).

National Council of Teachers of Mathematics. NCTM is the organization credited with starting the educational standards movement (Leinwand et al., 2014). CCSSM originated from NCTM process standards. The use of mathematical process and practice standards suggested by NCTM helps develop math proficiency in students. When students use mathematical skills and processes, they are not simply memorizing or taking part in rote activities that do not develop conceptual understanding of mathematics as a whole. Instead, they are using mathematics in a way that allows them to transfer their skills and understanding into situations beyond their schooling (Schwols & Dempsey, 2013).

NCTM understands that standards alone are not capable of producing students who have a deep understanding of mathematics (Leinwand et al., 2014). Relying solely on the standard will not improve students' mathematical understanding. NCTM's *Principles to Actions* (2014) fills the gap between the adoption of standards and the implementation of practices and programs needed to teach the standards successfully. CCSSM provide a starting point for mathematics education, but knowing how to elicit successful mathematical teaching practices is also necessary for student success (Meyers, 2014). Knowing subject matter and being able to effectively use it is at the core of educating all students (Ball, 2000).

NCTM's *Principles to Actions* (2014) explores structures and policies that must be in place for all students to learn. These include essential topics, such as teaching and learning, equity, curriculum, technology and tools, professionalism, and assessment (Leinwand et al., 2014). Simply increasing teachers' educational opportunities in mathematics knowledge is not enough to promote the effective teaching of standards (Ball, 2000). It is important for NCTM to promote creating comprehensive standards and practices as well as educating teachers on what is

needed to ensure all students are equipped with the ability to reason mathematically and are prepared for any life path they choose (Leinwand et al., 2014).

Because of NCTM's implementation of mathematics teaching and learning research and suggestions, much progress in mathematical understanding has been made (Leinwand et al., 2014). For example, eighth grade students receiving a proficient score or above on the National Assessment of Education Progress (NAEP) rose from 15 percent in 1990 to 36 percent in 2013 (National Center for Education Statistics [NCES], 2013). Also, average scores of fourth and eighth grade students on NAEP assessments rose 29 and 22 points between 1990 and 2013 (NCES, 2013). This shows the importance and positive effects enhancing mathematical education practices and standards can have.

Unfortunately, other assessment data shows that mathematical standards and practices are far from where they need to be. For example, NAEP average mathematics scores for 17-year-old students have been consistent since 1973 (NCES, 2013). Also, only about 16 percent of high school seniors in the United States have a proficient score on mathematics assessments (U.S. Department of Education, 2014). Implementing the CCSSM provides hope that the new standards will address challenges and build on progress that has already been achieved. CCSSM along with NCTM's suggestions of mathematical principles provide educators with a clear mathematical focus of standards and how to implement those standards in the classroom (Leinwand et al., 2014).

Common Core State Standards of Mathematics. CCSSM were adopted and employed during 2010-2014, with 45 states adopting the standards within a year of release (Reys et al., 2013). The adoption of these standards was voluntary and did not require a commitment to any other program or policy. States that chose to adopt these standards could join one of two

federally funded assessment consortia: Smarter Balanced Assessment Consortium (SBAC) or Partnership for Assessment of Readiness for College and Careers (PARCC) (Schwols & Dempsey, 2013).

As of February 2018, the Illinois State Board of Education (ISBE) is preparing to shift away from PARCC and introduce a new assessment titled the Illinois Assessment of Readiness. The Illinois Assessment of Readiness will be approved by the Every Student Succeeds Act (ESSA) and build on the high quality foundation of PARCC testing, specifically the rigorous writing tasks. PARCC is currently the only assessment to completely meet federal requirements. The Illinois Assessment of Readiness requires quality items, eliminates bias testing, and meets universal design procedures, which is why ISBE will continue to build off of it to develop new testing. Specific objectives will be included in the Illinois Assessment of Readiness: test data obtained more quickly, more languages built in to testing, high school growth measured, test items developed by Illinois teachers, use of a common scale to report results, use of full online assessment, and implementation of a computer-adaptive format (Smith, 2018). The vision of this change in assessing Illinois students is to serve teachers, families, and students with a useful understanding of the capabilities of students in their education and how prepared they are for the future (Smith, 2018).

CCSSM grabs the attention of teachers, mathematics leaders, and curriculum developers who want to improve mathematics education. Compared to previous standards, research suggests that CCSSM significantly shifts content goals, grade level placement of topics and concepts, and attention to mathematical practices (Dingman, Teuscher, Newton, & Kasmer, 2013; Reys, Dougherty, Olson, & Thomas, 2012). CCSSM also requires school districts to implement a greater mathematical focus within the curriculum. These new standards encourage mathematics

teachers to narrow and deepen mathematical teaching in the classroom as opposed to covering as many topics as possible (CCSSI, 2018).

To help educators determine which topics to emphasize, CCSSM provide different focuses for each level in the middle grades (sixth through eighth). In sixth grade, ratios and proportional relationship and algebraic expressions and equations are the focus. Seventh grade focuses on ratios and proportional relationships and arithmetic of rational numbers. Eighth grade focuses on linear algebra and functions (CCSSI, 2018). Having a focus in each grade level helps students develop a strong foundation, greater skills and fluency, and the understanding that these concepts can be applied to mathematical problems in and out of the classroom.

CCSSM provide greater detail of mathematical topics, student thought processes, teaching practices, and conceptual teaching and learning methods. They are designed and arranged to be coherent across grade levels so each standard clearly shows how it relates and builds upon prior knowledge. The emphasis on deeper mathematical understanding is what sets CCSSM apart from many previous state standards. Students who can articulate and implement mathematical understanding are better able to develop deeper understanding (Schwols & Dempsey, 2013). Deep understanding allows students to observe the usefulness of mathematical processes across various topics and use these processes effectively.

Organization of standards. The CCSSM are strategically organized to provide readers with a coherent and logical understanding of the standards and what is expected of students. The CCSSM are broken into two categories: Standards for Mathematical Practice and Standards for Mathematical Content. The Standards for Mathematical Practice expose students to the important processes they must cultivate and implement throughout their grade level (Schwols & Dempsey, 2013). These practice standards ensure students are involved in using actual math, not just

gaining knowledge about math. Standards for Mathematical Content delve deeper into the mathematics concepts taught.

The Standards for Mathematical Content were created to cover all conceptual mathematical knowledge and understanding students' needs during their kindergarten through twelfth grade education. Each grade's standards are introduced with a summary of critical areas along with an in-depth description of the areas. The standards are arranged by grade, then domain, then cluster. Standard domains point out the main ideas that associate content standards and topics. The middle school CCSSM include six domains: ratios and proportional relationships, the number system, expressions and equations, functions, geometry, and statistics and probability (Schwols & Dempsey, 2013). The standards are then broken into clusters which group several similar ideas about important mathematical concepts students will be exposed to throughout the school year. The content in domains and clusters compare due to the interrelatedness of the CCSSM. These standards as a whole provide a description of expected student understanding and mathematical ability (Schwols & Dempsey, 2013). Focusing on these categories allows educators to see the mathematical knowledge students should develop at their grade level.

***Analyzing CCSSM*.** Curriculum standards have been analyzed and evaluated for many purposes. The main purpose of CCSSM research consist of rating the quality of the standards and determining similarities and differences among and between standard sets (Tran et al., 2016). Various studies have been completed to gain information about the CCSSM.

One example of comparative research was performed for the Third International Mathematics and Science Study (TIMSS) to compare k-12 curriculum guides of various countries (Teuscher, Tran, & Reys, 2015). These data reports studied content focus and

coherence. The results show that CCSSM are comparable to mathematics standards held in TIMSS countries where students are high-achieving. In some countries, the CCSSM were more coherent than the high-achieving TIMSS countries (Schmidt & Houang, 2012). Using standards comparable to high-achieving countries may put the United States on the right track to increase student mathematical understanding and develop high-achieving status.

The Survey of Enacted Curriculum (SEC) has also been used to measure the alignment of CCSSM to other curriculum standards. These include NCTM, state standards (pre-CCSSM), and other countries' standards (Teuscher et al., 2015). These researchers found CCSSM have a moderate to low alignment with pre-CCSSM standards. Researchers in this study hypothesized that this low to moderate alignment might be from the grade level in which CCSSM places content (Tran et al., 2016). They determined that CCSSM show major differences in what states previously held as standards and assessed (Porter, McMaken, Hwang, & Yang, 2011). The fact that the CCSSM are not comparable to pre-CCSSM standards show that the new standards are different and require students to achieve understanding of mathematical concepts at different grade levels.

The Educational Policy Improvement Center (EPIC) also wanted to determine the rigor of the CCSSM. Based on their analysis, a strong alignment between exemplary state standards and CCSSM exists. CCSSM were stated as outlining critical mathematical concepts for high school students so they would be cognitively prepared for mathematical expectations at the college and career level (Tran et al., 2016). These analyses provide information on the increased rigor and coherence of the CCSSM.

Support for CCSSM. CCSSM are different in numerous ways from previously existing standards. One of the main reasons the CCSSM were so intriguing was that they were promoted

as being able to increase the rigor of mathematics education, which would match the demands of other higher-performing countries (Tran et al., 2016). Rigor is referred to as a deep understanding of mathematical concepts. To make sure students develop this deep understanding, teachers must encourage students and provide them with meaningful opportunities to develop conceptual understanding, skills and fluency, and application (CCSSI, 2018). In order for students to develop conceptual understanding, they must be able to use various perspectives and prior knowledge to see math as universally connected rather than a series of procedures that must be memorized.

CCSSM creates advantages among school districts across the country. One advantage is the CCSSM created continuity of standards across states allowing teachers to share their lesson plans targeting CCSSM and collaborate in content discussion and professional development. Another advantage is when assessments are shared across numerous states, financial relief results from working with other states to develop materials and procedures instead of spending time and money to create them individually. Teachers and administrators receiving these advantages and implementing these standards must thoroughly review CCSSM to make sure they understand the standards and create teaching practices to effectively educate students to meet the standards (Schwols & Dempsey, 2013).

Opposition to CCSSM. Even though there are advantages to the implementation of the CCSSM, some people oppose them for a variety of reasons. Opposition for the standards grew during the 2012-13 school year (Tran et al., 2016). Common negative viewpoints of the CCSSM are that they are not as rigorous as the previous standards taught (McGroarty & Robbins, 2012), they tell teachers how to teach without giving them any room to address student, classroom, or district uniqueness (Layton, 2014), they expect students to master developmentally inappropriate

tasks and skills (Strauss, 2014), and they are not backed by scientific evidence (Tienken, 2011). It is important to note that Pioneer Institute operates on a paid agenda by unknown sources; therefore, their views may be biased. Also troubling to some was the idea that the CCSSM were federally influencing state decisions, giving local communities less control of their school districts, and excluding constituents in standard development (Tran et al, 2016). These feelings and viewpoints resulted in a negative attitude towards the standards.

Algebra and Geometry in CCSSM

When mathematics is taught in a rule-based realm, students are more likely to forget the rules and have no other mathematical knowledge to solve problems. Instead of teaching rules for students to memorize, teachers must make sure students are making connections and developing a deep understanding of various mathematical and problem solving strategies that they can use (Gavin & Sheffield, 2015). Implementing CCSSM in the classroom requires teachers to understand the expectations and have time to prepare for changes in content emphasis and grade placement (Teuscher et al., 2015). When teachers have this understanding and time, they can develop lessons to help students create meaningful mathematical experiences.

Algebra is viewed as a tool for exploring mathematical patterns (Bressoud, 2012). It is a way of expressing mathematical thoughts and a way to transform symbols (NRC, 2001). Students must see algebra as a way to perform computational operations to manipulate numbers. CCSSM provides emphasis on this concept and allows for students to develop deeper understanding of mathematical procedures found in algebra and the ability to generalize them while implementing algebraic reasoning (Gavin & Sheffield, 2015). CCSSM emphasizes helping students develop deep connections and a strong foundation of algebraic concepts.

CCSSM have also had an effect on geometry standards. For example, before CCSSM were introduced, few states required middle school students to validate or understand the Pythagorean Theorem (Newton, 2011). However, since the implementation, CCSSM now views this as an important concept to introduce in the middle grades and provides standards as well as teaching practices on how to develop instruction (Teuscher et al., 2015). At the middle grades, the inclusion of geometric transformations also notes a noticeable change. (Wang & Smith, 2011). Previously, transformations were taught in high school after learning about congruence and similarity. CCSSM have shifted their implementation to an earlier point in the curriculum so students can use their prior knowledge to understand geometric transformation properties. A curricular shift, including more rigorous concepts at earlier grade levels, is occurring in middle school geometry teaching and learning (Teuscher et al., 2015).

Mathematics Cognition

The process of teaching can be grouped into three sections: setting instructional goals to improve student learning, developing activities that encourage this growth, and assessing how students have developed and what they have learned (Green & Emerson, 2010). Each of these sections must thrive for students to achieve deep educational understanding. The process of developing a deep cognitive understanding of the mathematical skills and strategies used to solve problems is important in the CCSSM.

Bloom's Taxonomy and Cognition in CCSSM

Bloom's Taxonomy has been influential in teacher training and development for many years. The original version of the 1956 taxonomy has been revised to the version used today by Lorin Anderson and David Krathwohl (2001). In the revised version, components are laid out clearly so they are easier to analyze and use (Wilson, 2016). This framework, used in the

mathematical setting, has the ability to improve the effectiveness of teacher instruction by allowing teachers to use data to assess themselves as well as their students (Holmes, 2012). Factual, conceptual, procedural, and metacognitive knowledge are all included and explained in the updated version of Bloom's Taxonomy (Wilson, 2016). It is evident that Bloom's Taxonomy influenced the creation of the CCSSM due to the focus on similar concepts and types of knowledge.

Anderson and Krathwohl's (2001) taxonomy helps educators create meaningful instructional practices and align them with CCSSM. This taxonomy aids in describing educational objectives, learning tasks and assessments. One facet of this taxonomy shows student knowledge as factual, conceptual, procedural, or metacognitive. Knowledge is then compared to the cognitive process domain to describe how students are using the knowledge: remembering, understanding, applying, analyzing, evaluating, or creating. The metacognitive domain is extremely important because true problem solving does not occur unless reflective thinking is used. Students need to be able to communicate their mathematical understanding by explaining their mathematical process of problem solving. In order to do this, students need highly-effective experiences in the "understand" domain, which is seen as lacking in procedure-based teaching practices (Green & Emerson, 2010). Using alternative and performance-based assessments has enabled teachers to get a better understanding of student knowledge by giving them the opportunity to express their unique strategies to solve problems (O'Neil & Brown, 1998). When students complete performance-based assignments, they can be creative in their mathematical problem solving as opposed to simply selecting a given answer to a multiple-choice question or remembering a rule.

NCTM (2000) recommends teachers to encourage and empower students to "communicate their mathematical thinking coherently and clearly to peers, teachers, and others" and that students who need to learn "what is acceptable as evidence in mathematics" (p. 60). By asking questions, teachers can encourage this communication and scaffold student thinking to allow them to develop conceptual understanding (Chin, 2006). In turn, when students ask questions, they are using metacognitive strategies which can help them take ownership of their learning by creating learning goals and monitoring progress to achieve those goals (Donovan & Bransford, 2005). Students who have the ability to elaborate on a topic perform better than students who were given an explanation of the topic (Brown and Kane, 1988). Metacognition improves academic performance, especially among low-preforming students within a subject area as well as across subjects. (Zohar & Ben-David, 2008). "Metacognitive approaches to instruction have been shown to increase the degree to which students will transfer understanding to new situations without the need for explicit prompting" (NRC, 2000, p. 67). Emphasis of deep understanding and metacognition are evident throughout the CCSSM and can help improve students' mathematical understanding.

Professional Development

Professional development for educators is an important topic in the world of education. While continuing development for educators is a substantial investment, there is evidence showing the professional development used now is not sufficient (Phelps, Kelcey, Jones, & Liu, 2016). Some criticize professional development for educators because it is expensive, and its benefits are not strongly tied to student academic achievement. It is reported that in 2004–2005, schools spent $1.5 billion dollars on teacher professional development by federal, state, and local agencies (Telese, 2012). In many districts, teachers regularly took part in professional

development opportunities through the school year, which accounted for much of the school budget. On average, typical school districts spend $18,000 a year on professional development per teacher (Phelps et al., 2016). Educators, researchers, and policymakers have all pushed the importance of educational quality enhancement to improve school and student outcomes (Phelps et al., 2016). Increasing and enriching educator knowledge, skills, and outlooks when it pertains to assessment, practices, and curriculum is a key component of the make-up and success of middle grades education.

Professional development for teachers after they have completed their teacher preparation program is crucial for long-term success, especially with consistently changing standards and teaching practices. The debate over whether professional development is necessary or beneficial is one that is viewed differently by various sources. In a review of 1,300 studies of professional development, only nine supported a strong causation of professional development and positive outcomes (Yoon, Duncan, Wen-Yu Lee, Scarloss, & Shapley, 2007). It was also discovered that certain professional development had a positive impact on how teachers learn and take that learning to the classroom (Phelps et al., 2016). Professional development such as workshops, conferences, and short-term training had a smaller impact on how teachers used their new knowledge in the classroom, while other development activities, such as mentors and study groups, had a larger impact. Professional development opportunities that aligned with teacher goals and practices that could be taken into the classroom were more effective than opportunities that were isolated or involved little need for teacher engagement (Phelps et al., 2016). Many times, mathematics teachers do not receive the opportunities to benefit from mathematics professional development, collaborative teams, or coaching (NCTM, 2014). It is important for

researchers to continue to learn more about this topic to determine educators' best use of time and school districts' best use of resources.

What type and how much professional development is optimal? Professional development opportunities should emphasize enriching teachers' content knowledge and professional practice. Research has been performed to determine how teacher MKT and M-PKC affects student success and to compare professional development and student achievement. Within this research, it was discovered that teacher MKT has a large role in affecting student achievement and some professional development activities were more beneficial than others (Telese, 2012).

After compiling 2005 NAEP data for 100 random teachers, the teachers were given a questionnaire and analysis was performed during workshops sponsored through the National Center of Educational Statistics (Telese, 2012). The topics on this survey included training to understand how students learn, mathematics theory, training using curriculum materials, instructional strategies, manipulative use, calculator use, assessment training, culturally responsive teaching, and mathematics assessment training. The results revealed information about what types of professional development areas should be available and for what lengths of time. One finding was that the number of content courses, not education courses, taken by mathematics teachers was more influential (Telese, 2012). This finding is in alignment with some researchers but conflicts with others which state that education courses are more effective on student achievement (Darling-Hammond, 2001; Wilson, Flodden, & Ferrini-Mundy, 2002). Topics on content standards, curricular materials, mathematics instructional methods, and calculator use were positively related to student achievement, as long as teachers only received a

small amount of development. The findings reveal that content knowledge is essential for educators, but more than a small amount of development resulted in a negative impact.

Overall, it is shown that middle school math teachers who receive only some professional development have students that received better NAEP scores than those students who had teachers that received no or moderate to large amounts of training. It is suggested that professional development should include a small amount of development and be on topics that are most beneficial at raising student achievement (Telese, 2012). Discovering what type and to what extent professional development is effective will not only save teachers time and school districts money, but will also greatly advantage student success. There is no definitive evidence that states the most effective amount of staff development needed to accomplish any certain outcome (Stout, 1996).

How can professional learning communities be successful? Professional Learning Communities (PLC) are seen as a positive and effective way to improve student achievement while developing teacher collaboration (Hallam, Smith, Hite, Hite, & Wilcox, 2015). Research was conducted to find the impact trust has on collaboration within a PLC team. Researchers performed a qualitative study that used intermediate schools with varying PLC effectiveness and compared teacher thoughts of their success and implementation factors (Hallam et al., 2015).

After studying the differences between the successful and non-successful PLC schools, trust is determined to be an important factor for the success of a PLC. Without trust, teachers do not feel engaged in the information presented or that they can take part and share ideas without negative, destructive feedback. Trust is essential because it allows for teachers to share effective ideas with others who teach similar subjects or students. The trust created within a PLC can then be taken outside of the traditional PLC workshop setting to include informal collaboration in

hallways or the teachers' lounge (Hallam et al., 2015). These informal meetings allow for teachers to receive encouragement and help any time throughout the day instead of having to wait for a formal meeting.

Even the best teachers must have trust within their teacher group and school to produce high-quality teaching (Hallam et al., 2015). In all cases studied, it was discovered that trust within PLCs was possible through the completion of teacher responsibilities and the sharing of ideas and experiences with patience and kindness. A main component of teachers feeling trust while in the school environment includes the principal. One finding from this study was that teachers felt trusted when principals allowed for PLC teams to function by their own direction rather than being structured by the principal. Also important was the principal allowing teachers to form their own teams. Teachers felt that by giving them control, the principal deemed them capable. Another finding determined when there is trust between members of the team, confidence in advice from others was developed (Hallam et al., 2015). A third finding showed when trust was created, teachers felt safe sharing personal data such as test scores. When school climate is structured around trust and collaboration, educators have a greater chance of using the skills they have learned from others in their own teaching (Phelps et al., 2016).

Creating an effective PLC within a school district could determine the outcome of student achievement as well as teacher success. Collaboration, trust, usefulness, and length of professional development can create a healthy school culture (Phelps et al., 2016). These factors correlate with high quality development in the education of middle grade students. Quality professional development presented in an engaging way for the correct length of time and relates to a concept teachers can transfer into the classroom has a positive impact on school environment and student success.

School Funding

Inequities in school funding alter what is available for some compared to others. Students from underfunded schools are not given access to expert teachers, quality curriculum, or effective educational materials (Baker, 2017). These teachers do not have access to yearly teacher budgets, classroom resources, or professional development. For these disparities to be reduced, district and state leaders must understand costs and benefits of strategies that could increase student and teacher success. Adequate school funding can help remedy these inequities.

Adequate money increases student outcomes by improving school resources and teacher knowledge. Some resources that require more funding but increase student achievement are smaller class sizes, instructional supports, early childhood and intervention programs, and higher teacher compensation resulting in higher quality teachers. Inequities in teacher pay were connected to inequities in teacher qualification. Teachers coming from schools with a large low-income population are often offered fewer training and educational opportunities (Baker, 2017). The best measure of teacher quality and teacher effectiveness is disagreed upon among researchers, but a large body of evidence (e.g. Ferguson, 1991; Hedges, Laine, & Greenwald, 1994) suggests that up-to-date instructional resources and teacher quality have positive effects on academic achievement. Money is not the sole answer to all educational challenges, but more adequate funding can provide a school with necessities to improving school district outcomes (Baker, 2017).

The Coleman Report (1966), an influential study, found a strong connection between student backgrounds and student achievement. The report did not conclude that school resources do not matter, but it suggested that school resources have a very limited effect on student achievement as compared to socioeconomic status (Coleman et al., 1966). Twenty years after the

Coleman report, there were indifferences about Coleman's findings. Many of these studies, however, had methodological flaws no longer suitable due to advances in statistical techniques (Hanushek, 1986). Some studies found effective resources were positively related to student achievements and increases in spending might be associated with increased student success (Greenwald, Hedges, & Laine, 1986). Primary resources found to increase student outcomes are human, such as quantities and qualities of teachers, administrators, and school personnel (Baker, 2017). After examining 101 students from the previous 15 years, it was found that the greatest effects on student achievement resulted from interventions such as tutoring, small-group instruction, and educating students' teachers (Baker, 2017). Healthy school environments involve teachers receiving imperative learning resources and having organizational structures that allow for professional development (Phelps et al., 2016).

Methods

To gain insight into the perspectives of middle-grade mathematics teachers, I interviewed four Illinois public school middle-grade mathematics teachers. Of these educators, one instructs sixth graders and three instruct seventh and eighth graders. Two educators teach in a wealthy, suburban setting, while the other two teach in a poor, urban setting. Data triangulation of students who meet PARCC expectations and are ready for the next level, class size, mobility rate, English Language Learners, socioeconomic status, students with individualized education plans, per pupil expenditure, and algebra readiness from the Illinois Report Card (2016-2017) were used to determine the school systems in which two teachers from two middle schools were selected to participate in interviews (see Appendix A). Interviews were conducted via telephone to discover interviewees' background, experiences, teaching environment, and feelings about best teaching practices. This qualitative ethnographic study included grounded theory and open and axial coding of collected data. The interviews were transcribed and similarities and

differences were examined using grounded theory (Patten, 2012). A transcription of the interview was taken and emailed back to the educators to make sure information transcribed was what the interviewee was trying to convey and to allow the interviewee to correct any misunderstandings.

Sample

Due to interviewing educators at a time and in a way that met their needs, I conducted interviews via telephone in March of 2019. These instructors were intentionally selected from a convenience sample. Mrs. Condiff (all names are pseudonyms) has been teaching for twenty-five years. For the past ten years, she has been working with sixth grade students in advanced mathematics, English language arts, and social studies. Her advanced mathematics class involves sixth grade students learning a seventh grade curriculum. Mr. Greger teaches at the same wealthy, suburban school as Mrs. Condiff and has taught seventh and eighth grade mathematics for the past six years. Mrs. Riddell has been instructing seventh and eighth grade mathematics for sixteen years in a poor, urban setting. Mr. Spittler works at the same school as Mrs. Riddell, and this is his second year teaching seventh and eighth grade mathematics. I contacted both of the districts' administrators for permission to interview their personnel. The suburban and urban school district curriculum and instruction specialists suggested Mrs. Condiff, Mr. Greger, Mrs. Riddell, and Mr. Spittler as participants. Once I contacted them via email, they agreed to participate. For participating, they were each given a one-hundred-dollar gift card to a store of their choice. Each of these teachers uses the same curriculum to teach mathematics. Their perspectives of challenges they face and opportunities they receive from teaching middle school mathematics were gathered through semi-structured interview questions (see Appendix B).

Data Collection

The qualitative ethnographic study I conducted examined patterns and perspectives of the interviewees. Interview questions were not provided to participants prior to the interview unless requested. Mrs. Condiff was the only participant to request the interview questions before the interview, and they were emailed to her. I typed responses to the interview questions during the interview. Follow up questions were asked when more clarification or information was necessary. After each interview, I emailed the transcription to the participant so he or she could check for accuracy and make any clarifications they deemed necessary.

Data Analysis

Data was analyzed using grounded theory along with open and axial coding (Birks & Mills, 2011; Patten, 2012). Patterns were determined while using open coding to analyze participants' responses. Horizontal close reading of transcripts was performed to determine similarities, differences, key words, and common themes. When performing the horizontal close reading, printed transcripts were placed side-by-side to analyze the text and subtext of interviewees' responses (Patten, 2012). Horizontal close reading of all four transcripts involved another researcher to determine areas of convergence and divergence. The dialogue between the two researchers assisted in the development of follow up questions for the interviewees (see Appendix C). This resulted in determining common themes and ideas among the teachers' perceptions of teaching middle school mathematics to observe during axial coding.

Findings

Data from teacher interviews gave insight to their perspectives on teaching middle school mathematics. Their answers to various questions provided information about their opportunities

and challenges while teaching. Many factors play a part in teachers' accomplishments, struggles, and feelings toward teaching middle school mathematics.

Mrs. Condiff, 6th Grade Teacher in a Wealthy, Suburban Setting

Mrs. Condiff is a 6th grade teacher at a rich, suburban school in central Illinois. She has been teaching for twenty-five years. For the past ten years, she has taught sixth grade mathematics, English language arts, and social studies. She has one math class and sees approximately fifty students per day as students do rotate for each class she teaches. The math class she teaches is an advanced class where sixth grade students learn a seventh grade curriculum. There are about twenty-five students in each class, with special education students pulled into a resource room. Prior to this teaching assignment, she taught all subjects in a self-contained classroom in the poor, urban district of two other teachers in this study, Mrs. Riddell and Mr. Spittler. She switched to her current district because it is closer to home as she lives in the district in which she teaches. Even though Mrs. Condiff teaches sixth graders, the math curriculum she teaches is at the seventh grade level. Mrs. Condiff has her bachelor's degree in elementary education with middle school endorsements in math, social science, and reading. She also has her master's degree in administration.

Mr. Greger, 7th and 8th Grade Teacher in a Wealthy, Suburban Setting

Mr. Greger is a seventh and eighth grade math teacher at a rich, suburban school district in central Illinois. He has been teaching for six years. Before becoming a teacher, he spent twenty years at State Farm as a technology training specialist. He sees approximately 130 students per day, with class sizes of around thirty. He teaches general math, pre-algebra, algebra, and geometry. Prior to teaching in this district, he taught in the poor, urban district of two other teachers in this study, Mrs. Riddell and Mr. Spittler. He switched to his current district because it

is closer to home, as he lives in the district in which he teaches. Mr. Greger has his bachelor's degree in commercial parks and recreation and has his master's degree in elementary education. His middle school endorsements are in math, music, and business.

Mrs. Riddell, 7th and 8th Grade Teacher in a Poor, Urban Setting

Mrs. Riddell is a seventh and eighth grade math educator at a poor, urban school district in central Illinois. She has been teaching for sixteen years. Before becoming a teacher, she spent twenty years banking. She has taught eight years of high school math and eight years of middle school math. She chose to move to the middle school because she felt she could reach students before they dropped out of school. During her career she did interview elsewhere but did not receive a job offer, which she felt was "meant to be" as she believes she is making a difference in the students she teaches (interview). She teaches three general math classes and two algebra classes. One of these general math classes is for seventh graders while the other two are for eighth graders. Both algebra classes are for eighth graders. She sees approximately 110 students per day with about twenty-five students in each class. Mrs. Riddell has her bachelor's degree in junior high education with a sixth through twelfth grade certification. She also has her master's degree in educational administration.

Mr. Spittler, 7th and 8th Grade Teacher in a Poor, Urban Setting

Mr. Spittler is a seventh and eighth grade math instructor at a poor, urban school district in central Illinois. He has been teaching for two years and works with three seventh grade classes. One of these is general math, one is co-taught, and one is honors. He also teaches two classes of eight grade math, one of these classes being co-taught. He sees approximately 95 students per day with about twenty-two students in each class. He has his bachelor's degree in elementary education with middle school endorsements in math, science, and social science. He

lives in the district in which he teaches but plans on applying elsewhere to move closer to his family.

Convergences and Divergences between Interviewees

There are many similarities and differences between the participants interviewed. All educators teach in central Illinois and teach mathematics to students in the middle school age range. None of the teachers work in a self-contained classroom, and all see multiple groups of students each day. All interviewees teach similarly sized classes of students and the same number of classes per day; however, Mrs. Condiff has to prepare for subjects other than mathematics, while the other teachers only focus on math. All participants use the same mathematics curriculum. Two of the four educators, Mrs. Condiff and Mr. Spittler, hold bachelor's degrees in elementary education, while one, Mr. Greger, holds his degree in commercial parks and recreation and another, Mrs. Riddell, holds her degree in junior high education. Mrs. Condiff and Mr. Spittler, who hold elementary education degrees, have only taught as their profession; however, Mr. Greger and Mrs. Riddell held jobs outside of the teaching profession prior to becoming educators. Three of the four teachers hold their master's degrees, two in administration and one in elementary education. Mr. Spittler plans on returning to school to obtain his as soon as he is financially able. Mrs. Riddell and Mrs. Condiff got their master's degrees in administration to "go up on the pay scale," and they do not plan on leaving the classroom to go in to administration (interview). Mrs. Condiff and Mr. Spittler are the only two teachers who teach advanced mathematics classes, and Mr. Spittler is the only teacher who teaches co-taught classes. Mrs. Condiff and Mr. Greger both previously taught at the district in which Mrs. Riddell and Mr. Spittler currently teach. Mrs. Riddell and Mr. Spittler both expressed wanting to leave their district at one point, Mrs. Riddell wanting to leave previously but not any

longer, while Mr. Spittler is wanting to leave in the near future. The varying degree of interviewees' backgrounds resulted in similarities and differences in their perceptions of teaching middle school mathematics.

Resources and Funding

Regarding resources and funding, teachers had clear views on how they could improve instruction. Educators thoughts on improving student learning appeared to be contextually contingent upon the type of school in which they worked. Teacher agency was evident with Mrs. Riddell and Mr. Spittler in their urban school as they were allowed to pick resources as a team. These resources were provided by the mathematics department of their school. Mrs. Riddell and Mr. Spittler felt administrative support when discussing the available manipulatives provided by their mathematics department and instructional coach. Both stated that the instructional coach was a valuable resource that offered them valuable manipulatives, lessons, and coaching.

Administrative support was also a topic in the suburban school district of Mrs. Condiff and Mr. Greger. Both teachers discussed the availability of resources provided to them. Unlike the urban school district, Mrs. Condiff and Mr. Greger's funding was provided by the district to individual teachers. Teachers could request items they felt they needed individually, but these items were not given to a grade band with input from various teachers. Unlike the urban district, Condiff and Greger felt that they needed more time with their instructional coach. Mrs. Condiff mentioned that the instructional coach was more interested in developing the technology department than helping teachers grow in their teaching practices.

Interviewees also discussed the technological resources that impacted their teaching. Students at the suburban school have Chromebooks, while students at the urban school have iPads. All teachers interviewed use the technology to assign, complete, and turn in homework.

Participants liked this because it requires less copying and some assignments can be automatically graded. They also liked how it enriches mathematics education in an interactive and engaging way. Mr. Greger wanted more technology training for teachers and students so that they could get the most out of the resources. Mrs. Condiff wanted more interactive programs to use with the Chromebooks. Instead of solely talking about why an educator might like or be successful with technological resources, Mr. Spittler and Mrs. Riddell mentioned the students and their interaction with the resources. Mr. Spittler stated that many of his students ended up getting their technology taken away due to behavior. Mrs. Riddell mentioned her students abusing the technology, getting off task and not handling it appropriately to the point it breaks. This resulted in the teachers having to do twice the work by creating a technological assignment for students who had access to their technology and a paper-based assignment for students who had theirs taken away. For the suburban district, technology seemed to be as problematic as it was empowering.

Impact of CCSS

CCSS plays a different role in the teaching of each interview participant. Mr. Greger and Mrs. Riddell discussed how the standards have not changed the way they teach but have impacted what they teach. They both stated that they make sure students get what they need regardless of what the standards require. Mr. Greger expressed his annoyance with the fact that the standards are "made by people who are not in teaching" (interview). Mrs. Riddell explained how she discovers the level at which her students are performing and affords them the tools and skills they need to positively impact and increase their understanding. Both teachers stated they may teach concepts in a different order due to the sequence of their CCSS aligned textbook, but they do not always present the information in the way the textbook suggests.

Mrs. Condiff and Mr. Spittler believed that the CCSS have greatly impacted their teaching. Mrs. Condiff felt that the standards have helped her teach students why and how a mathematical process works while also exposing them to multiple ways a problem can be solved. Mr. Spittler believed that the standards drive his instruction. He bases all lessons and activities on the standards and feels they are a path he can follow to make sure students are learning what they need to succeed. Both teachers expressed how they were able to use their CCSS-aligned textbooks to make sure students are being taught in a way that provides them with the greatest opportunity for mathematical comprehension.

Professional Development

Professional development has various impacts on the interviewed educators. While all teachers have professional development opportunities offered at their school or Regional Office of Education, these opportunities look different between districts and in what instructors feel they gain from them. In the suburban district, Mrs. Condiff and Mr. Greger get to choose their professional development opportunities. Professional development is school-wide and is not always math related. Some other options include Positive Behavioral Interventions and Supports (PBIS) meetings, retirement meetings, and reading development.

While the suburban school focuses on academic professional development, the urban school focuses on social-emotional learning and trauma-centered professional development. Mrs. Riddell stated that while some of the development offered is mathematics related, the majority of their development opportunities focus on student well-being rather than academics. Her school district feels that students must be taken care of mentally and physically before they can learn mathematics.

Funding for professional development is provided by the schools at both districts. Mrs. Condiff and Mrs. Riddell discussed that there used to be more funding available to attend national conferences. Mrs. Riddell stated that if money is in the budget and substitute teachers are available, her urban district will send one teacher to a national conference, such as NCTM, each year. That educator will then present the new information to the school's math department. Mrs. Condiff stated her district will pay for small, off campus professional development, but they rarely pay for national conferences like they used to do.

Another form of professional development, PLCs, are not available for all of the teachers interviewed. Educators at the urban school district are provided with PLCs, while teachers in the suburban district do not participate in them. Since all instructors taught at the urban school district at one point in their career, they are all familiar with PLCs. Mrs. Condiff and Mrs. Riddell enjoy PLCs and feel the collaboration is necessary and meaningful. Mrs. Riddell stated that along with the scheduled PLCs, she feels that impromptu collaboration happens in the hall, between classes, and at lunch. She believes that working with others is an important part of growing as an educator. Mrs. Condiff believes that PLCs are beneficial and stated that she would like to partake in PLCs in her current district. Mr. Greger and Mr. Spittler had different opinions on the effectiveness of PLCs. They both believe that PLCs are not beneficial. Mr. Spittler stated that they were often repetitive and did not pertain to teacher needs. They both felt that short, daily collaboration with their coworkers would be more beneficial than long, monthly collaboration.

Improvements to Positively Impact Teaching

While all teachers had ideas on how they would improve instruction, they had differing ideas on what should be the main focus. Educators at the suburban school expressed their desire

to have updated technology, newer textbooks, and paid technology subscriptions. Mrs. Condiff stated that she likes using the technology they have, but she would like more resources for the students to use with the technology. Mr. Greger feels that newer textbook that have a more effective scope and sequence along with spiral review of concepts will positively impact his teaching.

Instructors at the urban school were focused on acquiring more cohesive discipline practices and administrative support. Mrs. Riddell stated that she has students who are a disruption to the classroom, but school policy will not allow her to send them out of the classroom. This impacts the learning of other students. Mr. Spittler believes there should be greater consistency with adults in the building when it comes to implementing rules. He believes that administration must make sure teachers are enforcing the disciplinary procedures created by the PBIS team. Mr. Spittler feels that because rules and expectations are not enforced by all adults, students are not held accountable for their actions and behavior worsens. Because the administration is not witnessing the misbehavior on a daily basis, he feels they do not punish students accordingly, which results in the students continuing to misbehave.

Discussion

The perspectives of teaching professionals give an insight into what they view as important factors in the success of their teaching career and student accomplishments. Because the educators interviewed have different backgrounds and teaching environments, they hold different opinions on the teaching profession. Findings from the interviews of these professionals are significant when it comes to improving educational practices.

Significance of Findings for School Personnel

Teachers feel strongly about which resources they have available and how to effectively use them. Instructors in the urban district enjoyed being able to pick their own resources. Because they got to choose what worked best for their mathematics department, they felt support from their school district. Mrs. Riddell and Mr. Spittler also felt that the instructional coach was available to help them obtain resources and work with them to use those resources effectively. Because Mrs. Condiff and Mr. Greger got their resources funded individually, they did not feel a sense of collaboration when picking them; however, they did feel their needs were acknowledged by being allowed to ask for them. Unfortunately, they did not feel support from their instructional coach. The absence of the instructional coach's help left them feeling unsupported and may have resulted in limited use of the resources they acquired. Healthy school environments allow for educators to have a say in their instructional materials and be given development opportunities on effective ways to implement resources (Phelps et al., 2016). This shows that allowing teachers to pick their materials and supporting their use of the materials helps promote successful teaching environments.

While engaging resources are important to the teaching environment, it is imperative that those resources are used appropriately and effectively. All teachers interviewed believe they have useful resources. Mrs. Condiff and Mr. Greger want updated and more engaging resources. Their desire for more manipulatives may be due to their limited understanding of the resources they possess. It is possible that if their instructional coach was more involved, they would be exposed to more ways in which to use the resources they have. Mrs. Riddell and Mr. Spittler feel like they have enough resources, but they are misused by students. Both teachers feel as though administration is too relaxed when it comes to handling student discipline and enforcing

behavior rules and procedures. If administration was more involved and all teachers were implementing a cohesive behavior management system, students may take more accountability for how they handle and use school property.

Making sure that students receive what they need to have a successful education is extremely important. All teachers interviewed are supplied with CCSS-aligned textbooks. Mr. Greger and Mrs. Riddell felt that the CCSS did not change their teaching practices. They made sure to understand what their students needed and how they could best support them in their learning. Creating a mathematical environment that acknowledges student differences and prior knowledge is an integral part of being an effective teacher (NCTM, 2012). Interestingly, both of these teachers had different careers before entering the education profession. On the other hand, Mrs. Condiff and Mr. Spittler, who have only held a career in education, believe that CCSS guide their instruction. Mr. Spittler stated that he refers to the CCSS in all that he does to make sure he is adequately preparing his students for their future. Knowing mathematical content knowledge and being able to effectively teach this content, which CCSS help determine, is the root of effective teaching (Ball, 2000).

To maintain professional knowledge and keep up with changing standards, practices, and initiatives, teachers must be lifelong learners participating in professional development (NCTM, 2012). The different school districts have differing focuses on professional development. The suburban school district gave its teachers a choice of many different professional development sessions, mainly focusing on academics. The urban district provided its teachers with professional development that focused on students' social-emotional needs and trauma-centered remediation. Because much of the urban school's student body seems to have other than purely academic needs, it is effective to have teachers in that district attend these types of professional

development. When development opportunities align with the goals of teachers, they are more likely to use them in their own teaching (Phelps et al., 2016). Professional development needs to be relevant to educators' needs and wants to be effective.

Along with professional development opportunities, all instructors interviewed were familiar with PLCs. PLCs can create a positive and effective environment to collaborate and discuss ways to improve student achievement (Hallam et al., 2015). While Mrs. Condiff and Mrs. Riddell enjoy the collaboration of PLCs, Mr. Greger and Mr. Spittler believe that PLCs are not beneficial to their teaching. It is important that educators help lead PLCs and determine what is important to put on the agenda. It is necessary for teachers to trust that they can share with other educators and be trusted by their administrators to know how to effectively run a PLC (Hallam et al., 2015). It is possible that Mrs. Condiff and Mrs. Riddell have a positive view of PLCs because they are more confident in the PLC setting and have more trust with their colleagues since they have been teaching for more than ten years longer than Mr. Greger and Mr. Spittler. Ensuring that Mr. Greger and Mr. Spittler feel their opinions are valued will help them to trust in their peers and feel more confident in the PLC setting. With this confidence, they will be able to contribute more to the PLC and take more of what they learn into their own classroom (Phelps et al. 2016).

Significance of Findings for Researchers

Pre-service teacher education programs and professional development are viewed as crucial parts of preparing and improving teacher quality and student success. Unfortunately, it has been difficult to study their relevance because of the challenge of testing outcomes that measure content and skills that are the premise of professional development (Phelps et al., 2016). Because all teachers interviewed received their bachelor's and/or master's degree in education,

they went through pre-service teacher education programs that equipped them with content knowledge as well as effective teaching practices. Educators must have extensive knowledge of mathematics to provide students with unrestricted content knowledge (Hobbs, 2012).

What is known about positive professional development outcomes revolves around developing trust among teachers who can effectively communicate ideas and challenges (Hallam et al., 2015). Mrs. Riddell was very reliant on collaboration with her peers as a way of improving her educational practices. Mr. Greger and Mrs. Condiff were also in favor or collaboration with peers and being able to converse with coworkers to overcome challenges. It is crucial for principals to allow teachers to lead PLCs and have control over what is considered worthy of their time and impactful to their teaching. Principal support was seen as lacking when it came to Mr. Greger and Mr. Spittler's views of PLCs. Both cited that they were unnecessary and irrelevant to what a teacher would actually use in the classroom. Professional development that holds a larger impact on educators, such as mentors and study groups, should be considered when offering learning opportunities for educators (Phelps et al., 2016).

Implementation of the CCSSM requires teachers to have an understanding of student expectations, concepts to be taught, and effective teaching practices that help students make deeper connections. Instructors must know what students have learned in prior grades and how their teaching will connect to content in later grades (Teuscher et al., 2015). Mrs. Riddell discussed how she discovers what level her students are performing at to determine what educational gaps need filled and how students can best learn material. High-quality tasks and teaching practices are the key to student success and must be implemented into the classroom to aide students in creating deep connections that allow them to use mathematical concepts in various aspects of school and life. Due to the CCSSM's increased rigor and change in the grade

level placement of topics, teachers must identify goals and sequences of the CCSSM to fill all gaps and guide students in successfully building upon prior knowledge to develop deeper mathematical understanding (Teuscher et al., 2015). Mrs. Condiff and Mr. Spittler view CCSSM as a guide to follow that allows them to make sure students are deeply conceptualizing mathematical concepts in a way that will allow them to use the knowledge in the future.

Greater investment in education can have a positive impact on student outcomes. Having more money provides districts with more opportunities, such as professional development and useful resources, to improve school, teacher, and student success (Baker, 2017). Resources such as textbooks, manipulatives, technology, and curriculum instructors were viewed as beneficial in the process of creating a positive learning environment and overall education. In the urban school's case, increased technological resources came as somewhat of a hindrance when students could not appropriately use the resources. While the urban school teachers enjoyed having a curriculum instructor that they viewed as beneficial, the suburban teachers felt their curriculum instructor's time was spent more on fixing technology issues rather than helping teachers become more successful in the classroom. This shows that simply having resources does not automatically result in a successful learning environment. Resources must be used appropriately to acquire their full benefits. Creating a high quality mathematics education requires quality preparation for educators and more availability to professional development opportunities (NCTM, 2014). Concepts of collaboration, usefulness, shared decision making, and encouraging school cultures are key factors of high quality middle grades education programs (Phelps et al., 2016).

This research lends itself to extend in areas of future study. Researchers could study the perspectives of middle school math teachers in rural school districts to view the opportunities

they receive and challenges they face with their educational background and teaching setting. Future studies could include interviewing administrators to understand their perspectives of middle school mathematics teachers' challenges and opportunities. They may be able to provide more insight into why opportunities are available or challenges are faced. It would also be beneficial to observe teachers to understand their teaching style, teaching environment, and students. It may also be valuable to study the districts' behavior management systems to understand the school's rules and procedures.

This research is a contribution to the education profession in many ways. It allows for teachers, administrators, and researchers to gain a better idea of how middle school math teachers' perspectives can be influenced by resources, standards, professional development, and administrative support. By understanding what educators view as opportunities and challenges, administrators, researchers, and hopefully those in a position to impact educational policies will be able to understand what teachers want and need to be successful educators.

Limitations

There were limitations within this study. Due to the researcher obtaining her master's degree in one year, time constraint resulted in a narrow study. Only four teachers from two different schools were interviewed. Of the educators interviewed, one taught sixth grade, while the others taught seventh and eighth grade students. There was not a rural setting involved in the study to compare and contrast among the suburban and urban setting. One of the teachers who had little teaching experience was unable to answer some of the questions that required him to have been teaching longer to have a meaningful response. Teachers' perceptions were spoken as fact. Finally, interviews took place via telephone which did not allow the researcher to observe participants' body language and actions.

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Appendix A

Comparison of the Illinois Report Cards of the Urban and Suburban Schools

Criteria	Urban School	Suburban School
PARCC Readiness for Next Level	4%	40%
Algebra Readiness	26%	55%
Student Mobility	18%	6%
Low Income	77%	22%
ELLs	0%	0%
IEPs	15%	10%
Operational PPEs	$12,000	$8,300
Instructional PPEs	$6,100	$4,800
Class Size	17	20
Total Enrollment	344	357

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Appendix B

Interview Questions

1. How long have you been teaching in general?
2. How long have you been teaching math?
3. What is your bachelor's degree?
4. Do you have a master's degree?
5. How has your teaching changed in your time with this district?
6. What is unique about your school in regards to teaching mathematics?
7. What teaching resources do you have that help you be a better teacher?
8. How are math resources funded?
9. What resources would you like to have?
10. How have the Common Core State Standards impacted your teaching?
11. How often have you gone to professional development and conferences?
12. How is professional development funded?
13. What are improvements you would like to see happen that would help you do a better job teaching?
14. What are your biggest frustrations?
15. What are the best parts about your job?

Appendix C

Follow Up Questions

1. Why did you choose to go into the teaching profession?
2. How do you assess your class for understanding?
3. Do you feel Common Core State Standards have shaped assessment in your classroom?
4. Do you get to participate in PLC's (professional learning communities)?
5. Do you feel PLC's are beneficial?