TEACHER SELF-EFFICACY AND STUDENT LEARNING: A CASE STUDY OF THE IMPLEMENTATION OF COMMON CORE STATE STANDARDS IN MATHEMATICS IN A PAROCHIAL MIDDLE SCHOOL

by

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ABSTRACT

CANDACE ELIZABETH MAZZE. Teacher self-efficacy and student learning: a case study of the implementation of Common Core State Standards in Mathematics in a parochial middle school (Under the direction of DR. COREY R. LOCK)

In response to US student performance on national and international educational assessments, the National Governors' Association Center for Best Practices coordinated the development of Common Core State Standards in Mathematics and English Language Arts from grades kindergarten through twelve to provide a clear and consistent framework to prepare our children for college and the workforce (NGACBP, 2010). The adoption of the Common Core State Standards represents the first change to mathematics standards in North Carolina in over a decade. The process of curriculum change on the part of teachers not only involves an understanding and implementation of material and standards, but also the ability and willingness to adjust one's prior belief system and perceived abilities. Educators interpret curriculum change in varied ways—some see it as a substantial change in practice and adjusting instruction; others view it superficially, making very few changes. Student achievement barely improves during such ambiguity.

This study examined teacher perceptions of the Common Core State Standards in Mathematics implementation at the middle school level to learn of the adoption and practice of new curriculum standards in terms of preparation, feelings of self-efficacy and perceived effects on student learning during the

initial implementation year. Studying teacher perceptions and student performance in the sixth and seventh grades can provide insight to student learning and teachers' perceived abilities to teach under the recent curriculum change. The descriptions generated by the study's results can be useful in the planning and ongoing implementation of training and professional development specific to the Common Core State Standards in Mathematics in North Carolina.

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TABLE OF CONTENTS

CHAPTER I: INTRODUCTION

Educational reform efforts are in effect to establish a system in guiding students to better learning and understanding. The implementation of Common Core State Standards in Mathematics across the nation is one attempt to improve student learning and understanding of the subject. In 2012-2013, students in middle school grades across the nation have been expected to meet new and higher national standards in mathematics and be able to apply mathematical concepts at a higher level and to real world situations (Bitter, 2010). In North Carolina, Common Core State Standards in Mathematics have been the first change to curriculum standards in over a decade. It is intended student learning, understanding, and performance in mathematics can be deeply impacted by this change in curriculum standards.

Student learning and teacher understanding of mathematics under the new curriculum have been adjusted according to the scope, sequence, and instructional practices necessary to meet the new standards. Teachers' perceived ability, or self-efficacy, to teach curriculum is also affected by this change. During curriculum change, implementation and learning of the new curriculum among teachers can determine the effectiveness of reform on student learning.

Implementing curriculum change can be compromised by how teachers believe curriculum should be taught and learned (Roehrig, Kruse, & Kern, 2007;

Roehrig & Kruse, 2005).Research has found teachers typically instruct based on what they believe about the subject and how it should be taught (Charalambos & Philippou, 2010). In–service workshops and trainings are often provided to teachers to familiarize them with intended curriculum and instructional changes. Experiences, interactions with other teachers and having to adapt to new requirements could play a role in one's self-efficacy to teach effectively (McCormick, Ayers & Beechey, 2005). The process not only involves an understanding and implementation of material and standards but also the ability and willingness to adjust one's prior and current belief system. Such a process in turn can then impact student learning of the curriculum.

The current research describes teacher perceptions of the curriculum implementation process in terms of preparation, teacher self-efficacy and perceived effects of new mathematics standards on student learning. Teachers' perceived ability, or self-efficacy, to teach Common Core State Standards in Mathematics during the initial year of implementation can point to areas teachers may feel more confident in than others for successful mathematics preparation in teaching and learning. Student performance in mathematics can inform educators if learning is occurring as the curriculum intends. The findings reported in this dissertation can be important to administrators and teachers responsible for implementing the new standards and for the development of in-service training programs in middle schools.

Purpose of the Research

In this study, the researcher examined perceptions among sixth and seventh grade mathematics teachers of the newly implemented Common Core State Standards in Mathematics in terms of preparation, teacher self-efficacy and perceived effects on student learning. Recent changes to the mathematics curriculum have slowly transitioned into schools throughout the United States. Full implementation of new curriculum standards took effect in the state of North Carolina during the 2012 – 2013 school year. The new standards are research-based and intended to be more applicable to student learning outside the classroom than previous curriculum standards (NGABCP, 2010). The changes also intend for teachers to consider their instructional practices to reach all students (NGACBP, 2010). Due to such considerations, curriculum changes may impact teachers' perceived ability in teaching the new standards.

Studies on curriculum change report mixed findings on how teachers respond and implement new curricula. Roehrig and Kruse (2005) found implementation of the curriculum was strongly influenced by the teachers' beliefs about teaching and learning. Teachers trained in the traditional teaching and learning methods may continue to use them despite changes recommended during curriculum change (Roehrig & Kruse, 2005). However, confidence in one's teaching abilities has shown teachers are willing to try innovative instructional practices in efforts to implement new curriculum effectively (Gordon, Lim, McKinnon, & Nkala, 1998; Ghaith & Yaghi, 1997). Educators interpret

curriculum changes in varied ways - some see it as calling for a substantial change in practice and adjusting their instruction, others view it superficially, making very few changes (Robelen, 2012). Additionally, administrator expectations, such as how to deliver the curriculum during change, can affect teacher self-efficacy, regardless of having traditional or novel teaching methods (Cullingford, 2004). Student achievement barely improves during such ambiguity.

Growth in children's learning of mathematics has not aligned with accountability expectations (Ding & Navarro, 2004). The national effort to change how and what students learn at each grade level intends to improve student learning; a large focus being specifically on literacy and mathematics (NGACBP, 2010). Studies on student performance during curriculum change have typically been conducted at times of change in curriculum materials meeting standards-based reform not national standards (Department of Education, 2007, 2004; Reys, Reys, Lappan, Holliday, & Wassman, 2003; Ridgway, Zawojewski, Hoover & Lambdin, 2002; Riordan, & Noyce, 2001). Research on student performance in mathematics at the initial point of reform can be important in supporting research on textbook curriculum changes as well as the overall effectiveness of curriculum change.

Findings from the research serve multiple purposes. Examining the process of curriculum implementation in terms of teacher preparation, self-efficacy and perceived effect on student learning of mathematics provides guidance to curriculum developers and teachers in understanding how students

learn (Greenspan, 2000). Learning how teachers perceive their abilities to teach effectively during latest reform efforts can give insight of areas teachers felt most effective in and where they need more assistance based on the implementation process. Examining student performance under new curriculum standards can compare student learning to learning under previous mathematics standards. Student performance during the initial implementation year can also show whether student understanding and the potential for student growth in mathematics is occurring as the new standards intend to do. Although the study took place in North Carolina, the findings can be applicable to the 44 states who have adopted the Common Core Standards in Mathematics (NGACBP, 2010).

Research Question

This study examined the process of early implementation of Common Core State Standards in Mathematics in a southeastern United States parochial middle school, guided by the following question:

> How do sixth and seventh grade mathematics teachers describe the implementation of Common Core State Standards in Mathematics in terms of preparation provided, their self-efficacy in teaching the new mathematics standards effectively, and perceived effects of new mathematics standards on student learning?

Significance of the Study

Under No Child Left Behind (NCLB), a legislative act initially set in 2001 to continue through 2014, students throughout the United States have been

expected to achieve grade level proficiency across all subject areas (US Department of Education, 2012). Schools and states have been held accountable, by both federal and state legislation, for student achievement. Yet, from the federally mandated No Child Left Behind program, there is little evidence that student achievement in mathematics has improved (Murray, 2008). Recent changes to the kindergarten through twelfth grade curriculum intend to make teaching and learning standardized nationally instead of locally (NGACBP, 2010).

Since 2010, North Carolina and forty-four other states, along with the District of Columbia, four territories and the Department of Defense Education Activity adopted the Common Core Standards in Mathematics with achievement objectives established for kindergarten through twelfth grade (NGACBP, 2010). The standards were an initiative of the National Governors Association Center for Best Practices and approved by the U.S. Department of Education (NGACBP, 2010). Based on different standards across states, student mobility, global competition, and different skills required in today's' job, there was a need for an aggressive effort toward curriculum change in mathematics (Confrey, 2012). For over a decade, research studies of mathematics education in high-performing countries have found that the mathematics curriculum in the United States needed to become more focused and coherent in order to improve mathematics achievement in this country.

Research has shown that students are already challenged by mathematical concepts such as computation, geometry, and algebraic equations and the problem solving skills to master such concepts (Cai & Lester, 2010; NCES, 2005; Higgins, 1997). Competency in mathematics−both in numerical manipulation and in understanding the conceptual foundations—is needed to enhance a student's ability to handle the quantitative relationships that dominate day-to-day decision making (Greenspan, 2000). The Common Core State Standards in Mathematics is intended to meet these needs (Confrey, 2012; NGACBP, 2010).

Common Core State Standards developed as a result of research on learning trajectories and their expected tendencies in student learning (Confrey, 2012). The Common Core Standards in Mathematics (NGACBP, 2010) are based on what is known about how students' mathematical knowledge, skill and understanding developed over time. Common Core Standards in Mathematics stress conceptual understanding of key ideas and continually returns to previous concepts for the organization of principles and structuring those ideas. The expected result from the Common Core Standards is a higher expectation of student progress each year (Confrey & Maloney, 2011). Student progression each year means a tighter linkage between learning expected in elementary school, no lag and little review, and instead a dive into middle school with more content, and the push to have students in algebra during or by the eighth grade (Confrey, 2012).

The difference between the new and old standards involves a sequence of higher level thinking of mathematics concepts at an earlier stage of progression that applies to more diverse student proficiencies and real life applications. Many of the mathematical concepts focused on during seventh grade under the previous standards will be taught in the sixth grade such as central tendency, percentages, ratio and proportions. The concepts needed for algebra in eighth grade such as rational numbers will be taught in the seventh grade. Middle grades are now that much more important for student success of mathematical understanding since concepts and domains will be fewer, clearer and higher with no room for repetition (Confrey, 2012).

Research on middle school grades is critical to understanding the importance of student learning in these grades as well as under new curriculum standards. An assumption of adolescent epistemology is that learning higher mathematics is *de facto* similar to ways in which adolescents learn to negotiate with themselves, authority, and the world around them (Watson, 2010). The stage of adolescence can therefore contribute toward student performance in the subject. During middle school, students begin to form ideas of themselves as learners of mathematics—about their competence, their attitude, and their interest and motivation (NCTM, 2000). Research on student achievement in this subject during the middle grades can assist educators to better understand student thinking and lead to improved mathematical instruction and student performance at these grade levels.

Middle school is recognized as a transitional stage for adolescent academic development. Statistics show that some students with relatively strong mathematics skills at the end of elementary school are not in algebra by the eighth grade (NCES, 2010). Mathematics in elementary grades typically focuses on helping students get the right answer rather than on conceptual and intuitive understanding of mathematical concepts (Bitter, 2010). As students enter and continue through middle school, student thinking and understanding of mathematics can be compromised further. The inability for students to think through a problem will work against rather than ensure students' ability to produce or even recognize an appropriate answer whether on a standardized test or in a real life situation (Bitter, 2010).

The sixth and seventh grade years can be critical years for student learning and academic success. Seventh grade especially has been considered a "pivotal year" in students learning mathematical concepts (Bitter, 2010). Between the two grades, mathematical concepts are taught in preparing students for pre-algebra and algebra. Where students stand at the end of the seventh grade determines how quickly and successfully they get through the more advanced mathematical courses of eighth grade and beyond (EdSource, 2010). Student data on mathematics and science learning across the United States further signifies the extent middle school students are struggling in mathematics. Scores on the Trends in International Mathematics and Science Study (TIMMS) assessment show eighth grade students in the United States ranked last compared to nineteen other

countries between 1995 to 2007 (Livingston, 2007).The test measures the degree to which students have learned mathematics and science concepts. A concern becomes one of adequate preparation of all students to succeed at the goal of eight grade algebra (Burns, 2008). Improvement in student understanding of mathematics concepts before and during middle school can be the only way these students succeed in algebra and future mathematics classes.

Research has found students have come to separate the mathematics they know and experience in their classrooms from the discipline of creativity, problem solving and discovery. This behavior seems to be driven by students' experiences. Children develop a framework in mathematics that comprises a collection of memorized rules, formulas, and procedures; typically learned over time from teachers and school experiences (Higgins, 1997). At the same time inconsistencies and mental blocks exist when students are faced with non-standard mathematics problems with a degree of difficulty appropriate to their skills despite having high academic performance (Callejo & Vila, 2009). One assumption of student learning is that students must go beyond the information given to transform mathematical concepts and ideas into a more useful personal structure of knowledge (Albert, 2000). Current research examines if, in today's education system, students can actually perform as more rigorous expectations and more difficult mathematics course are expected of them.

This dissertation adds to current research of understanding sixth and seventh grade teacher perceptions of new mathematics curriculum

implementation. The research presents a baseline of student performance under new mathematics curriculum standards during an influential stage of their adolescent development. The study contributes to the body of literature on Common Core Standards in Mathematics and its effectiveness during the first year of its implementation, specifically in grades six and seven.

Plan of Study

Studying the implementation process of new mathematics curriculum standards among middle school teachers was conducted using a case study research design. Case studies are a valuable means of researching learning and skills, closely examining a specific case that focuses on a particular situation (Rossman & Rallis, 2003; Hodkinson & Hodkinson, 2001). The methodology is especially good for studying practical problems –for questions, situations or occurrences arising from everyday practice (Rossman & Rallis, 2003). Teacher preparation, self-efficacy and student performance under newly implemented curriculum standards have been situational everyday practices of learning currently in the school this study examined.

Case studies intend to describe a natural phenomenon in-depth and the data in its real-life context as it occurs (Baxter & Jack, 2008; Zainal, 2007; Yin, 2003). Curriculum implementation is a current phenomenon of today's K-12 educational system. It is best understood in the context it occurs−the school setting–and includes data from those individuals experiencing it at the time. Details result in a thick description that allows the reader to interpret and apply

case learnings to other settings (Rossman & Rallis, 2003). The case study method is part of a research strategy used to examine an important change in the way of doing something, in this case a new curriculum, in a real-life context. Findings from this case study shed some light on student learning and teacher implementation of the new mathematics curriculum, specifically in the sixth and seventh grades.

Under a constructivist framework, this case study was an intensive investigation of one middle school with a small participant population of teachers during educational change (Hancock & Algozzine, 2006). The constructivist approach examines the shape or growth of teachers and student learning in creating an effective change within the school (Bruner, 1960). Teachers and school leaders have had to make meaning of Common Core State Standards in Mathematics in order to effectively implement the new standards toward improved student learning. Through school leader and teacher descriptions and student performance records, a case study was used to describe how the school constructed change and how the change affected teachers, possibly reconstructing their teaching and learning.

The group of educators participating in this study provided description specific to their preparation for implementing new curriculum standards and their perceived abilities to teach the new mathematics curriculum. Studying the student population of whom these teachers instructed provided information on how students performed under the new mathematics standards. Suitable to the context

of outcomes studied, the use of case study methodology showed how the processes were involved in the causal relationships of curriculum change, teacher perceptions and student learning (Hodkinson & Hodkinson, 2001).

Case study research was the most appropriate methodology for the study of school faculty and student populations in the participating school. Case study research encourages educators to consider additional steps in an educational curriculum emphasizing communication and relationships (Zucker, 2009). Using case study research in education contextualizes the data. The data is gathered from the studied individuals to gain subjects' buy-in on changes that can lead to the change in the nature of education itself (Dawidowicz, 2011). The detailed qualitative accounts produced from this approach not only help to explore or describe the data in a real-life environment but also helps to explain the complexities of situations within it (Zainal, 2007). Findings from this case study described and explained the current implementation of new mathematics curriculum standards. From the study, new thinking and new ideas toward the implementation process may be generated and considered.

The case study methodology used in this study was mainly qualitative, although quantitative methods were included as well. Qualitative research tends to use an inductive approach, gathering data in search of preliminary findings to be used as a basis for future planning (Patten, 2007). The use of mixed methods research allows researchers to gain generalizable and in-depth insight through analysis of quantitative and qualitative data (Dawidowicz, 2011).

Qualitative data from the study provided insight from teachers into the adoption and practice of new curriculum standards. Surveys and semi-structured interviews were used to examine the implementation process as perceived by teachers and their school leaders. Surveys included closed-ended items about the self-efficacy in terms of preparation, their perceived abilities and perceived effects on student learning during the initial implementation year. Teachers were also asked to participate in audio-recorded semi-structured interviews on their perception of implementation of Common Core State Standards in Mathematics related to the above mentioned areas. Interview questions included formal and informal questions based on survey responses. Interview responses were transcribed in order to collect rich data and utilize participants' words.

The quantitative data collected in this case study was integrated with the qualitative data and analysis. The researcher examined quantitative data descriptively. Student grades were examined to describe sequencing and pacing of mathematics concepts and student performance on concepts under the new curriculum standards. Additional student scores from standardized achievement tests were examined in describing student performance under previous and new mathematics curriculum standards. Quantitative data provided numbers relative to results of the new mathematics standards. A descriptive analysis of quantitative data reflected student learning that occurred during the early implementation of Common Core State Standards in Mathematics.

Delimitations

The following parameters were established as delimitations the researcher expected to occur within the study:

(1) The setting of the study is one parochial middle school.

(2) Only private school sixth and seventh grade general mathematics teachers were included in the study.

(3) Mathematics teachers of eighth graders were not included in the study since their instruction is specific to mathematics coursework of pre-algebra and algebra only and may not provide accurate findings if included in the study.

(4) The study took place during the second marking period of the first year of the implementation of Common Core Standards in Mathematics, October 30, 2012 through January 17, 2013.

(5) Concepts taught during the second marking period for sixth grade students included computation and conversion skills of fractions, decimals, and percentages.

(6) Concepts during those months for seventh grade students included ratios, proportions, percentages, fractions, decimals, scale drawing, distance measurement, graphing, tables, integers, order of operations and properties, variables and expressions, and comparison statements.

(7) Participating teachers used ConnectEd Math 2 textbooks and supplemental resources for mathematics instruction.

(8) Participating sixth grade mathematics teachers used ConnectEd Math 2 standardized tests to assess students on mathematics concepts of decimals, percentages and fractions.

(9) Participating seventh grade teachers used ConnectEd Math 2 standardized tests to assess students on mathematics concepts of ratios, proportions, percentages, fractions, decimals, scale drawing, distance measurement, graphing, tables, integers, order of operations and properties, variables and expressions, and comparison statements.

(10) Pearson Stanford 10 achievement test was administered October 2012 to measure student growth performance in mathematics. Test score collection consisted of student scores on achievement test portions of Mathematical Procedures, Mathematical Problem Solving and Total Math. Scores of sixth and seventh grade mathematics performance were collected from the 2011-2012 and 2012-2013 school years.

(11) Sixth grade teachers were certified to teach all subjects kindergarten through sixth grade including mathematics.

(12) Seventh grade teachers were certified to teach mathematics for that secondary grade level and subject.

Limitations

Limitations are those characteristics within the research design that may impact or influence the application, interpretation, generalizability and utility of findings (http://libguides.usc.edu/writingguide, 2012). The following limitations were considered in minimizing potential external and internal validity threats to study outcomes:

(1) Common Core State Standards in Mathematics was implemented during the 2012-2013 school year to middle school grades 6 to 8. The new mathematics curriculum was being learned by teachers at the same time as being implemented therefore a potential learning curve to instruct the standards may have existed of the new curriculum.

(2) School leaders included in the study may not have been as active in the planning of the implementation process of new curriculum as others that did not participate.

(3) Sixth and seventh graders brought their knowledge of mathematics learned from previous curriculum standards which may impact the transition of learning mathematics under new curriculum.

(4) Student grades reflect mathematics student performance on standardized tests and not considered an evaluation of teacher knowledge or instruction of mathematics.

(5) Some of the literature in this field may be dated. The researcher included those sources in sharing the extent of research on curriculum change occurring years prior to the recent efforts.

(6) A limitation of using case study methodology would depend on the competence, judgment and ability of the researcher.

Assumptions

The following assumptions were made within the study:

(1) Students learning mathematical concepts under the Common Core Standards in Mathematics were assumed to be learning the concepts during the sixth and seventh grades in the sequence the standards expect them to be taught.

(2) Teacher administration of mathematical assessments and Pearson Stanford 10 achievement tests would have been adhered to as required by the participating school administrators and in accordance with the accompanying instructions with assessments.

(3) Self -efficacy may have been based on one's thoughts, beliefs, perception, and experiences of their abilities to learn and teach new curriculum effectively.

(4) Teachers and school leaders may have had previous beliefs about mathematics curriculum in regards to instruction and student learning.

(5) Teacher participants may not have attended Common Core State Standards in Mathematics professional development training as provided by the participating school.

(6) School leader participants may not have attended Common Core State Standards training as they recommend for their teachers.

The Study's Methodology

The setting and study participants were a purposeful sample. The study site was chosen by the researcher, aware that the middle school was going to implement Common Core State Standards in Mathematics in 2012-2013. The Superintendent and Principal of the participating school were also interested in learning of teacher views and student performance under new curriculum standards. The setting was available for conducting a study during the intended time period. The Superintendent and Principal of the participating middle school approved the study prior to the collection of student and teacher data. Six teachers for the sixth and seventh grade general mathematics classes participated in the study along with the collection of their students' scores. The school provided additional sixth and seventh grade student scores on the Pearson Stanford 10 achievement test. Participants were informed of the rationale, procedures, and intended outcomes of the study prior to beginning the study. Participants were given the opportunity to not be included in data collection and analyses if they chose. Data collected were anonymous. There was no identification of students by name, gender, race or test grades or teachers other than by grade levels. The

participating school leaders were provided study results after the study was completed. Sharing of study findings to the school community was at the discretion of school leaders.

The study involved data collection and analyses of teacher perceptions and student performance in six and seventh grade mathematics under the Common Core State Standards in Mathematics. The implementation process of new curriculum standards was studied in terms of preparation, teacher self-efficacy and perceived effects on student learning as intended through Common Core State Standards in Mathematics. Student performance was studied through the collection of numerical grades received on mathematical portions of a standardized achievement test and standardized mathematics tests of each concept taught during the marking period. Students' overall mathematics grade received for the marking period based on these tests was also collected. How students performed on standardized tests demonstrated their understanding of mathematical concepts as taught under new curriculum standards.

The study used mainly qualitative research methods to collect data. Quantitative methods were included to support qualitative findings. A mixed methods approach provided a better understanding of the research. Each approach contributed to the study. Qualitative data included open-ended questions from teacher surveys and teacher and school leader interviews. A Likert-type scale survey was administered to teachers in measuring teacher perceptions of the implementation process of the new mathematics curriculum standards; responses

ranged from strongly agree to strongly disagree. Surveys were constructed from a previously administered instrument on teacher self-efficacy belief. Interview questions were adapted and developed from within the research on curriculum change. Interview and survey responses described perceptions of the implementation process of Common Core State Standards in Mathematics in terms of preparation, teacher self-efficacy and perceived effects on student learning. Quantitative data was collected from mathematics scores among sixth and seventh grade students. Numerical grades on students' standardized tests administered on each concept covered during the study and overall performance for the second marking period were collected. Scores on mathematical performance were also collected from standardized achievement tests administered among sixth and seventh graders under the previous and new mathematics curriculum standards.

Definition of Key Terms

The key terms used in the study are defined below:

(1) Sixth graders: students typically aged 11 to 13 in the first year of middle school and specific to schools structured sixth through eighth grade.

(2) Seventh graders: students typically aged 13 to 15 in the second year of middle school and specific to schools structured sixth through eighth grade.

(3) School leaders: administrators of a parochial middle school planning and implementing the Common Core State Standards in Mathematics in grades 6 to 8; specific to the case study included the Principal and Dean of Students.

(4) Preparation: training and time spent on learning Common Core State Standards in Mathematics materials, resources, and instructional practices prior to instruction and implementation (as defined by researcher).

(5) Teacher self-efficacy: a type of self-efficacy; a cognitive process in which people construct beliefs about their capacity to perform at a given level of attainment (Erdem & Demirel, 2007; Bandura, 1997). For the purpose of the study, the perception of one's ability to feel they can teach and implement Common Core State Standards in Mathematics effectively for improved student learning (as defined by researcher).

(6) Teacher Self-Efficacy Belief Scale (Erdem & Demirel, 2007): a measurement of scale of self-efficacy, constructed from Teacher Sense of Efficacy Scale (Tschannen-Moran & Woolfolk –Hoy, 2007) and Teacher Self-Efficacy Scale (Hoy & Woolfolk, 1990).

(7) Common Core State Standards in Mathematics: national and state led efforts to define grade specific standards of what students should be able to understand and be able to do in mathematics (NGACBP, 2010). Parochial, private and independent schools may instruct and sequence

standards taught at each grade level differently in comparison to public schools.

(8) Student performance: the ability to which a student can make meaning of the concept or idea and produce a solution to a problem as measured by numerical grades on tests administered on each topic covered during the study as well as a demonstration of abilities during mathematics lessons as perceived by the teacher (as defined by researcher).

(9) ConnectEd mathematics textbooks: research-based materials supporting the Common Core State Standards in Mathematics specific to their grade. ConnectEd Math 2 was a project initially funded by the National Science Foundation in which the curriculum helps students develop an understanding of important concepts, skills, procedures, and ways of thinking and reasoning in geometry, measurement, algebra, probability, and statistics (Lappan et al, 2006). ConnectEd Math 2 is research based and problem centered (Lappen et al, 2006). Guiding the ConnectEd Math curriculum is a single mathematical standard, namely, "all students should be able to reason and communicate proficiently in mathematics; should have knowledge of and skill in the use of vocabulary, representations, materials, tools, techniques, and intellectual methods of the discipline of mathematics, including the ability to define and solve problems with reason, insight, inventiveness, and technical proficiency" (Lappen et al., 2006).

(10) Pearson Stanford 10 achievement test: research-based and designed to meet the No Child Left Behind Act and national and state standards in academics (Pearson, 2012; Pearson, 2011; AERA, 1999). Measures all K-12 general school subject areas along with listening and thinking skills. Mathematics subtests of Total Math ability, Mathematical Problem Solving and Mathematics Procedures were used only.

Summary

Reform efforts aimed at student achievement in mathematics over the past two decades have focused on rigorous standards and higher expectations for academic learning and social support in the middle school setting (MacIver & MacIver, 2009). Students in sixth and seventh grades are at an important point in their education regarding the understanding of mathematics. The sixth and seventh grades lay the foundation for higher order thinking in mathematics that extends to high school and beyond. Curriculum changes during a critical period of cognitive and emotional development can affect their academic growth as well. Teacher self-efficacy in teaching new curriculum standards during the initial implementation year is also important to understand. How teachers perceive their abilities of teaching mathematics may be challenged to meet new expectations. The success of a major curriculum change can depend on general understanding and efforts to how the curriculum intends to improve learning. Findings on teacher perceptions under the Common Core State Standards can guide future teacher training and professional development in order to improve teaching and

learning of the mathematics curriculum. The findings from this research can inform educators on the effectiveness of the new curriculum standards on sixth and seventh grade student performance under the first year of implementation.

Organization of the Dissertation

In the first chapter, an overview of the study was presented. In Chapter 2, a comprehensive review of the literature to support the study is examined. The research questions, design of the study, instrumentation, sample and sampling procedures, data collection procedures and data analysis procedures are described in Chapter 3. In Chapter 4, an analysis of the data and results of the study are presented. Recommendations for future research and implications of the study are presented in Chapter 5. A complete bibliography and appendices appears at the end of the dissertation.

CHAPTER II: LITERATURE REVIEW

Declining mathematics performance among students in grades four through eight has been a continuing issue in education for many years (Cai & Lester, 2010; NCES, 2010, 2007; Higgins, 1997). Implementing Common Core State Standards in Mathematics is intended to improve student performance. Specifically in middle school, students are at a point of continuous physical, emotional and mental development. How students learn at this time can change as much as how they develop. Any change in curriculum is critical to students' cognitive and emotional development and could affect their academic growth. The change is a process not only affecting student learning to some level but also teacher beliefs of the curriculum and their teaching abilities. How teachers perceive their ability to teach mathematics with new curriculum standards could have a significant impact on student learning (Roehrig et al., 2007; Roehrig & Kruse, 2005).

The literature review begins with the theoretical framework from which the study is guided. The review presents the research that resulted from curriculum change and effects of implementing new standards, specifically Common Core State Standards in Mathematics. Literature on school leader and teacher beliefs and student performance in mathematics, specifically in grades six and seven, during the initial year of new mathematics curriculum implementation is also included. Teacher instruction and beliefs and school leader support and

guidance of the curriculum can influence student learning especially during grades that are most needing learning to occur. The role of teachers and school leaders during curriculum change is critical throughout the implementation of new curriculum. The literature review provides a basis toward learning the implementation process of Common Core State Standards in Mathematics during its first year in terms of preparation, teacher self-efficacy and student learning.

Theoretical Framework

Constructivism provides the framework for this case study of the implementation of Common Core State Standards in Mathematics. Through a constructivist approach, understanding curriculum change examines the shaping or growth of teachers and student learning during educational change (Bruner, 1960). Students are expected to learn, teachers are expected to instruct towards improved student learning. In doing so, teachers may possibly revisit their previous beliefs of instruction and student learning in constructing new meanings (Schiro, 2008). Their perceptions can be "either-or'' during this period (Joyce, Weil & Calhoun, 2011). Teachers may either rethink what they believe works for them and their students or continue as they have. This perception can influence the effectiveness of implementing new standards and how students learn. Effective change involves learning and being active in the process. Teachers may have to construct new ideas or concepts based upon their current and past knowledge, a major theme of constructivism (Schiro, 2008).

The constructivist theory is a general framework for instruction. School leader descriptions of the implementation process provide the context for the culture in which teacher instruction and student learning occur. This culture provides "the toolkit" by which teachers construct not only their worlds but the conception of themselves and their powers (Bruner, 1996). The school can shape teacher learning of the new standards and their abilities to teach under the standards. Interviews describe the shaping and growth, or construction, of implementing Common Core State Standards in Mathematics.

Implementation of Curriculum

Change and initiatives toward new mathematics curricula in schools come from many sources−societal, political, mathematical, technological and educational. An assumption behind national curriculum is that in the "best" possible implementation scenario, the intended curriculum is transformed into the attained curriculum (Loveless, 2012; Leder, 1992). The implemented curriculum is the curriculum as contained in the various texts and materials which are selected and approved for use in the schools and as communicated to students by teachers in their classroom (Leder, 1992). Attained level of curriculum is the curriculum as learned and assimilated by students (Loveless, 2012; Leder, 1992). Aligning the two for successful student learning is a process requiring participation by teachers and school leaders alike.

The recent adoption and implementation of Common Core State Standards across the nation has been transitional based on state requirements. Implementing

new curriculum involves the training and learning of Common Core State Standards as well as the instructional practices, application and evaluation of the new curriculum. The implementation process varies according to the school type, state and local expectation of the school as well as school leaders' plan of implementation. The 2012-2013 academic year is the first year North Carolina schools will be applying the new standards in mathematics across all kindergarten through twelfth grades. The extent to which the standards are implemented and instructional practices in place for implementation may still vary based on the school. Necessary planning and practices in that transition to Common Core State Standards in Mathematics is critical for successful curriculum implementation and therefore student learning.

Role of School Leaders during Curriculum Change

School leaders are those who guide the teaching and learning in institutions charged with educating today's youth. The development and implementation of curriculum to meet these goals is left to individual states, districts, schools, and specifically the school leaders. School leaders have the responsibility of deciding how best to meet standards by directing faculty and staff through the change. Without planned guidance, teachers are likely to experience frustration and failure. The extent to which school leaders are engaged in the implementation process can also contribute to how effective and engaged faculty are during curriculum change.

Under No Child Left Behind, educational leaders have faced the challenges of trying to align school wide reforms priorities with accountability demands (Choi, 2011). Not all schools were at the same stage in their school reform efforts then and nor have they been in implementing Common Core State Standards. Due to the pressure to improve student achievement scores, school officials may feel the need to rush the planning process which can negatively affect implementation (Choi, 2011).In a study of schools implementing school wide change within the changing state and district contexts, schools that made careful efforts to align changes with state priorities had the highest rates of implementation success (Choi, 2011). School leaders are charged with matching expectations placed on them from outside sources to their current school culture while doing so to the comfort level of all within the school.

Experts identified essential elements on school leadership during change. Those believed most critical to successful implementation of the Common Core State Standards Initiative include (a) establishing a purpose; (b) setting priorities; (c) aligning personnel with curricular needs; (d) practicing professional discourse; (e) encourage risk taking; and (f) providing feedback (Eilers & D'Amico, 2012). School leaders from principals to instructional facilitators continually lead teachers to look closely at curricular changes, question each practice, and make adjustments as needed. Eilers & D'Amico (2012) suggest this process is a way to determine if the overarching purpose is being met and to refine instruction constantly to further enhance student achievement.

Those leading schools are familiar with the constant task of setting goals and the purpose for meeting those goals. During curricular change however, establishing a purpose toward successful implementation is that much more important. The inclusion of input from teachers and staff from the initial stages can ensure success. An expectation of familiarity and critical analysis of standards and resources is needed by all school members. This means prioritizing and proactively structuring staff, curricular, and student needs to respond accordingly toward the purpose of change in order to reduce anxiety and frustration while ensuring success (Eilers & D'Amico, 2012). Building a climate and structure for change with staff in mind is an important responsibility of the school leader.

Identifying key teachers to provide support to others who are hesitant is critical for teachers to feel a sense of belonging in the process. Providing intensive professional development builds on that support as well. Professional discourse is also needed among teachers and staff to meet standards effectively (Eilers & D'Amico, 2012). Guiding personnel through productive conversations requires school leaders to discuss all aspects of the initiative with teachers, ask questions to promote critical thinking, and lead everyone to seek answers together. The facilitation of discourse at each grade level and subject area can bring about clarity to classroom practices that are associated with improved student learning (Eilers & D'Amico, 2012).

Especially during curriculum change, school leaders have to be willing to take risks and encourage risk taking from their teachers and staff. Eilers and

D'Amico (2012) suggest that leaders learn along with the faculty to support and encourage risks and experimentation appropriately. This can help teachers build confidence and trust in the implementation process. Because the Common Core State Standards do not dictate how goals should be reached, risk taking with support must be embedded in all other essential elements to bring about change. Providing feedback assists teachers toward feeling comfortable to take risks. Two-way discussion with specific input from the leader can result in shared plans about how to improve instructional decision making an achieve outcomes required by Common Core State Standards (Eilers & D'Amico, 2012). School leaders will be looked at closely by teachers for guidance during curriculum implementation.

School leaders rely on teachers to play a key role in any innovation. They are the experts in the classroom and should not be seen as barriers to implement new curricula as they may sometimes be viewed. There is always opposition to change but as soon as teachers are given the chance to experience the materials and instructional practices and see it positively affecting their students learning, they may be more willing to go the extra distance toward improving mathematics education. However, initial reactions to new curriculum can be a mixture of panic, resignation, relief and welcome; panic typically dominates especially among novice teachers (Leder, 1992). A negative reaction or belief toward new curriculum implementation can then play a factor in teacher's belief of their own instructional abilities. Time spent learning about the new curriculum can build

teacher confidence and make sure they understand fully the nature of the change and expectations of them (Leder, 1992).

School Leader and Teacher Beliefs during Curriculum Change

The process of reform involves conflict, uncertainty, and ambiguities. The effects of reform or change can be contradictory, leading to tensions or conflicts (Flett & Wallace, 2005). These dilemmas are features that must be managed by school leaders in implementing change. For school administrators, the existence of autonomy, focus and acceptance are factors influencing effective change. Autonomy between using the traditional power and authority inherent in their positions and sharing the decision-making authority presents leaders with conflicting dilemmas that often hamper school officials' decision making (Flett & Wallace, 2005). The issue of where the school reform effort is focused, whether it's a whole-school change or change at the classroom level, can be influenced again by the expectations placed on them (Flett & Wallace, 2005). Acceptance of change may be the hardest across all school members to manage. Acceptance of change is not always evident, and there can be a considerable mismatch between "what is said and what is done" in schools (Flett & Wallace, 2005).These issues can make it difficult for school leaders and teachers to fully evaluate new initiatives and may lead them to discount the potential educational benefits of the change.

Teacher Preparation

The change of new curriculum and standards involves many steps and each population group−school leader, teacher and student−is involved to an extent in those phases, from adoption to training to instruction and evaluation. Effective implementation of new curriculum relies on classroom instruction and teacher abilities. Teacher instruction depends on knowledge of the content, strategies used to present content and the needs of the learner. How a teacher learns and feels about the curriculum can play a factor in how the material is taught to and learned by students.

Curriculum implementation by the teacher themselves is associated with two key elements: (1) teachers must develop an understanding of their role as agents in mediating the interaction of student and content and (2) teachers must have a repertoire of instructional strategies to use in effectively mediating the interaction of students and mathematics content (Silver, Ghousseini, Charalambos & Mills, 2009). Teachers perceive their role as it occurs in the preparation and instruction of curriculum material. The planning and implementing of material can be viewed differently among teachers and between grade levels. During the early stage of implementation, tasks and supporting materials can be used as resources for instruction regardless of teachers' vision and understandings of their roles (Silver et al, 2009). After the initial phase of instruction, contributions of the teacher become critical (Silver et al, 2009). There could be an underdeveloped conception of role and the limited repertoire of instructional strategies can

minimize further improvement; the two features work in tandem (Silver et al., 2009).

The teacher's role during curriculum change also occurs with textbook materials and resources used by teachers and students. These materials are intended to keep teaching and learning consistent with the curriculum standards. Teachers often base their teaching approach on the way the curricular materials are presented (Moyer, Cai, Laughlin & Wang, 2009). The way in which teachers read, interpret and use those materials is shaped by their knowledge of the content and views about mathematics (Remillard & Bryans, 2004). Teacher perceptions of mathematics, the instruction and the goals they have for their students can impact student achievement as well (Moyer et al, 2009). Teacher preparation of curriculum change must involve knowledge and understanding of available resources to maximize the effectiveness of the change.

The current change to Common Core State Standards in Mathematics aligns with objectives for each concept under 2003 curriculum standards. Educators should be able to familiarize themselves with what a student will know, understand and be able to do in comparison to previous standards (NGACBP, 2010). Common Core Crosswalks are support tools designed to help North Carolina educators teach the Common Core. Standards are "unpacked" in the Crosswalks in effort to answer a simple question "what does this standard mean that a student must know and be able to do" (North Carolina Department of Public Instruction, 2011). Teachers read through the objectives and work on examples in

order to better understand instruction and content of new curriculum (Obara & Sloan, 2009). The process not only involves an understanding and implementation of material and standards but also the ability and willingness to adjust one's prior belief system and perceived abilities.

Teacher Self-Efficacy

Self-efficacy is important for teaching, learning and motivation. Teacher confidence in their ability to promote student learning effect the motivation of students and time it takes to adopt new curriculum or other changes in teaching methodology. Research has indicated that teachers' sense of efficacy is an important influence on their practice and student learning (Silver et al., 2009; Woolfolk, Rosoff & Hoy, 1990; Ashton & Webb, 1986; Gibson & Dembo, 1984). Teachers' mediating decisions and associated actions and interactions with students can affect student learning (Sliver et al, 2009). The self-efficacy belief is an important concept in the understanding of teacher thoughts, decisions, feelings, behaviors, performance, and attitudes towards their students. Self-efficacy beliefs are very important in terms of decisions regarding classroom management, organizing courses, teaching, motivating the students for learning and communicating with the students effectively.

Teachers of mathematics are called upon to make decisions on what they will teach, how they will teach it, and how they will assess what they teach. Teachers shape the learning of their students. Through the selection they make, the emphases they place and their delivery of the range of topics included in the

intended curriculum to be taught (Leder, 1992). Decisions don't always represent what they believe they should do; they may feel compelled by prescribed curricula to teach content they believe their students aren't ready to learn. Some might feel they shouldn't attempt to change their instruction until they've had appropriate or adequate training and resources they believe to be essential. These beliefs are part of a teacher's level of self-efficacy.

Teacher self-efficacy can be defined differently across educational research. Most recognized comes from Bandura (Erdem & Demirel, 2007). Bandura defines teacher self-efficacy as a type of self-efficacy – a cognitive process in which people construct beliefs about their capacity to perform at a given level of attainment (Erdem & Demirel, 2007; Bandura, 1997). These beliefs influence how much effort people put forth, how long they will persist in the face of obstacles, their resilience in dealing with failures, and how much stress or depression they experience in coping with demanding situations (Erdem & Demirel, 2007; Bandura, 2006). This definition proposes that achievement depends on interactions between one's behavior, personal factors such as thoughts and beliefs and environmental conditions (Schunk & Pajares, 2002).

For the purpose of this study, teacher self-efficacy was defined as the perception of one's ability to believe one can teach and implement Common Core State Standards in Mathematics effectively for student learning. Self-efficacy has been shown to be a key predictor of intentions and choice as well as the persistence to complete a task (Erdem & Demirel, 2007). The existence of these

intertwined concepts has contributed to a lack of clarity about the nature of teacher efficacy (Tschannen-Moran, Woolfolk & Hoy, 1998). How one perceives their abilities in teaching with these existing factors may play a role in the implementation of new curriculum of which then may relate to student performance. Examining the role of self-efficacy in these areas is needed toward improving student learning as well as teacher self-efficacy.

Self-Efficacy and Instruction during Change

Teachers' sense of self-efficacy of instruction has been found to play a large role in the implementation of new curriculum standards. Research shows teacher self-efficacy during curriculum change can be compromised by how teachers perceive their abilities to learn and teach the curriculum (Roehrig & Kruse, 2005). Teacher self-efficacy can not only cause an inappropriate curriculum to be implemented but also block future understanding and acceptance of the philosophy of a new curriculum preventing substantial curricular change (Battista, 1994). Roughly 15% of teachers adapt instinctively and intuitively to curriculum change recognizing opportunity and how to make it work in their classroom (Calvert, 2002). Changes to curriculum and standards can often move rapidly to engage the best teachers but stall in the capacity to reach the majority (Calvert, 2002).

Charalambos & Philippou (2010) found teachers who were more comfortable with pre-reform approaches tended to be more critical of change and exhibited more intense concerns about their capacity to manage the change.

Roehrig & Kruse (2005) found that teachers holding predominantly traditional curriculum beliefs showed little change in their classroom practices and offered low levels of their ability to implement the curriculum. Teachers also showed hesitation when challenged by the necessity to prepare students for accountability testing rather than teach instructional strategies they felt could help their students understand mathematics conceptually (Obara & Sloan, 2009). Obara & Sloan (2009) found testing requirements under NCLB created a situation in which teachers regardless of their beliefs about teaching and learning mathematics relied heavily on past experience and their abilities to guide instructional decisions. Their findings suggest that curriculum initiatives might fail when ignoring teachers' beliefs about their capacity to use pre-reform approaches (Charalambos & Philippou, 2010).

Swackhamer, Koehllner, Basil & Kimbrough (2009) suggest that teacher self-efficacy can also have a positive impact on new curriculum implementation. A strong sense of efficacy has been shown to support teachers' efforts to face difficult challenges and persist in the face of adversity (Smith, 1996). Studies show teachers with high self-efficacy tend to be more willing to adopt innovations and experiment with them (Gordon et al., 1998; Ghaith & Yaghi, 1997; Guskey, 1988). Highly efficacious teachers were more likely to use "reform-based" teaching methods such as inquiry-based and student-centered approaches while teachers with low self-efficacy used more teacher-directed methods such as lecturing and textbook reading (Czernaik,1990). Ones' sense of ability to teach a

given class can fluctuate in response to the characteristics of their teaching and instructional tasks (Ross, Cousins & Gadalla, 1996; Benz, Bradley, Alderman & Flowers, 1992; Raudenbush, Rowan & Cheong, 1992). Teacher beliefs of the curriculum tend to be connected to their learning and experience prior to curriculum change (Roehring & Kruse, 2005).

Teachers' self-efficacy to bring about student learning has been shown to decline when mandated changes were adopted (Ross, McKeiver & Hogaboam-Gray, 1997). Rosenholtz (1987) found that some teachers believed these influences reduced opportunities for students, thereby depressing achievement. Instruction and classroom management of middle school students focus on the academic and social development of students between elementary and high school. Elementary school instruction progresses students' understanding of subject matter developmentally from mental operations to solidifying concrete operations to an increasing ability to abstract. Prior to high school, instruction must consider the varied level of abstract reasoning and other differences related to many factors beyond age alone. Additional challenges of new curriculum standards or instructional practices to this group of students can affect teachers' self-efficacy even more and in turn affect student learning.

Effect of Teacher Self- Efficacy on Student Learning

Charalambous & Philippou (2010) found that teacher self-efficacy relates positively to student performance and teachers' attitude toward changes. Teachers with high self-efficacy maintained learning environments that were more

responsive to students, persisted longer with struggling students and orchestrated more productive small group work (Woolfolk et al., 1990; Ashton & Webb, 1986; Gibson & Dembo, 1984).Knowledge of material has also been shown to improve teacher's self-efficacy in affecting student outcomes among middle school teachers (Patel, Miura, Franco & Boyd, 2012; Swackhamer et al., 2009). This finding supports the relationship between teachers with high self-efficacy and higher student achievement; they know they can teach the subject in a successful manner (Bates, Kim & Latham, 2011). Those who have higher content knowledge of mathematics tend to feel more confident about their mathematics abilities; however, having higher mathematical content knowledge is only one part of teaching mathematics (Bates et al, 2011).

Teachers' sense of efficacy may also counteract instruction inadvertently (Charalambos & Philippou, 2010). A study found teachers unintentionally taught what the National Research Council has termed "mindless mimicry mathematics" (Battista, 1994).This resulted from mistaken beliefs about the nature of mathematics - reduce tasks to rigid, step-by-step procedures to ensure that their students would be successful in completing the "mathematical" tasks given to them (Battista, 1994).Teachers' level of self-efficacy to instruct students any differently was based on their beliefs that students could not fail if following their step-by-step procedures and inadvertently robbed their students of opportunities to "do" mathematics (Battista, 1994). The result was that students' devalued ideas that impeded the development of their mathematical reasoning skills (Battista,

1994).Teachers' level of self-efficacy and student achievement are important in learning more of the extent the two may be influenced by curriculum change.

Curriculum change requires school leaders and teachers to focus on the purpose of the change: to improve student learning. The process of implementation requires teachers to understand and potentially change the instructional practices and beliefs they bring with them to the classroom. Teacher beliefs of new curriculum and their abilities to teach it effectively can be challenges to teach the curriculum effectively. The role of school leaders is just as important during these changes. Such factors have to be considered in the process of implementing new curriculum in order to improve student learning.

Student Learning during Curriculum Change

Changes to curriculum occur in order to improve student learning. In the middle grades, learning is challenged by the knowledge adolescents bring with them from earlier grades as well as the knowledge they're expected to have for future grades. How students learn mathematics during the middle grades depends on how the subject is taught. Meeting the academic needs of middle grade students relies on instructional practices and beliefs that support improved student learning. During curriculum change, these influences are even more important in meeting the learning expected of students at these grade levels.

Impact of Curriculum Change

Effective curricular change relies on the distance between the implemented and attained curriculums (Loveless, 2012). The implemented

curriculum is what teachers teach (Loveless, 2012; Silver et al, 2009; Leder, 1992). Two teachers at the same grade level in classrooms next door to each other may teach multiplication in different ways and with different degrees of effectiveness (Loveless, 2012). Similarly, two students in the same classroom and instructed by the same teacher may acquire completely different skills and knowledge. One student understands and moves on and another struggles and is stuck; even happens in classrooms with outstanding teachers (Loveless, 2012). The attained curriculum is what students learn (Loveless, 2012; Silver et al, 2009). New mathematics curriculum standards will be taught in the classroom and within a school district to be fully implemented over the next two years in North Carolina (North Carolina Department of Instruction, 2010). Effective implementation of the new curriculum standards will be measured in the improved attainted mathematics curriculum by students. Student learning under previous standards was found to be hindered by the implementation process of those standards.

With No Child Left Behind (NCLB), students in the United States have been expected to achieve grade level proficiency in reading and mathematics (U. S. Department of Education, 2012). The impact of NCLB has mixed results; some schools performed well above set goals, others performed well below expected goals. The law allowed states to set their own annual benchmarks provided they reached 100 percent proficiency by 2012-2013 (McNeil, 2011). Schools were expected to meet state "adequate yearly progress" targets toward bringing all

students up to the "proficient" level on state tests (U. S. Department of Education, 2012). By 2010, 38 percent of schools were failing to make adequate yearly progress up from 29 percent in 2006 (McNeil, 2011). Recent results of student achievement in 2011 show several states had failure rates over 50 percent (McNeil, 2011). As the data show, curriculum expectations set in 2001 were not met and were a disadvantage to K-12 students.

Mandated laws and state regulations have impacted how subjects should be taught as well as standards students need to achieve. Results of reading and mathematics achievement under NCLB show there is no convincing evidence that high stakes testing leads to greater student achievement (Nichols, Glass & Berliner, 2005). Similarly, proficiency requirements in reading and mathematics under NCLB have shifted teacher instruction and attention to students closer to the proficiency standards (Neal & Schanzenbach, 2010). Teacher instruction and student performance are now more concerned about meeting proficiency standards rather than if mathematical understanding has occurred.

The recent educational change to Common Core State Standards in Mathematics challenges middle and high schools most directly in terms of implementation. With the intention to have every student on a pathway to college and career readiness, teachers and school leaders will be challenged in their willingness to learn (Achieve, 2011). Learning new ways of teaching and leading can take months and years of deliberate practice to master. Because instructional shifts with Common Core State Standards can be expected to take years to

implement effectively, the assessed needs of students as well as the professional development needs of the teachers have to be priorities (Achieve, 2011).

Current Progress of Common Core State Standards in Mathematics

The standards were introduced in transitional stages during the 2010-2011 school year and continue through 2014 when those states who've adopted the new curriculum standards will have completed the implementation process (NGACBP, 2010). During this time, there will be issues for many teachers as a result from the new mandates (Stevenson, 2008). This will cause teachers to determine what should be taught and when and whether to strictly adhere to new curricular standards or if there are opportunities to modify the current curriculum for their classes (Stevenson, 2008). Implementing the Common Core State Standards across multiple school years will require the continuous efforts of teachers to review the curriculum and their instruction of it.

An initial survey on public perceptions of the Common Core State Standards reveals there may be some reluctance on the part of teachers to a curricula change (Achieve, 2011). However, educators who understood the new standards generally were supportive and most teachers were open to change (Achieve, 2011). Positive results on public perception of the Common Core State Standards show that nearly 60% of teachers have a favorable impression of the standards, while just 15% have an unfavorable impression (Achieve, 2011). Another recent survey shows that 73% of teachers think they are prepared to teach the new standards (Gates Foundation, 2012). Given that many states and districts

have only just begun to implement the Common Core State Standards, the high percentage may raise questions about just how much educators really understand them (Gates Foundation, 2012).

Teacher perceptions and self-efficacy may be challenged in effectively implementing the new mathematics curriculum standards. A study on the progress of Common Core State Standards shows 50% of districts in the adopting states agreed or strongly agreed that the Common Core State Standards will require fundamental changes in instruction (Kober & Rentner, 2011). With instructional changes, 64% of the districts in adopting states agreed or strongly agreed that the Common Core State Standards will require new or substantially revised curriculum materials in mathematic s (Kober & Rentner, 2011). School leaders will be faced with adjusting teachers' expectations relative to the amount of learning that needs to be done (Gates Foundation, 2012).

Research on the effectiveness of Common Core State Standards is still new and exploratory. As the new standards are implemented, learning how teachers, school leaders and students perform during the process is critical for effective change overall. Student success depends on effective implementation during of curriculum change. Teacher instruction to create student success depends on effective implementation of the new standards.

Mathematics Curriculum

The National Council of Teachers of Mathematics is the leader in mathematics education. The Council provides resources for the development and implementation of curriculum, instruction and assessment based on research in the field and focused on increasing student learning (NCTM, 2009). Each state uses these resources differently. This has resulted in inconsistent student learning outcomes across the nation. In developing the recent common national curriculum in mathematics, basic principles for designing an excellent curriculum were adopted at the beginning to avoid the risk of producing a negotiated list of standards that are merely an intersection of those that are currently addressed in each of the fifty states (NCTM, 2009).

The NCTM (2009) has recommended the following guiding principles for the potential development of any set of common curricular expectations and assessments:

- A curriculum is more than a collection of activities: It must be coherent, focused on important mathematics, and well-articulated across the grades.
- Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge. Learning mathematics with understanding is essential.
- If a voluntary national mathematics curriculum is developed, the topics studied in that curriculum must be taught and learned in an equitable

manner in a setting that ensures that problem solving, reasoning, connections, communication, and conceptual understanding are all developed simultaneously along with procedural fluency.

- A potential national curriculum must include important mathematics in the following key content areas: number and operations with procedural fluency; algebra; geometry and measurement; data analysis, statistics, and probability.

Alignment and coherence of curriculum, standards, and assessment are important foundations of mathematics education and necessary for student learning of mathematics (NCTM, 2009).

North Carolina Mathematics Curriculum

North Carolina was among the first states to adopt new curriculum standards in a number of academic disciplines (North Carolina Department of Public Instruction, 2010). Implementation of the mathematics curriculum in North Carolina K-12 public schools is determined by the Department of Public Instruction (DPI) using the learning objectives and guidelines created by the National Council for Teachers of Mathematics (NCTM, 2000). DPI is the governing agency that mandates student learning objectives, teacher licensure and accountability requirements for primary and secondary education in the state (North Carolina Department of Public Instruction, 2010). North Carolina's Department of Public Instruction provides schools with the Course of Study from which teachers instruct and students are to learn at each grade level. The new

curriculum standards have occurred simultaneously with the final years of accountability requirements set under NCLB for the previous curriculum. Prior to the current adoption of the new standards North Carolina's last curriculum standards were adopted in 2003.

The Course of Study was originally developed in 1898 and provided information for organizing subject matter and for offering suggestions to teachers to improve their instruction (NCCS, 1923). The Course of Study has been revised over time to meet societal needs and state government requirements. However, the principle of the curriculum has remained similar - arouse student interest; create a situation where a child is involved and has real desire for knowledge of number facts and process; develop skill and accuracy in computation as well as reason problems met in everyday life; and apply arithmetical knowledge to solution of problems of everyday experiences as well as those in ordinary business transactions (NCCS, 1923).

Over time, national and state mandated curriculum changes occurred. No Child Left Behind (NCLB) was one of those changes to improve the achievement gap of students across the nation. NCLB is a federally-mandated act passed in 2001 that holds schools and school districts accountable so that no child is left behind (Department of Education, 2012). Schools are held to proficiency goals of student achievement in grades three through twelve. North Carolina's Department of Public Instruction introduced an accountability model, ABCs of Public Education, to their schools in 2008 as a means to fulfill this mandate. The model

is a school-based management and accountability framework consisting of measurable objectives schools should demonstrate through growth and performance composites in order to receive funding incentives if meeting and exceeding those scores (North Carolina Department of Public Instruction, 2010). The ABC's intended to identify what students should know and measure whether students are on track for success after high school (North Carolina Department of Public Instruction, 2010). Beginning with the 2012-13 school year, North Carolina public schools will operate under the new READY accountability model (NC Department of Public Instruction, 2010). The state's new model will incorporate new measures to gauge student success to make sure schools in the state continue to meet the needs of all students (North Carolina Department of Public Instruction, 2010).

North Carolina along with 44 other states has adopted Common Core State Standards in Mathematics in effort to improve student learning. Changes to the standards require learning what concepts won't be taught, what will be, and whether additional or other instructional strategies or resources are needed to create successful student learning. Also required is participation from school leaders and teachers in understanding and guiding the efforts of curriculum change. Preparation and teacher beliefs of their abilities to teach new curriculum are needed in the process of implementation curriculum change in order for the change to be effective.

Common Core State Standards in Mathematics

Research on mathematics education has concluded that the mathematics curriculum in the United States needed to become more focused and coherent in order to improve mathematics achievement in this country (NCTM, 2009). The Common Core Standards in Mathematics were an answer to this challenge (Confrey, 2012). The implementation of the new standards for students in kindergarten through twelfth grade would result in greater student progress each year - tighter linkage between learning expected in elementary school, no lag and little review, instead a dive into middle school with more content, and the push to algebra during or by eighth grade (Confrey & Maloney, 2011). The change in standards supports higher and more diverse student proficiencies in higher level mathematics reasoning including items measuring performance, connections across domains, misconceptions, links to practices and developmental clusters (Confrey & Maloney, 2011).

The new Common Core State Standards were a result of behavior research on learning trajectories and patterns (Confrey, 2012). Problematic behavior or typical trends of student struggles were identified to generate a more applicable yet thorough and rigorous curriculum. The standards are based on what is known about how students' mathematical knowledge, skill and understanding develop over time. They stress the conceptual understanding of key ideas and the organizing principles such as place value or the properties of operations to structure those ideas (NGACBP, 2010). The curriculum standards are built as a

vertical curriculum of sequencing topics and performances based on what is known about how students learn (NGACBP, 2010). The goals of mathematics education - conceptual understanding, strategic competence, adaptive reasoning, productive dispositions, and procedural fluency are emphasized in the Common Core Stare Standards (Pape & Wang, 2003).

Common Core State Standards in Mathematics in the Middle Grades

Middle school mathematics has to be presented in a way those students between eleven and fourteen years old can cognitively process information in order to apply, retain, and carry it over into settings outside the classroom. The curriculum is set between those concepts learned in elementary grades such as number sense and operations to those concepts needed in the high school years of functions and modeling through trigonometry and statistics (NGACBP, 2010). Mathematics taught under previous standards has not followed this progression of concepts effectively. The implementation of new standards has made this progression more rigorous. Students will now be expected to learn topics at an earlier grade level than before.

In the new mathematics curriculum, according to Confrey (2012), concepts and domains are fewer and clearer at each grade level to include higher order thinking. Grade specific domains overlap between the sixth and eighth grades of certain topics. Confrey & Maloney (2011) describe this overlap and building of mathematical concepts as learning and building on the concepts of the number system, expressions and equations, geometry, and statistics and

probability (NGACBP, 2010). The scope and sequence of concepts covered in Common Core State Standards in Mathematics involve “major shifts” in the curriculum (Confrey & Maloney, 2011).

Slight differences to the mathematics curriculum taught between the 2003 North Carolina Mathematics Standard Course of Study and the Common Core State Standards in Mathematics occur at each grade level from kindergarten through twelfth. Each grade level has new or removed concepts and instructional considerations different from previous standards.

Mathematical concepts introduced under the new standards in the sixth grade curriculum include:

- Unit rate
- Measurement unit conversions
- Number line – opposites and absolute value
- Vertical and horizontal distances on the coordinate plane
- Distributive property and factoring
- Introduction of independent and dependent variables
- Volume of right rectangular prisms with fractional edges
- Surface area with nets (only triangle and rectangle faces)
- Dot plots, histograms, box plots
- Statistical variability (Mean Absolute Deviation (MAD) and Interquartile Range)

Mathematic concepts no longer taught in the sixth grade under the new standards include:

- Multiplication of fractions (moved to 5th grade)
- Scientific notation (moved to 8th grade)
- Transformations (moved to 8th grade)
- Area and circumference of circles (moved to 7th grade)
- Probability (moved to 7th grade)
- Two-step equations (moved to 7th grade)
- Solving one- and two-step inequalities (moved to 7th grade)

Other instructional considerations for Common Core State Standards in the sixth grade in 2012 – 2013 include:

- Multiplication of fractions
- Division of whole number by unit fractions and division of unit fractions by whole numbers
- Multiplication and division of decimals
- Volume with whole number
- Classification of two-dimensional figures based on their properties

New mathematical concepts taught in the seventh grade curriculum under the new standards include:

- Constant of proportionality
- Percent of error

- Factoring to create equivalent expressions
- Triangle side lengths
- Area and circumference of circles
- Angles (supplementary, complementary, vertical)
- Surface area and volume of pyramids
- Probability

Mathematical concepts no longer taught in the seventh grade under the new curriculum standards include:

- Similar and congruent polygons (moved to 8th grade)
- Surface area and volume of cylinders (moved to 8th grade – volume only)
- Creation of box plots and histograms (moved to 6th grade – 7th grade continues to compare)
- Linear relations and functions (y-intercept moved to 8th grade)
- Views from 3-Dimensional figures (removed from Common Core State Standards)
- Statistical measures (moved to 6th grade)

Other curriculum changes brought about by the new Common Core State Standards in the seventh grade:

- Work with ratio tables and relationships between tables, graphs and equations; focus on the multiplicative relationship between and within ratios
- Unit conversions within systems
- Opposites and absolute value
- Distributive property with area models and factoring
- Volume of rectangular prisms and surface area
- Mean Absolute Deviation

(North Carolina Department of Public Instruction, 2010)

The new curriculum also emphasizes what are known as Common Core State Standards for Mathematical Practice. These practices are expected to be integrated into every mathematics lesson for all students across grades kindergarten through twelve (North Carolina Department of Public Instruction, 2010):

1. Make sense of problems and persevere in solving them;
2. Reason abstractly and quantitatively;
3. Construct viable arguments and critique the reasoning of others;
4. Model with mathematics;
5. Use appropriate tools strategically; and
6. Attend to precision.

The middle grades are critical to student success of mathematical understanding in preparation in order to prepare students for future math courses and concepts. Schools in North Carolina started transitioning the Common Core State Standards into their mathematics curriculum in 2011. The timing of the implementation has been determined by each school district. Training and instructional practices for the Common Core State Standards have occurred in many school districts. Full implementation and training is expected for all schools in the academic year 2012-2013.

Middle Grade Students and Mathematics Performance

Middle school students are at a level of childhood development concerned with identity, belonging, being heard, being in charge, being supported, feeling powerful, understanding the world, and being able to argue in order to be heard (Watson, 2010). Adolescent learning is concerned with the development of self in relation to others. How a middle school student perceives themselves in relation to others is a large component of their emotional, social, and academic development during this stage of their development. Middle school students become more able, with help, to deal with the unfamiliar as well as familiar, focus on imagined and abstract ideas as well as sensory data, informed by reason as well as by intuition, think about social and abstract implications as well as immediate reactions, and act in a way socially mediated rather than driven by immediate responses (Watson, 2010). Interaction is the most important activity

during adolescence and influences their understanding of more complex, abstract ideas (Watson, 2010).

Shifts toward abstract patterns and structures within a complex world are seen as typical of adolescent development (Watson, 2010). An assumption of adolescent epistemology lies in their learning of higher mathematics−*de facto* similar to ways in which adolescents learn to negotiate with themselves, authority, and the world (Watson, 2010). The combination of maturation and education gives adolescents ongoing experiences they must negotiate around. When students experience a concept in mathematics that is problematic, they must rely on their conceptual understandings to drive their procedural advances; a relationship between mathematical thinking and mathematical learning (Watson, 2010). The two are necessarily linked (Watson, 2010; Hiebert, Carpenter, Fennam, Fuson & Human, 1996). Knowledge and understanding of procedures is critical as mathematic concepts get progressively more intricate and specific through the grades.

Students develop a framework in mathematics that includes memorized rules, formulas, and procedures typically learned over time by teachers and school experiences (Higgins, 1997). Equating skills with rules to solve all problems has positive and negative consequences. Skills give students a sense of empowerment within their own learning and confidence, a place to start the problem solving process and the possibility of transferring their problem solving skills to other classes as well as situations outside the school environment. Rules give students

procedures to follow with relative ease. Student understanding of how the two concepts interrelate can be hard for adolescents to cognitively interpret.

One obstacle in that connection between mathematical learning and thinking is the level of cognitive development students have during adolescence. Mathematics challenges a fourteen year old to learn concepts by making shifts between perception and interpretation, such as when seeing fractions as objects rather than pairs of integers; understanding new notations, such as interpreting symbolic expressions; keeping track of meaning and purpose in multi-stage problems; and classification problems such as what technical terms mean and whether categories are exclusive or inclusive (Watson, 2010).To overcome such problems, students need to adopt ways of classification, perception and interpretations, and representation they can successfully learn from (Watson, 2010). Mathematical understanding depends largely on students solving problems with prescribed steps or procedures and at the same time also thinking about what they are doing, how they are doing it and why they are doing it (Albert, 2000). Research has shown students to explain their perception between understanding and getting an answer as different ways of solving problems and their ability to make generalizations (Loveless, 2008; Higgins, 1997). However, viewing skills as rules may limit students in both their ability and their creativity in solving problems when faced with a problem for which none of the problem solving skills known could apply (Higgins, 1997).

Adolescents want to learn and understand what they're doing rather than merely follow rules (Watson, 2010). A lot of attention in mathematics education is concerned with the students' ability to follow procedures done in mathematics. Following the procedure does not necessarily indicate the student's understanding of what they're doing and the concepts being taught (Huang & Normanda, 2009).How students learn mathematics procedures impact their future mathematical learning. When progressing to higher level courses, higher order mental reasoning and proficiency of fundamental mathematical skills are needed to master the concepts (Loveless, 2008; Schickedanz, Schickedanz, Forsyth & Forsyth, 1998). A major goal of middle grades mathematics is improving these mathematical abilities in students (Zollman, 2009).

Schools push students to grasp mathematics at higher levels before they are ready. Advancing students through grades to meet school performance goals not only can compromise students' academic success but the confidence to make an effort in learning mathematical concepts. Even if students are academically successful through memorization, they eventually realize they didn't learn it. Classes and subject matter must meet the ability and interest levels of adolescents for them to identify with the need to progress in their learning. When adolescents struggle in a subject, they get overwhelmed and may eventually give up in their efforts to succeed.

The middle grades are where many students begin to lose ground in key subject areas such as mathematics (Edsource, 2010). These grades may also be the

last best chance to identify students at risk of academic failure and get them on track in time to succeed in high school (Edsource, 2010). Statistics show middle school students have continued to struggle during these years in mathematics for over a decade. Scores on the Trends In International Mathematics and Science Study (TIMMS) assessment show eighth grade students ranked last compared to nineteen other countries between 1995 to 2007 (NCES, 2007).

North Carolina students have been found to fare slightly better than the nation overall on mathematics scores. The average score of eighth-grade students in North Carolina was 286 in 2011, higher than the average score of 283 for public school students (US Department of Education, 2011). In 2011, the score gap between students in North Carolina at the 75th percentile and students at the 25th percentile was 49 points (US Department of Education, 2011).This performance gap was not significantly different from that of 1990 when it was 50 points (US Department of Education, 2011). Research has recognized seventh grade as a significant year for student learning in mathematics (Bouchey, 2010; EdSource, 2011). However, there is a lack of research on both sixth and seventh grades together in studying mathematics achievement; two years that impact mathematics understanding in higher grades.

Purpose of Research Study

New mathematics curriculum standards have been adopted across the United States over the past two years. As policy makers, teachers and school leaders implement Common Core State Standards, the hope is these standards are

in fact high quality that will lead to improved student achievement (Schmidt & Houang, 2012). School leaders and teachers are charged with understanding and implementing the standards as they learn them, possibly at a faster pace than they've been prepared for. Similarly, their beliefs of curriculum change may not align with the intended curriculum change or implementation process. Student learning can also be impacted by the implementation of Common Core State Standards; a belief toward improved mathematics achievement for all students across the country (Schmidt & Houang, 2012).

The researcher was interested in the process of early implementation of Common Core State Standards in Mathematics in a southeastern United States parochial middle school. Many teachers and school leaders were experiencing the curriculum change process for the first time. New curriculum standards, teacher preparation and their self-efficacy and perceptions of curriculum effect on student learning can impact the effectiveness of the change. Additionally, the new standards emphasize middle grades as critical years for student learning in mathematics; the curriculum is more condensed and involves higher order thinking (Confrey, 2012). Students have been expected to learn necessary skills at this time for continued and advanced learning in high school and college. Student learning in mathematics during these years can provide a baseline of mathematics achievement and whether it demonstrates initial alignment with the intentions of the new curriculum standards. The researcher sought to answer the following research question:

> How do sixth and seventh grade mathematics teachers describe the implementation of Common Core State Standards in Mathematics in terms of preparation provided, their self-efficacy in teaching the new mathematics standards effectively, and perceived effects of new mathematics standards on student learning?

Learning is also expected of the teachers. Understanding and implementing new curriculum standards require active and personal engagement from teachers in making meaning out of their experiences and resources used during those experiences (Schiro, 2008; Remillard & Bryans, 2004). This factor can be crucial for teachers to perceive their teaching of the new standards as effective and for student learning to be successful. The implementation of Common Core State Standards involves engaging in teacher training of new curriculum standards. Teacher training requires teachers to learn the material and instructional practices as they're intended to be learned by the student and apply the curriculum in the classroom. Descriptions from teacher interviews and survey responses provided insight of teacher thoughts on preparation offered for teaching new curriculum and their perception of their abilities to teach it effectively. Teacher descriptions of the implementation process may have also included previous and currently transforming perceptions of the new standards and their abilities to teach the standards. Such narratives presented how new curriculum may initially impact curriculum change and student learning in the classroom. Perceptions of the implementation process, teacher self-efficacy and effects of

new standards on student learning may also influence school leaders' conception of change. However, perceptions of the new curriculum among school leaders and teachers may have begun long before the process occurred. Descriptions of preparation, teacher self-efficacy and perceived effect on student learning were best collected through teacher surveys and interviews during the early stages of the new standards. School leader and teacher descriptions were collected during the middle of the academic school year in which initial implementation of new mathematics curriculum takes place. Student scores were also collected during the middle of the academic school year.

Studies at the initial stage can be beneficial to learn the effectiveness of the implementation and whether student performance begins to reflect the intentions of the new mathematics curriculum. From this study, a case was developed on the implementation process within a southeastern parochial middle school. The findings from the research provided insight on how the implementation process worked in introducing the new mathematics curriculum and if the process was successful in improving preparation, teacher self-efficacy and student learning.

Summary of Conclusions Drawn from Research

Common Core State Standards in Mathematics is a recent curriculum change to K-12 education. These new standards set the curriculum at a more rigorous pace than previous standards in order for students to learn mathematical concepts in earlier grades. Studies have reported that students are impacted by

curriculum change. Research shows the middle school years are a critical stage where the development of behaviors, emotions and attitudes toward mathematics emerge with sixth and seventh graders at a point in their education between basic knowledge and skill development to concept mastery under a more rigorous curriculum. Teachers of adolescents between the ages of eleven to fourteen years old must be aware of emotional and social influences on students and where students are cognitively to master mathematics concepts. How the new curriculum will better prepare students for mathematics and how mathematics could be made easier to understand will be based on the implementation and teacher self-efficacy of the new standards. Research shows curriculum change influences student learning at all grade levels. For the middle grades, examining the implementation process of curriculum is even more critical being a difficult academic stage between elementary and high school concepts and skills.

Literature on curriculum change is ongoing. The process of implementing new curriculum, in this case Common Core State Standards in Mathematics, involves a foundation of research from which existing research on curriculum change and mathematics education has examined and continues to further. Change to the new mathematics standards is important in learning how teachers and school leaders prepared and put into practice the standards as they are provided by the state. Their preparation and perceptions may influence how the curriculum standards are met and learned by students. Teacher self-efficacy can not only be impacted by the standards but their previous experience and

perception of teaching according to previous research. Studying how school leaders and teachers introduce a new curriculum can show how the implementation process was perceived toward creating effective curriculum change and in turn improved student learning.

In Chapter 3, the researcher will present the methodology for the study.

CHAPTER III: RESEARCH METHODOLOGY

This chapter covers the research design, methods and instrumentation, the setting and participants of the study, and the types of data analyses used in developing a case study guided by the following research question:

> How do sixth and seventh grade mathematics teachers describe the implementation of Common Core State Standards in Mathematics in terms of preparation provided, their self-efficacy in teaching the new mathematics standards effectively, and perceived effects of new mathematics standards on student learning?

Research Design

Case studies are a valuable means of research used when (1) the focus of the study is to answer "how" or "why" questions, (2) the behavior of those involved in the study cannot be manipulated, (3) contextual conditions are believed to be relevant to a phenomenon or (4) boundaries aren't clear between the context and phenomenon (Yin, 2003). Curriculum implementation is a real phenomenon in today's K-12 educational system and is best understood in the context of the school setting itself. This case was of understanding "how" educational change occurred and described within the context of one school where it takes place (Yin, 2004). This study of a recent change to Common Core

State Standards in Mathematics described the everyday activities of preparation, teacher self-efficacy and student performance in schools today.

Case study research is the most appropriate methodology for the study of a school setting. The methodology is used in studying a small or limited number of individuals as the subjects (Zainal, 2007). This case study was an intensive investigation of one middle school and a particular group of individuals within it, providing description typical of case study research (Hancock & Algozzine, 2006). The researcher described school leaders' process of implementing new curriculum standards, teachers' perceived abilities to teach the new mathematics curriculum, and student performance under the new standards. Examining the student population these teachers instruct also provided description of a particular yet related group. Case study research encourages educators to consider new thinking and ideas in an educational curriculum, emphasizing communication and relationships (Zucker, 2009). Suitable to the context of outcomes being studied, the use of case study research shows the involvement and relationships between curriculum change, teachers and students (Hodkinson & Hodkinson, 2001).

A mixed methods approach was used in preparing this case study. Both qualitative and quantitative data were collected from one specific setting and particular group of individuals. The use of mixed methods research allowed the researcher to describe how this particular case is happening and help further explain it through a collection of perceived behaviors. Qualitative research tends to use an inductive approach, gathering data in search of preliminary findings to be used to learn of a circumstance for future planning toward improving it (Patten,

2007; Rossman & Rallis, 2003). The collection of qualitative data presents how the situation, the implementation of new curriculum standards, occurred. Quantitative research typically presents research in numbers or statistics to explain the situation that has occurred (Patten, 2007). The collection of quantitative data extends the description of how students and teachers have performed during the initial implementation of Common Core State Standards in Mathematics.

Qualitative methods of teacher surveys and semi-structured interviews were used in this case study in providing a description of teacher perceptions on the preparation provided, their self-efficacy to teach Common Core State Standards in Mathematics and the effect of the new standards on student learning. Surveys (Appendix A) included closed-ended items referring to teacher abilities in teaching mathematics under new curriculum standards during the initial implementation year. Teacher participants marked their level of agreement, from strongly agree to strong disagree, on fourteen items describing instruction abilities. Teacher interviews (see Appendix B) included formal and informal questions in describing perceptions of the implementation process. School leader interviews (Appendix C) were conducted in gathering a description of the school culture in which the study took place. Descriptions from school leaders and teachers provided descriptions and initial findings toward the continued implementation of new curriculum standards.

Quantitative data from sixth and seventh grade teacher grade books (Appendix D & E) were collected to further describe student learning during the implementation process of this one middle school. Student scores from classroom assessments on mathematical concepts for each grade level were averaged to show how students in sixth and seventh grade performed in certain topics taught under Common Core State Standards in Mathematics. From student grades, the sequencing and pacing of mathematics concepts was also described. A description of the sequence and length of instruction on mathematics concepts provided further detail related to teacher self-efficacy and their perceived effect on student learning under the new mathematics standards. Standardized test scores on areas of mathematical procedures, mathematics problem solving and overall mathematics ability were also collected to describe student performance under previous and new mathematics curriculum standards. The description generated from quantitative data collected in this case study intended to show the outcome of student performance and teacher self-efficacy within the event of curriculum change.

Setting and Participants

The study was conducted in a parochial middle school in North Carolina. The school lies on the outskirts of a large city. The school serves students from within and outside the city limits and holds a student population of sixth, seventh and eighth graders. During the 2012-2013 school year, approximately 287 students were enrolled in sixth grade, 256 students in seventh grade, and 327

students in the eighth grade. The school has one principal, two assistant principals, one Dean of Students, two guidance counselors and fifty-eight teachers.

The setting was appropriate for a case study. Interest from the school Superintendent and Principal toward improving student performance in mathematics and learning teacher views of teaching new curriculum standards were shared with the researcher. The administration wanted to implement Common Core State Standards in Mathematics although it is not required of them by the state of North Carolina. A case study of a middle school implementing new curriculum standards during its initial year has intended to describe one specific setting of many across the nation trying to do the same effectively.

School Leaders

School leaders are charged with not only school level decisions but those coming from the state. School leaders of the participating middle school made the decision to plan and implement Common Core State Standards in Mathematics in grades six to eight during the 2012-2013 school year. Most involved in the process for the participating school were the Principal and Dean of Students. School leaders were interviewed (Appendix C) to get an understanding of the school culture in which the study takes place. The Principal and Dean of Students of the school were asked about the purpose, preparation and goals in implementing Common Core State Standards in Mathematics in their school during the 2012-2013 school year. Both school leaders have been with the

particular school system for over ten years, in various positions. Each school leader has been in an administrative role for roughly four years. The interviews provided insight to the school culture during the planning and implementation of the new mathematics standards.

School leaders of the participating school system did not have to implement Common Core State Standards in Mathematics by "a certain time." As a system that tends to follow North Carolina public schools in what the state requires of schools, the principals had "talked about and discussed" the timing of mathematics standards to be implemented. Public schools within the state of North Carolina had begun implementing Common Core State Standards in Mathematics in schools across the state during the 2011-2012 school year (NC Department of Instruction, 2010). As a parochial middle school, the participating school along with high schools in this school system, has "a little bit more autonomy" in timing of anything the state puts out where as "the elementary school is really focused" to do so more immediately. At the time of the study, Common Core State Standards in Literacy had been fully implemented. Social Studies and Mathematics were described as the next "critical" core subjects to address by the school. It was decided by the participating school system's leaders that Common Core State Standards in Mathematics would be implemented in all grades, kindergarten through twelve, the 2012-2013 school year.

The Principal and Dean of Students reviewed the Common Core State Standards in Mathematics. Training was provided for the participating middle

school as well as the other middle school and two high schools within the school system during March of the 2011-2012 school year. The principal described the intention of the workshop.

> It was led by one of the two high school's mathematics department in the participating school system for middle and high school mathematics. The purpose was a brief introduction to common core. The high school's mathematics chair would have facilitated this meeting. Our teachers were given a copy of the Common Core Standards ahead of this meeting. I am not aware of other resources which were handed out in their individual meeting.

During the half day allotted for this workshop, mathematics teachers worked together within their core and school level to look at the standards in discussing what they were doing at the time and what they would do in the future. The Principal described additional training of the ConnectEd textbook currently used for mathematics instruction of Common Core State Standards. The training occurred two years ago and was led by an algebra teacher from each of the two middle schools of the participating school system. Textbook trainers have also come in over the two years to assist teachers in using the textbooks toward effectively instructing mathematics standards. When Common Core State Standards in Mathematics "came about, all mathematics teachers have had this training."

At the time of the interview, additional professional development days were being planned for the upcoming February and March of the 2012-2013 school year. During those workshops, middle school core subject teachers within the participating school system would be meeting to "share with their peers what they have been doing in teaching Common Core State Standards." The March workshop was being provided to all diocesan school teachers and administrators, organized by the school system's Curriculum Day Committee. Training was to be held at three different locations, teachers and administrators choosing the site most appropriate for their teaching or administrative positions. The participating middle school was one of those sites. Dr. Terry L. Cline, Speaker from the Department of Public Instruction - Common Core and Essential Standards was scheduled to provide training to all school faculty from the two middle schools within the participating school system. Afterwards, core subject areas teachers, mathematics being one such group, were then expected to meet for "Core Subject Sharing. Where are we? Where do we want to be? Action Steps to obtain our goals." The mathematics core lead teacher at the participating middle school was expected to lead the core subject sharing for sixth through eighth grade mathematics teachers. In addition to planned professional development by the school and school system, participating school leaders encourage teachers to take opportunities of professional development as they see a need to in seeking additional resources.

School leaders shared their belief that "it's important our teachers do what they need to do for the students to learn." The school has teachers "at various different levels of their career so (the change of standards) forces everybody to revisit what they were doing." Mathematics teachers meet on grade level weekly to discuss where they are in teaching mathematics concepts and lessons. School leaders also provide monthly core meeting times for teachers across all three grades in the middle school to discuss where they are in the curriculum." Teachers "more or less keep together in their lessons but that doesn't mean they have to be." The Principal and Dean of Students shared that the school does not have "a culture where everyone is on page five, where the superintendent or system says we need to be on the same page." Teachers are all using the same book and are aware of the expectation that specific mathematics concepts and skills need to be covered and needed for students to learn for the next grade level.

School leaders have expected sixth and seventh grade mathematics teachers to prepare their students for future learning. Mathematics classes at these grade levels are "preparing them for algebra as eighth graders, no matter what we call it." School leaders emphasize the necessity of "looking at where the students are, work with them where they are and try to get to get them to algebra." Being a middle school that has several feeder schools coming in to it, "quite a sizable and growing number of students are from other schools or the public system." School leaders believed "it's important that the students need to know how to do mathematics and do well." Both agree, in theory the new mathematics standards

"should bring them in all at the same point." By implementing Common Core State Standards in Mathematics, school leaders intend to do just that – as students enter the school and when they move on to another or high school.

Sample

The researcher purposefully chose the sample and setting for the study. The site was selected and the participants were believed by the researcher to be a good source of information. The researcher was familiar with the setting of the study as well as the school system's Superintendent and Principal. The implementation of Common Core State Standards in Mathematics was a change both the school leaders and researcher were interested in understanding as it occurred. The school site was available for the time the study was intended to take place, during the middle of the 2012-2013 academic year. At the time of the study, school leaders and teachers had awareness of implementing and instructing the new mathematics standards and should have developed a perception of their abilities to do both effectively.

The participating middle school has a similar student and faculty population and mathematics course offerings as those in most middle schools. The faculty racial composition is approximately 87% Caucasian and 13% Non-Caucasian members. Approximately 92% of the student population in grades 6 and 7 are Caucasian, 8% non-Caucasian. Mathematics course offerings include general mathematics, pre-algebra, and algebra.

Teacher participants included two male and four female teachers; three taught sixth grade and three taught seventh grade general mathematics classes. Sixth grade were licensed to teach kindergarten through sixth grade core curriculum, and the seventh grade teachers were licensed to teach seventh grade mathematics. All participating mathematics teachers held a Bachelor's degree as their highest level of education. The table below describes teachers' years of teaching experience and at the participating school. For the purposes of confidentiality and anonymity, teacher participants have been given pseudonyms.

Table 1. Description of teacher participants' level of experience

Teacher (pseudonym)	Number of Years Teaching at the Participating School	Number of Years Teaching Overall	Number of Years Teaching Mathematics	Highest Degree
Kevin	6-10	11+	11+	Bachelors
Tom	1-5	6-10	1-5	Bachelors
Jill	1-5	1-5	1-5	Bachelors
Beth	6-10	11+	11+	Bachelors
Susan	1-5	1-5	1-5	Bachelors
Ann	6-10	11+	6-10	Bachelors

Between the teachers, there were a total of 24 general mathematics classes in the study; 12 in the sixth grade and 12 in the seventh grade. Other mathematics classes taught by these teachers−pre-algebra and algebra−were not included in the

study. While no students were contacted or observed by the researcher in the study, teachers provided grade books with de-identified student data including scores on classroom assessments and standardized tests. The student population between the sixth and seventh grades within the participating school included 287 sixth graders (144 female, 143 male) and 256 seventh graders (126 female, 132 male). One male and one female school leader were also interviewed to provide the context for the study. School leader participants have education degrees, collectively having been in education almost fifty years and in administrator positions for over ten years.

Teachers selected for the research were provided with the research purpose, procedures, and risks. Student scores were anonymous (no personal identifiers) and teacher and school leader information was kept confidential by the researcher. Participants were given the right to refuse participation according to the signed consent form provided by the researcher and the parochial school system policies and regulations.

Procedure

The researcher received permission from teachers of the selected mathematics classes. A debriefing session was conducted with the selected mathematics teachers as well as the principal of the school in which the study took place to discuss the study procedures, collection and analysis of data, and exclusion of any specific mathematics classes and students not eligible for the study. At the time of the debriefing, procedures for the administration and

collection of teacher consent forms, surveys and interviews were determined. A waiver of parental consent was requested for the collection of student mathematics scores. The school provided parents with a letter informing them of the study, procedures, implications, intended outcomes of the results and the option to not have their children participate. The researcher and school intended to assure parents that no identification of students by name, gender, race or test grades or teachers was collected other than by grade levels. After data collection, a description of study conclusions and implications of the research was made available to the Superintendent and Principal of the middle school in the study. The implementation process and student scores may have been shared with the school community based on the school leaders' discretion.

Teacher involvement included the completion of a paper-based questionnaire (December 2012 and January 2013), participation in an individual interview (January 2013), and participation in a follow-up interview (February 2013). Teachers were also asked to provide student scores on standardized tests and for the marking period to the researcher during the time of the study.

Data Collection – Questionnaire and Interviews

Surveys measuring teacher self-efficacy were administered among sixth and seventh grade teacher participants. Surveys were administered to teacher participants of the study during January of the 2012 – 2013 academic year. By that time, teachers had awareness of Common Core State Standards in Mathematics and attended Common Core State Standards training and workshops.

Preparation, instruction and implementation of new mathematics curriculum began at the end of the 2011-2012 school year at which teachers should have, at the time of the study, a self-perception of their abilities in teaching the intended curriculum. Teacher surveys (Appendix A) were adapted from Erdem and Demirel's (2007) Teacher Self-Efficacy Belief scale to measure their self-efficacy of teaching new mathematics curriculum standards. The instrument was a measurement of teacher self-efficacy only, not of experience or content area. The instrument used in the study included fourteen closed-ended items from the original Teacher Self-Efficacy Belief scale (Erdem & Demirel, 2007) in a 4-point Likert scale format, from strongly agree to strongly disagree, arranged from left to right. The survey items were worded to avoid ambiguity. Each item had a single focus to one category specific to teacher self-efficacy: (1) preparation, (2) ability to instruct effectively, and (3) understanding how students learn.

Semi-structured interviews (Appendix B) were also conducted. Participating teachers were asked questions that extended from survey items on the Teacher Self-Efficacy Belief Scale (Erdem & Demirel, 2007). Existing literature on curriculum change and implementation was used for additional questions and adapted for the study (Braun, 2011; NGACBP, 2010). Other interview questions extending from the research were developed and reviewed by the researcher and assisting faculty. The semi-structured interview included the same questions to all participants so there would be no differences in interview outcomes (DeWalt & DeWalt, 2011). Interview questions addressed teacher self-

efficacy in teaching mathematics under newly implemented curriculum standards in terms of preparation, abilities to effectively instruct and perceived effects on student learning. Additional questions were added during interviews based on responses received from the teachers. Follow-up teacher interviews were conducted to verify initial analyses of teacher responses. Interview responses were analyzed descriptively to present the qualitative data of teacher perceptions on the implementation process of Common Core State Standards in Mathematics.

A semi-structured interview was also conducted of school leaders of the participating school (Appendix C) to more appropriately describe the context and motivation for the curricular change. Interview questions were adapted from the existing literature on curriculum change and implementation process (NGACBP, 2010; Cullingford, 2004). An extension of research-based questions were created and reviewed by the researcher and assisting faculty. Interview questions addressed school leaders' process in implementing Common Core State Standards in Mathematics. School leaders were asked to describe the purpose and preparation of the implementation process. Questions also addressed school leaders' perceptions of teacher self-efficacy and perceived effects of student learning in relation to the implementation process of new mathematics curriculum standards. Additional questions were added during the interview based on school leader responses. School leader interview responses were used to describe the context of the school setting during the implementation of Common Core State Standards in Mathematics.

Data Collection - Standardized Tests

Data on student performance included student grades and achievement test scores. Numerical grades on standardized mathematics tests from students in participating general mathematics classes were collected (Appendix D & E). At the time of the study, sixth grade students were taught the concepts of fractions, decimals, percentages, and by one teacher, geometry as well. Students were assessed on their learning of each concept prior to moving to the next sequenced topic of the sixth grade mathematics curriculum. Assessments were standardized tests that accompanied the curriculum materials for sixth grade mathematics. Seventh grade students were taught ratios, proportions, percentages, fractions, decimals, scale drawing, distance measurement, graphing, tables, integers, order of operations and properties, variables and expressions, and comparison statements during the study, each topic assessed immediately after the final lesson of the topic. Assessments were standardized tests that accompanied curriculum materials for seventh grade mathematics. Assessment instruments were part of the curriculum materials used with the new curriculum standards. Student grades provided by teacher participants also showed the sequence of topics, assessment type, and amount of assessments per topic. An examination of student data was included to describe student performance on specific mathematics concepts as well as the culture of instruction within the school during the implementation process of Common Core State Standards in Mathematics.

Numerical scores on mathematical portions of the Pearson Stanford 10 achievement test were also examined in showing mathematical performance under new and previous mathematics curriculum standards. Mathematics scores on the achievement test (Appendix F & G) included those of three subtests – Total Math, Mathematical Problem Solving and Mathematical Procedures. Total Math is a weighted combined score of Mathematical Problem Solving and Mathematical Procedures. Mathematical Problem Solving measures student competency in number sense and operations; patterns, relationships, algebra; data, statistics, probability; geometry and measurement; communication and representation; estimation; mathematical connections; reasoning and problem solving; thinking skills (Pearson, 2009). Mathematical Procedures measures student computation skills of whole numbers, decimals, fractions, in context, symbolic notation, thinking skills (Pearson, 2009). Scores in each achievement area were calculated by various measures, such as Scaled Score, Grade Equivalent, Percentile Rank and Normal Curve Equivalent. For the case study, only those measures relevant to the purpose of the study within Total Math, Mathematical Problem Solving and Mathematical Procedures were analyzed.

Grade Equivalent and Percentile Rank measures were examined in learning student mathematical performance on the Pearson Stanford 10 achievement test. Averages of Grade Equivalents and Percentile Ranks were calculated from all sixth and seventh graders from the 2011-2012 and 2012-2013 school year administering of the test. Percentile Rank indicates relative standing

of students in comparison to same-grade students in the norm-reference group who took the same subtest at a comparable time (Pearson, 2009). For example, a Percentile Rank average of 75 indicates students performed as well or better than 75% of students in the 2007 norm referenced group (Pearson, 2009). Grade Equivalents represent the "average performance of students tested in a given month of the school year" (Pearson, 2009). The score is best used to interpret performance on a group of students rather than the performance of an individual student (Pearson, 2009). Grade Equivalent averages and Percentile Rank averages provided the best description for this study of how students performed at their grade level and in comparison to students across the nation in the same grade.

Validity and Adequacy Considerations

In qualitative research, validity of study findings can also be referred to as trustworthiness of study findings (Bowen, 2005). In establishing trustworthiness, data sources, collection and study results should be of credibility, transferability, dependability and confirmability (Bowen, 2005). The use of multiple data sources in the present study - teacher self-efficacy survey (Erdem & Demirel, 2007) and research-based interview protocols (Braun, 2011; NGACBP, 2010; Cullingford, 2004), an existing standardized achievement test (Pearson, 2011) and mathematics concept tests (Lappen et al., 2006) - were instruments adapted from the existing literature in establishing adequacy of study procedures. Using each data source in conjunction with others contributes to the adequate and overlapping description resulting from the combination of sources.

The use of case study methodology helps to establish trustworthiness of study findings by limiting the context of the study itself. The setting consisted only of one parochial middle school and did not include data from any other schools. The participants of the study were of a small select group and specific to the study – sixth and seventh grade general mathematics teachers. Details of the school culture described by school leaders provided the context of the single setting in which Common Core State Standards in Mathematics was being implemented, specifically in terms of preparation, teacher self-efficacy to teach effectively and their perceived effect on student learning under new mathematics standards. Detailed descriptions from the collection of teacher interviews, self-efficacy surveys and teacher grade books provided transferability of study findings to similar school cultures (Bowen, 2005; Guba, 1981).

Each instrument used in the present study was research-based and within the existing body of literature on curriculum change and teacher self-efficacy. Developed and adapted from Erdem and Demirel's (2007) Teacher Self-Efficacy Belief Scale, the Teacher Self-Efficacy Belief scale used in the study consisted of 14 closed-ended items determined by the researcher to be most appropriate for the areas of preparation, feelings of ability to effectively instruct, and perceived effects on student learning. Semi-structured interview questions extended from the Teacher Self-Efficacy Belief Scale (Erdem & Demirel, 2007), developed by the researcher and advising faculty members. The interview protocol included items from existing research and studies on curriculum change and

implementation (Braun, 2011; NGACBP, 2010; Cullingford, 2004). Self-efficacy surveys were used as a tool in conjunction with teacher interviews to better qualify teacher perceptions of the implementation process. The collection of standardized assessments on mathematics topics covered during the study and Pearson Stanford 10 achievement test scores generated further description of teacher perceptions of the implementation, specifically on the perceived effect of new mathematics standards on student learning

The Teacher Self-Efficacy Belief Scale (Erdem & Demirel, 2007) demonstrated high reliability with a Cronbach's alpha coefficient of .92. A factor analysis elicited fundamental dimensions of the survey with a coefficient of .93, demonstrating construct validity of the instrument in measuring perceived capability (Erdem & Demirel, 2007; Bndura, 2006). Cronbach's alpha coefficient was not calculated on the adapted and administered version of the Erdem and Demirel's (2007) Teacher Self-Efficacy Belief Scale due to low number of participants in the study. Interview questions extending from the self-efficacy survey asked participants to describe their perception of the implementation process in terms of preparation, perceived ability to effectively teach the new mathematics curriculum and perceived effect on student learning. Questions were worded to avoid ambiguity. Any additional questions asked during the interview were based on participant responses that may add further description of areas of the implementation process being studied. Follow-up interviews were conducted with each teacher participant after the researcher reviewed analyses of all data

sources. Questions for follow-up interviews were specific to each teacher participant based on data collected from each teacher.

Mathematics assessments were designed for reliability through research-based practices and theories (Lappen et al., 2006). Tests were aligned with textbooks used in the mathematics course to measure student understanding of mathematics as demonstrated through textbook material (Lappen et al, 2006). The Pearson Stanford 10 achievement test is research-based and designed to meet the No Child Left Behind Act and national and state standards in academics (Pearson, 2009; AERA, 1999). The mathematics section has high internal consistency, with a Cronbach's alpha of.80-.87 (AERA, 1999). The standardized achievement test is administered to the students of the participating school in October of every academic school year.

The use of limited yet triangulated research methods helped maximize credibility and adequacy of study findings and minimize any complexities that may occur in the study (Bowen, 2005; Guba, 1981).The overlapping research methods used in this case study further established confirmability and dependability of study findings (Bowen, 2005). A continuous review of data sources, procedures, and findings by the researcher and advising faculty throughout the study time period was intended to confirm case study results. Events or changes occurring at the time of the study able and unable to be controlled by the researcher may limit study findings (Patten, 2007). However, the

researcher made efforts during the study to minimize such occurrences and ensure trustworthiness and validity of study findings.

The researcher was objective during the study; neutrality and reflexivity were practiced in the use of research methods in relation to interpretations and recommendations (Bowen, 2005; Guba, 1981). Surveys were completed individually by participating teachers and were administered prior to teacher interviews. Survey items were worded to describe typical classroom educational and organizational practices in teaching and instruction and should have presented the context of "teacher self-efficacy" in order for teachers to understand interview questions to be answered. Interviews were done confidentially and independently from others. Questions were specific to teacher perceptions of the preparation, their self-efficacy and effect on student learning as it pertains to the early implementation process of new mathematics standards. Teacher grade books were collected to show only data on mathematics concepts taught, student performance on those concepts and assessments used to evaluate student learning during the study period. No identification of students was included in teacher grade books nor in the collection of student scores on Pearson Stanford 10 achievement tests. Data collected on student performance reflected only that which would be needed for the purpose of examining student learning under Common Core State Standards in Mathematics during the second marking period of the 2012-2013 school year. Such procedures were intended to confirm the logic and validity of study findings.

Data Analysis

Both qualitative and quantitative analyses were performed. Qualitative descriptive analyses were conducted from open-ended items on teacher surveys and participant interviews. Open-ended survey responses were coded and tabulated in looking for patterns and frequencies within responses (Rossman & Rallis, 2003). Codes were then placed into pre-determined and emergent categories. An examination of responses led to a description of teacher perceptions about the Common Core State Standards in Mathematics implementation process related to pre-determined categories of preparation, ability to effectively instruction, and effects on student learning. Survey responses generated guiding themes toward study findings of teacher self-efficacy. Teacher interviews were conducted to strengthen the qualitative data of surveys by capturing the words of participants. Interviews were audio-recorded, transcribed and coded for analysis of themes occurring from responses. Recurring words and phrases generated codes that fit into pre-determined and emergent themes (Rossman & Ralis, 2003). The researcher and assisting faculty reviewed the analysis of responses to survey and interview questions. Multiple reviewers of data analyses provided more reliable results than if analysis was conducted by the researcher alone.

Descriptive analyses were also performed on the quantitative data. Average numerical scores on sixth and seventh grade mathematical concept tests were examined to describe student performance in mathematics within those

grades under new curriculum standards. The student grade books were examined to characterize the scope, sequence and assessments of concepts taught under Common Core State Standards in Mathematics from October 30, 2012-January 17, 2013 by each teacher. Average mathematics scores from standardized achievement tests were evaluated descriptively to show overall mathematics performance among sixth and seventh graders under previous and new curriculum standards. Quantitative data from standardized achievement tests were evaluated on measures of average Grade Equivalents and Percentile Rank for all students in grades six and grade seven of the participating school. The examination of mathematics scores described initial student learning of mathematics under Common Core State Standards in Mathematics at the sixth and seventh grade levels. Descriptions of the data provided a context of how the implementation of new mathematics standards occurred in sixth and seventh grade classrooms within the participating school.

Overall Plan of Study

In order to conduct the case study, the researcher met requirements of the university from which she attends and the participating school. Prior to the study, university and participating school faculty reviewed and approved the study procedures, rationale, risks and benefits and expected outcomes from the study.

University IRB requirements

Approval by the Institutional Review Board (IRB) was needed prior to conducting any intended study to ensure ethical conduct of research. As required

by the Office of Research Compliance at the University of North Carolina at Charlotte, the researcher completed the protocol application and submitted required documents associated with the study. The researcher also completed the required online training in conducting ethical research of human subjects.

School system requirements

School district policies of the participating parochial school system dictated specific procedures for professional research and publishing conducted on and within their schools. Approval of research was given by the superintendent of the participating school system and the principal of the school that was the setting of the study.

The researcher fulfilled university and school system requirements prior to conducting the study.

Summary

Through mixed methods, a case study was conducted on the implementation of Common Core State Standards in Mathematics in a parochial middle school. The researcher was interested in learning teacher preparation, their self-efficacy and perceived effect on student learning in mathematics during the initial year of curriculum change. Such factors may contribute to the effectiveness of continued curriculum implementation of new mathematics standards in a school. The use of case study methodology was to understand how educational change occurred in one school and describe it within the context it took place in. Interviews and surveys of sixth and seventh grade teachers were conducted to

collect information on the implementation process of the new mathematics curriculum standards in terms of preparation, ability to effectively instruct and perceived effects on student learning. School leaders were interviewed in describing the context of the school culture in which the study took place. Student scores on standardized tests were examined to measure student performance under Common Core State Standards in Mathematics. Average scores on Grade Equivalent and Percentile Rank measures on the Pearson Stanford 10 achievement test were evaluated to describe sixth and seventh grade mathematics performance under current and previous curriculum standards. Both qualitative and quantitative examinations were performed to analyze the data descriptively. Qualitative data included information collected from teacher surveys and semi-structured interviews and teacher grade books. Quantitative data included a description of student scores from mathematics tests and standardized achievement tests.

Chapter 4 presents the results of the data analysis.

CHAPTER IV: RESULTS

Results of data analyses on the process of Common Core State Standards in Mathematics in a parochial middle school during its first year of implementation are presented in this chapter. As detailed in Chapter III, data were collected from six semi-structured teacher interviews and self-efficacy surveys, their students' mathematics performance scores on classroom assessments and sixth and seventh grade Pearson Stanford 10 standardized achievement test scores from the 2011-2012 and 2012-2013 school year. Mathematics scores from over 280 sixth grade students and 250 seventh grade students were collected during the 2012-2013 school year on mathematics concepts and the mathematics portion of the Pearson Stanford 10 achievement test. Scores from over 250 sixth grade students and about 320 seventh grade students were collected from the 2011-2012 school year results of the Pearson Stanford 10 mathematics achievement test. Follow-up teacher interviews were also conducted to clarify and enrich the student data. Interview transcripts were analyzed to provide rich description of the Common Core State Standards in Mathematics implementation process. Self-efficacy survey responses, pacing and sequencing of instruction, and student grades were used to triangulate findings on teacher perceptions of their teaching

abilities and student learning. Descriptions from school leader interviews provided the context of the school culture during the first year of new mathematics standards.

Data collection occurred during December 2012 and January 2013, months within the second marking period (October 30-January 17) of the 2012-2013 school year. This particular time frame allowed the researcher to gather a clear description of perceptions on preparation, abilities to teach effectively and effects on student learning during the initial implementation of Common Core State Standards in Mathematics. An examination of data collected focused on the preparation, teacher self-efficacy and perceived effect on student learning during the implementation process of Common Core State Standards in Mathematics. This case study answered the following research question:

> How do sixth and seventh grade mathematics teachers describe the implementation of Common Core State Standards in Mathematics in terms of preparation provided, their self-efficacy in teaching the new mathematics standards effectively, and perceived effects of new mathematics standards on student learning?

Findings – Teacher Perceptions

Interview questions and self-efficacy survey items were organized into pre-determined categories of preparation, self-efficacy and perceived effect on student learning. The relationship between open and closed-ended items and areas

of the implementation process being studied can be seen in Table 2. The category of Instruction was generated from survey and interview items to represent self-efficacy. Although instruction was not specifically identified as part of the study, the researcher assumed teacher perceptions of their instruction lie within their perception of their ability to teach.

Table 2. Categories of study within data sources

Category: Preparation/Familiarity
Self-Efficacy Survey
1. I can organize learning activities effectively
2. I can organize learning materials concerned with learning objectives appropriately
3. I can organize learning activities taking into account my students' characteristics
Interview Protocol
Q1. How familiar are you with the new Common Core State Standards in Mathematics?
Q2. Based on your knowledge of the new standards, what do you consider the major difference between the old and new standards in mathematics?
Q3. How were you prepared for the implementation of the new standards? Describe any special training and instruction in the new standards.

Q4. How well do you feel you were prepared to teach mathematics under the new standards?

Q8. What parts of the implementation process could have been done better?

Category: Instruction

Self-Efficacy Survey

4. I can decide on the most effective way to teach mathematics

5. I can apply scientific theories in education to my mathematics class

6. I can draw my students' attention to the lessons easily

8. I can communicate with my students effectively in order to understand each other in the learning process

9. I can motivate my students who are not interested in the mathematics work

Interview Protocol

Q5. How have the new standards affected your approach to teaching mathematics?

Student Grades

Pacing and sequencing of mathematics concepts

Assessment types and length of instruction on each concept

Category: Student Learning

Self-Efficacy Survey

7. I can direct my students to reinforce their learning

10. I can give appropriate reinforcement to improve the desired behavior of my students

11. I orient my student to use alternative learning strategies to reach their mathematics learning objectives

12. I can correct my students' mathematics knowledge deficiencies or errors

13. I can make efforts to teach my students to analyze mathematics events, situations and knowledge

14. I can teach my students to offer creative solutions by investigating problems from alternative viewpoints

Interview Protocol

Q6. What do you believe is the effect of the new standards on your students?

Q7. Have you noticed any change in student performance due to the new standards?

Q9. Under the new curriculum standards, do you perceive your students to be more interested in learning mathematics?

Student Grades

Scores on quizzes, tests, homework and classwork

Emerging Themes

Categories within the implementation process being studied were used to organize data collected from teacher interviews and self-efficacy survey. From the codes developed in each of these categories, themes were then identified. One

category emerged from the study not originally considered by the researcher– sequencing and pacing of instruction.

Preparation

Three themes emerged from the teacher responses to interview questions on their preparation to implement Common Core State Standards in Mathematics during the 2012-2013 school year– familiarity, more training and resources. Themes and codes on preparation are shown below in Table 3.

Table 3. Themes and codes from teacher interviews on teacher preparation

Familiarity	Pretty familiar Somewhat familiar Not familiar at all Heard Introduced Knows them Know what to cover Know what we need to teach
More training	One half day Vertical team meeting (the Common Core) website Reading up on it on (their) own Didn't get enough Another day to review the standards
Resources	Here are the new standards Have to rely on many

When discussing how familiar teachers were with the new standards, there was variation ranging from not familiar at all to pretty familiar. Ann described her level of familiarity with Common Core State Standards.

> Obviously I've looked it over and I referred to it a lot more in the first quarter than I did the second quarter. But I think I will probably spend more time looking at it over the summer so next year I'm really set and feel good about it.

Beth felt more familiar with Common Core State Standards in Mathematics.

> I've seen them before. Most of the things we've done with the standards, we've looked at what has changed this year, what we've been doing, what we've dropped. I couldn't quote you on any of them but seeing what is the same what is different. So I'd say somewhat familiar.

A few teachers felt pretty familiar with them, having reviewed them. Tom shared his level of familiarity as expected of mathematics teachers by the participating school.

> I know at the beginning of every year, that's just part of what we're told to do, taught to do, to make sure we're up to date with knowing what (the standards) are. So I'm pretty familiar with them. I've reviewed them.

The teachers talked about first hearing of the mathematics standards. Beth shared her awareness of the upcoming curriculum change.

> We had sort of half heard something through the grapevine, through the public schools but we had not realized if it was going to affect us, or they didn't explain exactly what they were exactly. It was more like next year your standards are going to change and didn't go into it.

Once introduced to the new mathematics standards, teachers described having "gone through them as well to adjust our scope and sequence and sequence of what needs to be done." Tom mentioned "we knew coming into this year, exactly what we need to cover, this is what we need to teach, we made those adjustments before the year started so we know ok which direction the year began." Teachers meet on a weekly basis within their grade level "core meetings to go through and make sure we're hitting" what is needed. Most teachers agreed the "standards were already built into what we're already been doing."

When discussing training, teachers overall felt they "did not get enough" to teach Common Core State Standards in Mathematics effectively. Beth described a half day workshop provided by the school during the 2011-2012 school year.

> We met at the end of last year, a core vertical team meeting where we met as a group of math teachers and worked together on the standards. We mostly were working on grade levels that day too so 7th grade teachers

> were working on 7th standards and so on but we could then discuss, call out to the 8th grade 'are you guys doing this or are you guys doing that.' There weren't anybody from the state or anything like that it was mostly in house kind of thing. They did have someone directing the training on that in-service day. I'm pretty sure it was just a teacher who had been learning about it more than we had. I can't remember off the top of my head who it was. They put together some activities, led discussions but we mainly looked at the old standards versus the new standards to discuss and adjust the scope and sequence as necessary for each grade level to cover appropriate concepts.

During that training, Beth mentioned teachers "got on the website and realized (the standards) not that different but for we knew they could've completely changed our curriculum and (they) didn't tell us how much it was going to change or not change." Two other teachers, Jill and Susan mentioned they further prepared on their own. Susan went "to another (workshop) this year where we could pick and choose what we went to and I specifically went to a couple that were math standards. I'm going ahead and do it on my own." Jill shared of "reading up on it on my own."

All teachers felt they could've been more prepared and would like "another day to review the standards." Susan would've liked "a grade specific or even a longer period of time with the middle school to see who is doing what and stuff like that." Jill hoped for "a full day of all the new standards and break it up

into grades, have someone come in to help from the state or anyone go over it with us."

Teachers also described the resources provided for learning the new curriculum standards. Provided with not much other than "here are the new standards," they described "having to rely on many" resources additional to the textbook they use for classroom instruction. Teachers had mixed perceptions on the ConnectEd mathematics textbook provided by the school for mathematics instruction. Some teachers felt the textbook "aligned and matches up with" Common Core State Standards in Mathematics. Beth described the textbook used by teachers for the past three years.

> It's already sort of aligned to the Common Core before we got (the new standards) so that idea of (students) being more active, more discussion, using more action verbs in the learning, that's already been built in there a little more. It's all higher level thinking and completely straightforward with the standards.

However, a few teachers perceived the book to be "not user-friendly." Kevin shared that "the basics skills, traditional math sense and computation skills are more or less erased," perceived as a challenge for "students, teachers and parents." All teachers shared they were using "other books to add supplemental things to lessons and assignments to reach the differentiated levels of the students."

Teacher Self- Efficacy

Themes generated from teacher responses to self-efficacy interview questions and survey items include comfort level and instructional approach. Themes and codes on teacher self-efficacy are shown below in Table 4.

Table 4. Themes and codes from teacher interviews on teacher self-efficacy

Comfort	Fairly comfortable Pretty comfortable Still new Learning
Instructional Approach	No effect (of new standards) on their teaching Teach the same style Teach the way I'm going to teach Changed a little Want to push (students)

Teachers discussed their comfort level in teaching under Common Core State Standards in Mathematics, feeling mostly comfortable in their abilities to teach

the new standards effectively. Teacher perceptions of their comfort level were reflected in how teachers described their instruction, some changing it only a little to not all as a result of Common Core State Standards in Mathematics. Most teachers felt "fairly comfortable" with what is in the new mathematics standards. Tom shared he felt "pretty comfortable since we made those adjustments kind of before the year started." Susan described getting more comfortable with the new mathematics standards.

> I'm learning how and what to teach what goes with it and the breakdown and knowing the standards and how to teach them. This year being my third year I have a much better feel for what my students know and don't know, what they can handle, when to slow down.

Teacher responses on self-efficacy surveys also reflected their comfort level in teaching the new mathematics standards effectively. Overall, teacher participants showed high self-efficacy, agreeing or strongly agreeing to 14 closed-ended items describing abilities to teach students effectively. Ann, with over six years of experience teaching, was consistent in survey responses, marking "agree" to all 14 survey items. Ann responded positive although improving as described during her interview. "I'm getting more comfortable with what I need to do, I have more confidence and I don't have to refer to it all the time."

Survey responses reflected perceptions of instructional abilities and approach as well. Teachers responded to feeling positive in their abilities to

organize learning activities effectively, draw students' attention easily to the lessons easily, communicate with students effectively in order to understand each other in the learning process and correct students' mathematical knowledge deficiencies or errors. Teachers felt less positive, though still responding high in overall abilities, in their ability to apply scientific theories in education to mathematics class and teach students to offer creative solutions by investigating problems from alternative view. Teacher's perceived instructional abilities and approaches were also described during teacher interviews.

Teachers with mostly ten or more years of teaching mathematics shared they kept the same style of teaching they had in the past. Kevin described his instruction to have not changed at all under the new mathematics standards.

> I'm still going to teach to my strengths, to the way it reaches the students, teaching everything I'm supposed to teach but if I need to put an emphasis or more emphasis on this and all that kind of stuff of course.

Beth shared she was teaching "the same style I've taught the past 3 years."

Teachers with less years of experience in teaching mathematics or teaching overall mentioned their approach "changed a little bit" than previous years. Jill offered how Common Core State Standards in Mathematics has made her "rethink. Instead of just being direct teaching like we learned the old school way, definitely going back and having the kids do more critical thinking." Tom has "learned to be more engaging with questions" based on the new mathematics

standards. Teachers who perceived their instructional approach to have changed slightly under Common Core State Standards in Mathematics were among those who felt less confident in survey items describing their ability to apply scientific theories in education to mathematics class and teach students to offer creative solutions by investigating problems from alternative viewpoints. All teachers described wanting to "push students all the way through, to that next level and really reinforce" the critical thinking.

Findings – Student Performance

Perceived Effects on Student Learning

Two themes emerged from teacher interview questions on perceptions of student learning under Common Core State Standards in Mathematics – no effect and critical thinking. Themes and codes on the effect of new mathematics standards on student learning are shown below in Table 5.

Table 5. Themes and codes from teacher interviews on perceived effect on student learning

No effect	Don't see too much Same as last year Probably next year Don't think so Hope so
Critical thinking	Pushed Not be bogged down with just one right answer Multiple ideas Difference (between previous and Common Core State Standards) More talkative Talking together Collaborating Picking each others brains

Teachers discussed student learning and performance under Common Core State Standards in Mathematics. Many of the sixth and seventh grade mathematics teachers mentioned they don't see too much effect on student performance, described as being "the same as last year." Jill and Susan both described student performance "from last year to this year, grades are pretty much the same." Beth shared she also didn't "see too much effect. I think they're going to learn what they're going to learn."

Kevin felt similar, describing student performance the years leading up to the implementation of new mathematics standards.

> I think it's kind of hard for me to tell right now but I'd say no. I think we get the kids more now with less. We actually talked about this it seems like every year we get the kids with less computation skills, less and less with the basic skills.

When teachers were asked if they felt the new mathematics standards would have an effect on student learning after a year under instruction of them, teachers had mixed feelings. Beth believed "there'll probably be a difference next year." A few other teachers "don't think so." Kevin considered student performance as expected under new mathematics standards.

> I hope for better understanding and retaining (of knowledge) for long periods of time. Because we're focusing more on less, the hope is that 40-

> 60% will have mastery as opposed to the roughly 20% seen now. I guess it's one of those things where I'd probably have a better comment there I guess a couple years down the line, really see where and how things are effected and how things increase or decrease.

The collection of sixth and seventh grade student scores on mathematics concepts averages were examined to observe student performance under Common Core State Standards in Mathematics during the second marking period (October 30-January 17) of the 2012-2013 school year. It was not possible to aggregate or compare student scores across classrooms as teachers did not administer the same assessments. The researcher decided to evaluate student data in terms of average student performance overall at each grade level. An average score was calculated for each sixth and seventh grade assessment administered for concepts taught. Results identified initial student learning under new mathematics standards and provided a triangulation of findings from teacher descriptions of student learning under new mathematics standards.

Sixth and seventh grade student performance on concept tests and quizzes ranged from below average (73-74%, mid D) to well above average (99-100%, high A). Student performance was lowest on assessments covering computation skills of fractions for sixth grade, and integers and fractions for seventh grade. The interview responses of teachers at both grade levels reinforced that students have struggled the most with fractions, both in the past and presently. Teachers

noted seeing no effect on student learning under Common Core State Standards in Mathematics at the time of the study; however previous years' performance data were not available for descriptive comparison.

Student mathematics performance was also observed from the collection of sixth and seventh grade student scores on the mathematics portion of the Pearson Stanford 10 achievement test for 2011-12 and 2012-13. Average scores on three subtests within the Math portion - Total Math, Mathematical Problem Solving and Mathematical Procedures - were calculated and examined. For each subtest, the average Grade Equivalent and Percentile Rank were calculated. Both scores reflect mathematical performance of sixth and seventh graders at their current grade level as well as how they rank nationally as a grade level

The average Grade Equivalent for sixth grade students on mathematical subtests of Pearson Stanford 10 achievement test for the 2011-2012 and 2012-2013 school years are shown below.

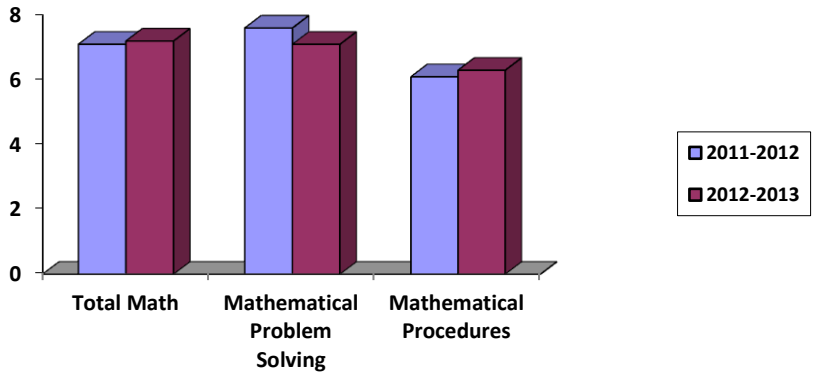

Figure 1. Comparison of sixth grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Grade Equivalent averages

Six grade students averaged a grade level above their current grade in the Total Math (7.2) and Mathematical Problem Solving (7.1) subtests of the 2012-2013 achievement test, and performed at grade level on the Mathematical Procedures section (6.3). The 2011-2012 school year results were very similar for the three subtests.

The average Percentile Rank for sixth grade students on mathematical subtests of Pearson Stanford 10 achievement tests for the 2011-2012 and 2012-2013 school years are shown below.

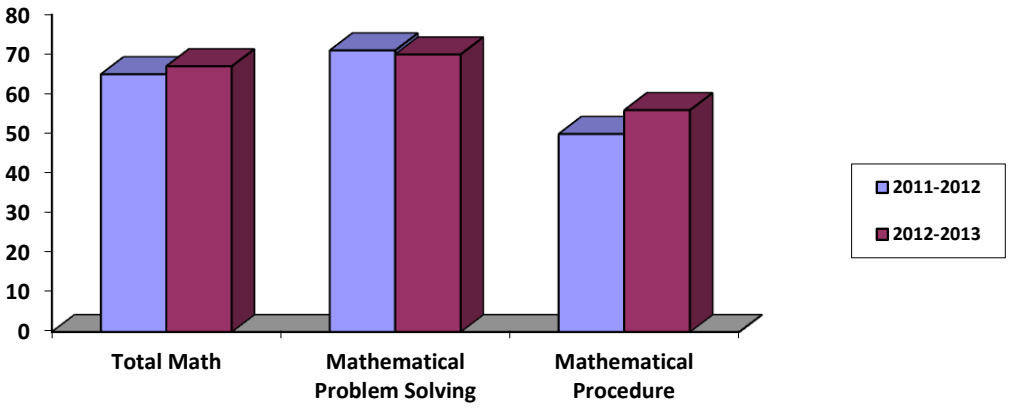

Figure 2. Comparison of sixth grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Percentile Rank averages

Average Percentile Rank for the sixth grade students were 67 for Total Math, 70 for Mathematical Problem Solving, and 56 for Mathematical Procedures. Sixth grade mathematics performance on all three subtests is above the national norm, with Mathematical Problem Solving at a higher percentile rank than other mathematics subtests. Average Percentile Rank on the subtests was similar on the 2011-2012 test.

Sixth grade student performance was above the national norm under previous and new mathematics standards. The average Percentile Rank scores under Common Core State Standards show sixth grade student performance was above the national norm under previous and new mathematics standards. These findings are consistent with teacher perceptions on student learning; there has been no noticeable effect on student learning under Common Core State Standards in Mathematics at the time of the study. Teachers expressed mixed feelings on whether any effect on student learning would occur under new

mathematics standards in the future; results from 2012-2013 average Grade Equivalents and Average Percentile Rank sixth grade scores can be used to examine changes in the future.

The average Grade Equivalent for seventh grade students on mathematical subtests of Pearson Stanford 10 achievement tests for the 2011-2012 and 2012-2013 school years are shown below.

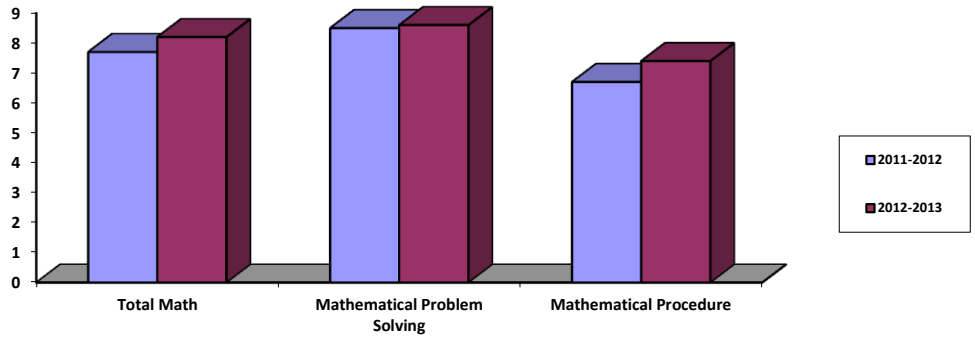

Figure 3. Comparison of seventh grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - Math portion Grade Equivalent averages

Like their sixth grade counterparts, seventh grade students performed above grade level on Total Math ability (8.2) and Mathematical Problem Solving (8.6), at grade level on the Mathematical Procedures (7.4) subsection of the 2012-2013 Pearson Stanford 10 achievement test. These results were similar to those obtained on the 2011-2012 tests, however students showed slightly higher grade equivalent scores in Total Math Ability and Mathematical Procedures in 2012-2013.

The average Percentile Rank for seventh grade students on mathematical portions of Pearson Stanford 10 achievement tests for the 2011-2012 and 2012-2013 school years are shown below.

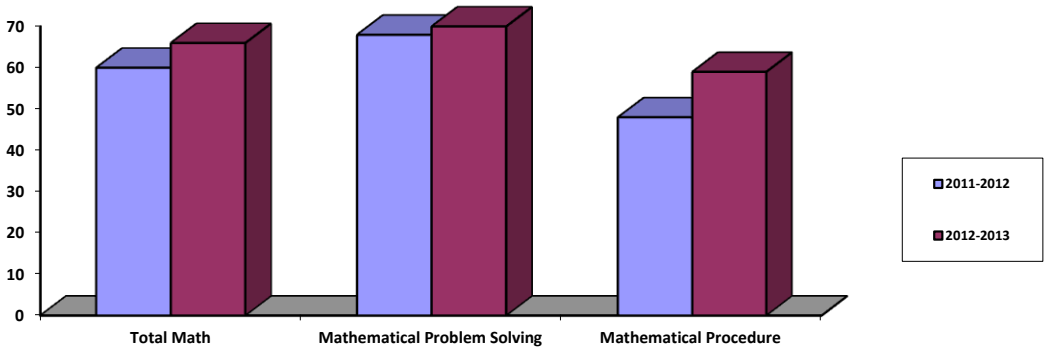

Figure 4. Comparison of seventh grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Percentile Rank averages

The Average Percentile Rank for seventh grade students was 66 for Total Math, 70 for Mathematical Problem Solving, and 59 for Mathematical Procedures, indicating above average performance. The 2012-2013 Percentile Rank average was slightly higher in all three mathematics subtests compared to 2011-2012 average scores.

At the time of the study, teachers perceived no effect of Common Core State Standards in Mathematics on student learning as described during teacher interviews. However these results show seventh grade students to continue a rank above the national norm and slightly higher than the year prior. Although the timing of testing (October 2012) during the implementation of Common Core State Standards, seventh grade Percentile Rank results should be considered,

results of 2012-2013 seventh grade Grade equivalent and Percentile Rank performance can be used as baseline data in comparing performance of seventh graders in future years under the new mathematics standards.

Although teacher perceptions of student learning described no change or effect in student performance on assessments under new mathematics standards, a change in student performance during class was described. Beth described students "to be more talkative when I'm posing a question. I think this helps them step outside of themselves for a little bit." Susan also perceived a difference among students in classroom learning.

> It gets them thinking and talking together that part I like about cause having them, letting them play off of each other and collaborate with each other they learn from each other and pick each other's brains and talk about it and stuff like that.

Student learning under the new mathematics standards was perceived by all sixth and seventh grade mathematics teachers to be focused more around critical thinking; a difference in learning mathematics than under previous standards and one perceived by teachers to be demonstrated by students during classroom learning. Beth believed "the more complex critical thinking has really pushed the kids to form multiple ideas and not be bogged down with just one right answer." Susan perceived students' multiple ways in solving problems as well under the new mathematics standards.

> I think the Common Core allows students to gain a deeper understanding of number sense and relations, finding multiple ways to solve problems (ex - using ratio boxes, not just proportions); some kids appreciated multiple ways, some were not ready.

Tom saw similar behaviors from his students during classroom learning under Common Core State Standards in Mathematics.

> I can see it in their writing. When they answer problems, I've always not asked them for a question for the answer but to explain how they got from A to B and I think asking and getting them to talk verbally about those connections and visualize how they got it in their mind really does help and enhance their skills. The kids that can really verbalize it and talk about it you can see that translate. So I think definitely been brought about by the new standards.

Teaching toward the critical thinking expected from the new mathematics standards was demonstrated through teachers' responses to the survey and interview questions. Susan felt less positive in her ability to "apply scientific theories in education to (their) mathematics class," the only "disagree" marked on her survey. She described "learning how to incorporate the challenge for the ones that can and change it up for the ones that can't. To ask a different way and make sure they really understand."

Kevin supported this instructional challenge, describing students' ability to think critically.

> It's hard for them, creating a bit of a dividing line between the kids that are able to critical think and get to that next level and kids that are just on the surface of understanding the idea and concept. I think it creates good opportunities for kids to expand and really push them but also some kids not ready to move on have trouble sometimes understanding the deeper level behind certain concepts. I do feel like some of the deeper level thinking is more challenging.

Teacher perceptions of the effect of Common Core State Standards in Mathematics on student learning during the initial year described no change to mathematics performance. An examination of student scores in some assessment areas and teacher descriptions of student learning in the classroom may show otherwise. However, student learning as mathematics standards intends and the struggles of certain mathematics concepts for students to learn were described to still remain.

Sequencing and Pacing of Instruction

An additional category, not originally considered by the researcher, emerged from school leader descriptions of the school culture as well as teacher interviews and student grades. From school leader descriptions, the context of the school culture was one where teachers had the authority to sequence concepts to

be learned by students as they felt appropriate. Prior to implementing Common Core State Standards in Mathematics during the 2012-2013 school year, mathematics teachers met within their grade level to determine the sequence of mathematics concepts for based on what students needed to learn before moving to the next grade. Sixth and seventh grade mathematics teachers met weekly within their grade level meeting to discuss their planning and progress.

All teachers stated there was a scope and sequence of Common Core State Standards in Mathematics for them to follow. However, teachers guided the sequence of concepts. The participating school gives all teachers the authority to sequence subject concepts as they feel appropriate as long the scope of what needs to be covered at each grade level is addressed. Themes and codes generated from the data on sequencing and pacing of mathematics instruction are shown below in Table 6.

Table 6. Themes and codes from teacher interviews on sequencing and pacing of instruction

Depth	A mile wide and an inch deep Fewer concepts Go more in depth with each one
Flexibility	Adjusted Rearranged What we know works Natural progression of knowledge to learn Authority Differences in what teacher's cover Things interfere Difficulty of subjects Student learners

Teachers discussed the scope of Common Core State Standards in Mathematics. Kevin described Common Core State Standards in Mathematics as "condensed."

> They took some things off. Now it's just like we get to a certain topic and there's more depth with that topic as opposed to trying to accomplish so

> many things now we're trying to accomplish fewer things but we just really want to get in depth with those things.

Tom and Ann both referred to the new mathematics standards as being a "mile wide and an inch deep." Tom further described this depth in comparison to previous mathematics standards.

> There's less material and just go more in depth with it and really enhance their understanding compared to covering as many things as you can over the course of the year, covering fewer concepts but going more in depth with each one.

School leaders have given teachers authority to determine the sequence and pace of mathematics instruction in covering necessary concepts at each grade level. Beth described how the one half day workshop for teachers prior to the 2012-2013 school year was used to do so.

> Each grade level broke down and kind of 'here are the new standards that you have.' We took our scope and sequence and we're like ok we need to make some adjustments cause all the grade levels know this is exactly what you need to cover and how can we tweak what we're already doing to make it fit those?

Beth also shared that her team also considered "what we know works and the natural progression of knowledge to learn." Jill described a similar approach by her team in sequencing the mathematics concepts under the new standards.

> We make sure we cover what needs to be but also prepare (students) for the next level and what they'll need to know going up. We discuss what students came to us knowing and the best order to teach with what we're teaching.

Weekly grade level meetings are scheduled for teachers to plan for covering intended concepts in any given week. Through interviews and student records, differences in concepts taught between teachers within each grade level were identified. Tom described how grade teachers sequence and pace collectively as well as individually.

> We collaborate as a group of grade teachers and once we have our scope and sequence we say these are everything we're going to cover this year. What do we think is the best order so everything builds on itself. So we definitely go by building on the skills that we think are, what are most important. We stay pretty close to the same scope and sequence, but like I covered one section differently than the two of them cause of the natural transition for where we were going.

Ann mentioned they would spend "more or less time on a topic based on the difficulty of concepts and their student learners. At the same time, sometimes

things just interfere and we can't teach what we planned when we had planned to."

Student performance scores on mathematics concepts based on the sequence and pace of instruction were collected from sixth and seventh grade teachers. Sixth and seventh grade student mathematics scores were collected on concepts assessed by tests, quizzes and homework or classwork. Mathematics concepts taught in the sixth and seventh grades were taught within other concepts. Sixth and seventh grade teachers mostly taught the same concepts as their grade level team teachers although some covered more or less skills within each concept during the study. Similarly, the amount of assessments administered on concepts differed among teachers at each grade level. Multiple concepts and/or skills were assessed on each test or quiz. Teacher responses to follow-up interview questions shared that for the most part they instruct and assess similarly to their grade level peers, although daily events, difficulty of concept and progress of student learning may alter the amount of lessons on each concept taught. Grade books reflect the flexibility teachers have in pacing and sequencing their mathematics instruction.

Concepts taught during the second marking period were provided as well. Sixth graders were taught computation and conversion skills in the concepts of fractions, decimals, and percentages during the second marking period; one teacher covered a unit on geometry as well. Seventh graders were taught ratio, proportion, scale drawing, graphing, variable expressions, order of operations and conversion and computation skills of fractions, percentages, decimals and

integers. Grade books showed in some cases, teachers combining concepts to instruct more in depth on a mathematics concept. Beth described her instruction on scale drawing.

> Thinking of something as larger or smaller, we started out with the idea that if you take something to a copy machine and you want a bigger picture what do you type into the copy machine; something they've already done before that can relate to but make them think of the concept a different way.

As described during teacher interviews, the scope of Common Core State Standards in Mathematics was one that involved more focus on fewer concepts; a difference from previous mathematics standards.

Results

Preparation

School leaders implemented Common Core State Standards in Mathematics during the 2012-2013 school year. Prior to the school year, professional development was provided for teachers in preparation for teaching the new mathematics standards. Teachers described their preparation as being "not enough." A professional development half day was designated for mathematics teachers within the school system to learn of and review the new mathematics standards together. Although most teachers stated they were familiar with the Common Core Standards in Mathematics, all wish they could have another day to review them. Teachers referred to their weekly planning meetings

as their preparation. All teachers mentioned their team planning as a time they "make sure standards are being covered."

Teacher Self-Efficacy

Overall, teachers described their abilities to teach mathematics effectively as positive. Teacher responses to interview questions and the self-efficacy survey were consistent, with most teachers perceiving themselves as having high self-efficacy. One mathematics teacher however described their abilities to teach under Common Core State Standards in Mathematics slightly different then their self-efficacy responses showed.

Self-Efficacy of One Mathematics Teacher

One participating mathematics teacher, Ann, demonstrated lower self-efficacy during the interview than on the self-efficacy survey. Having over 10 years' experience as a middle school teacher at the eighth grade level, teaching algebra and English-as-a-Second-Language, the 2012-2013 school year was the first for Ann to a mathematics teacher at the current grade level. From interview and self-efficacy responses, Ann demonstrated positive self-efficacy. Her self-efficacy survey responses showed she felt confident in her ability to teach mathematics effectively to their students. However, during the interview some responses implied Ann may doubt her abilities to teach effectively due to the 2012-2013 school being the first year back in the classroom.

As a mathematics teacher, Ann described confidence in her preparation in teaching the subject. At the same time, she acknowledged she "doesn't feel very

familiar at all" with Common Core State Standards in Mathematics. Ann "doesn't know if she's had enough" preparation on the new standards, a similar response to other participating teachers, and that her knowledge of the new standards came from weekly team meetings. During the initial year in teaching Common Core State Standards in Mathematics, Ann had "more confidence in the second quarter" than the first quarter; "I'm getting more comfortable with what I have to do." She described the 2012-2013 school year as her "learning or relearning year," "learning at the same time the kids are." Ann's experience in teaching middle school students has been with the eighth grade population prior to 2012-2013 school year where "maturity levels are completely different." Being back in the classroom as a mathematics teacher in combination with teaching to a different student population, Ann perceived herself as "setting (the students) up to fail." In general, she believed she "could handle it better."

During the interview, Ann was asked how teaching under Common Core State Standards in Mathematics has affected her teaching approach. Ms. Jones stated she doesn't "teach to standards, it's not the way I teach." Her teaching approach "hasn't really changed."

Perceived Effect on Student Learning

All teachers believed there was no effect on student learning occurring at the time of the study. All teachers perceived students to be more challenged by Common Core State Standards in Mathematics. However, student performance was described by teachers as being no different on the same concepts taught the

year prior. Teachers were mixed on whether the new mathematics standards would affect student learning one year later. Some teachers believed their instruction may have more of an effect on their students' learning than the Common Core State Standards in Mathematics.

Student scores were initially to be analyzed in learning of performance on mathematics concepts under Common Core State Standards in Mathematics. Once collected and reviewed, the researcher adjusted analysis procedures of the data. Averages were calculated for concepts assessed. Student mathematics performance among sixth and seventh graders ranged from average to well above average depending on the concepts being assessed. Student mathematics performance seemed to be lowest in both grade levels on assessments covering computation skills of fractions. Seventh grade student performance also seemed to be lowest on assessments covering integers.

A review of the Mathematics portion of the Pearson Stanford 10 achievement test also provided a description of student performance. Mathematics measures of Grade Equivalent and Percentile Rank showed how sixth and seventh grade students perform under the initial implementation of Common Core State Standards in Mathematics as well as in relation to mathematics performance of students under previous standards. Overall, student performance among sixth and seventh graders on subtests within the Math subtests of the Pearson Stanford 10 achievement test was slightly higher among the 2012-2013 sixth and seventh grade population.

Sixth grade student performance showed performance to be above grade level in two of the three mathematics subtest, with performance at grade level on the subtest of Mathematics Procedures. Results on all three subtests were very similar to results on all three subtests of the 2011-2012 test. Mathematics performance on all three subtests also showed to be above the national norm, with Mathematical Problem Solving at a higher percentile rank than other mathematics subtests. Under previous and new mathematics standards, student performance was above the national norm. These findings are consistent with teacher perceptions on student learning; there has been no noticeable effect on student learning under Common Core State Standards in Mathematics at the time of the study. Teachers expressed mixed feelings on whether any effect on student learning would occur under new mathematics standards in the future; results from 2012-2013 average Grade Equivalents and Average Percentile Rank sixth grade scores can be used to examine changes in the future.

Seventh grade student performance also showed averages on all three mathematics subtests on the 2012-2013 Pearson Stanford 10 achievement test to be similar to those obtained on the 2011-2012 test; however students showed slightly higher Grade Equivalent scores in Total Math Ability and Mathematical Procedures in 2012-2013.The Average Percentile Rank for seventh grade students indicated above average performance, and slightly higher, in all subtests compared to 2011-2012 average scores. At the time of the study, teachers perceived no effect of Common Core State Standards in Mathematics on student

learning as described during teacher interviews. However these results show seventh grade students to continue a rank above the national norm and slightly higher than the year prior. Although the timing of testing (October 2012) during the implementation of Common Core State Standards, results of 2012-2013 seventh grade Grade equivalent and Percentile Rank performance can be used as baseline data in comparing performance of seventh graders in future years under the new mathematics standards.

Summary

In this chapter the researcher presented the findings of a case study on the initial implementation process of Common Core State Standards in Mathematics in a parochial middle school. Teacher descriptions of their preparation, self-efficacy and perceived effect on student learning during the implementation of the new mathematics standards provided themes of each. Student grades on concepts taught October 30, 2012-January 17, 2013 demonstrated mathematics performance during the middle of the initial implementation year of new standards. Scores on the Pearson Stanford 10 achievement test were analyzed in learning how students from the 2011-2012 and 2012-2013 schools years performed in mathematics and establish baseline mathematics achievement under Common Core State Standards in Mathematics among sixth and seventh graders.

Teacher interview and self-efficacy responses generated themes in the areas of preparation, teacher self-efficacy and effect on student learning during Common Core State Standards in Mathematics implementation. An additional theme emerged from teacher interviews in conjunction with student grades. When

describing teacher preparation provided by the school toward instructing under the new standards, teachers felt they were *familiar* but needed *more training*. *Resources* were also referred to by teachers as contributing much to their preparation.

Teacher self-efficacy was found to be positive overall during teacher interviews and on self-efficacy surveys. Most teachers demonstrated *comfort* in their abilities to teach Common Core State Standards in Mathematics effectively. Teachers' *instructional approach* did not seem to be affected too much by the new mathematics standards however some described as changing a little. One teacher shared lower self-efficacy during the teacher interview however self-efficacy survey responses show higher self-efficacy.

Teachers perceived new mathematics standards to have no effect on student learning at the time of the study. There were mixed views on whether Common Core State Standards in Mathematics would affect student learning in the future. However, teachers described *critical thinking* as a change they see in how students are being expected to learn mathematics. The sequencing and pacing of instruction was a theme that also emerged from the data. Teachers recognized the *depth* of the curriculum and have the *flexibility* to adjust the sequence of concepts accordingly based on the new standards.

Student scores on mathematics assessments were examined to determine student learning during the first year of Common Core State Standards in Mathematics. Sixth and seventh grade student scores showed mathematics

learning to be at and above average, depending on the mathematics concept. Based on a review of student scores, student performance among sixth and seventh graders was lowest on the mathematics concept of fractions. Integers also seemed to be a concept both sixth and seventh graders struggled with, based on mathematics scores. Sixth and seventh grade teachers all described fractions to be the hardest mathematics concept for students.

A review of mathematics performance among sixth and seventh graders under the new and previous standards was also conducted. Student mathematics performance on the subtests of Total Math, Mathematical Procedures and Mathematical Problem Solving on the Pearson Stanford 10 achievement test was examined in terms of average Grade Equivalents and Percentile Rank. Grade Equivalent scores across subtests for sixth grade students showed performance to be above grade level in two of the three subtests and similar to 2011-2012 results. Seventh grade student performance showed similar results, performing above grade level performing on two of the three subtests. Percentile Rank scores across the three subtests for 2012-2013 sixth and seventh grade students showed overall, mathematical performance was above the 2007 national norm. Results from the mathematics portion of the Pearson Stanford 10 achievement test show differences and baseline data on how students perform on various mathematical skills at grade level under the initial implementation of Common Core State Standards in Mathematics. The data provide school leaders with a baseline to

gauge student learning as the implementation of new mathematics standards progresses.

In Chapter 5, the researcher presents conclusions and recommendations for further study.

CHAPTER V: CONCLUSIONS

The purpose of this case study was to study the implementation process of the new Common Core State Standards in Mathematic in one middle school. Six mathematics teachers from the sixth and seventh grades completed written surveys and were interviewed about their preparation for implementing the new mathematics standards, their self-efficacy to teach effectively under the new standards and the perceived effects of the new standards on student learning. School leaders planned the implementation process and curriculum expectations of new mathematics standards with the intention of maintaining a school culture the teachers were familiar with. The information collected from the study described the initial efforts by one parochial middle school to prepare teachers for implementing the new standards. Results of the study will be helpful to middle schools making curriculum changes.

Discussion of Results

Emerging themes from teacher descriptions provided teacher perceptions of the implementation process of Common Core State Standards in Mathematics at their middle school during the initial year. Themes on the preparation provided included *familiar, more training,* and *resources. Comfort* and *instructional approach* summarized teacher self-efficacy. The effect of new mathematics standards on student learning generated perceptions of *no effect,* and *critical thinking*. An additional area within the implementation process emerged from

teacher descriptions and student grade records. Sequencing and pacing of instruction among teachers showed the *depth* and *flexibility* expected by Common Core State Standards in Mathematics and permitted by school leaders.

Existing research is lacking and of that which exists, is mixed on how teachers and students respond to the learning expectations placed on them during initial implementation of national standards (Robelen, 2012; Roehrig & Kruse, 2007, 2005; Department of Education, 2007, 2004; Ding & Navarro, 2004; Reys, Reys, Lappan, Holliday, & Wassman, 2003; Ridgway, Zawojewski, Hoover & Lambdin, 2002; Riordan, & Noyce, 2001). The present study showed that despite the limited preparation described by sixth and seventh grade mathematics teachers to teach the new curriculum standards, teacher participants demonstrated positive self-efficacy in teaching the Common Core State Standards in Mathematics effectively. The sixth and seventh grade mathematics teachers seemed confident in their instructional approach and abilities for student learning to occur. All teachers reported that there was no effect on student learning under the new mathematics standards. However, student learning during classroom activities was described as being demonstrated differently from mathematics learning under previous mathematics standards. Overall, sixth and seventh grade mathematics teachers and student scores from this one middle school described being unaffected by the implementation process of Common Core State Standards in Mathematics.

A Case of One School

Implementation Process

The study required teachers to describe their perception of the processes used in implementing the Common Core State Standards in Mathematics. School leaders had planned to make a curriculum change during the 2012-2013 school year. To accomplish this objective effectively, school leaders developed an implementation process that would maintain the existing school culture. Teachers were to use the resources and workshops provided to them by the school prior to and during the implementation of the new standards. At the same time, students would be learning mathematics under Common Core State Standards in Mathematics.

Preparation

Sixth and seventh grade teachers felt familiar with Common Core State Standards in Mathematics based on the preparation provided to them by the school. Teachers were given the standards to review. All teachers felt they knew specific mathematics concepts they needed to cover and teach for their grade level. However, training provided by the school on new mathematics standards was perceived as not enough and teachers hoped for more. Teachers also shared that they were relying on additional resources to help them effectively use the new Common Core State Standards in Mathematics. All were aware of professional development days planned during the upcoming February and March of the implementation year. The new mathematics standards were to be the focus

of the workshops and teachers were looking forward to the additional time they would receive from the professional development days.

What constitutes enough preparation? In this middle school, resources were given to sixth and seventh grade mathematics teachers by school leaders. Teachers did not emphasize a need for more resources though; they all described finding additional resources to supplement their instruction. Textbook publishers, such as McGraw-Hill (2013), state education department websites, teacher associations (Association of Supervision and Curriculum Development, National Council of Teachers of Mathematics) and the Common Core State Standards website (www.corestandards.org) offer tools and resources for teachers and school leaders to effectively implement the new mathematics standards. Teachers did share they hoped for more time to review and understand Common Core State Standards in Mathematics. From teacher perceptions, preparation meant more time.

Teacher Self-Efficacy

Sixth and seventh grade mathematics teachers shared they felt comfortable in teaching Common Core State Standards in Mathematics. Teachers conveyed positive self-efficacy during their interviews and self-efficacy survey responses. Most teachers had not changed their instructional approach. These teachers perceived their style of instruction to effectively address the new mathematics standards for student learning to occur. A few teachers described their teaching approach changing a little but were still confident in their abilities to teach their

students effectively. Only one teacher described some doubt in her teaching abilities; however this perception seems to come from returning to the teaching of mathematics after a few years rather than the implementing of new mathematics standards. Overall, instructing under the new mathematics standards did not seem to have an impact on teachers' self-efficacy nor on their approach to teaching.

Teacher self-efficacy among participating teachers within this one middle school could be contributed to the culture of the school. Having the flexibility to adjust instruction as one feels most appropriate, teachers can take confidence from this school leader support. Similarly, teachers have the authority to use textbook resources they determine most effective for student learning. All teachers described an upcoming textbook adoption intended by the school in two years. Teachers, as a group, would be choosing the textbook along with their school leaders. At the time of the study, mixed feelings were shared on the current textbook. Some teachers were comfortable with the current textbook, others hoped for a more user-friendly resource. A new textbook could hinder teacher perceptions of their teaching abilities. A new textbook adopted at a time teachers have more familiarity with new mathematics standards could resume initial perceptions of teaching abilities from the early implementation stages. If however, the school culture remains as one allowing for collective teacher flexibility toward instruction, a new mathematics textbook may not impact teacher self-efficacy at all.

Perceived Effect on Student Learning

Sixth and seventh grade teachers perceived the Common Core State Standards in Mathematics to have minimal effect on student learning at the time of the study. Teachers did not see much difference in mathematics performance under the new mathematics standards. Teachers described students still struggling with the same concepts at each grade level as students had in previous years. When asked their perception of the new mathematics standards affecting student learning in the future, some teachers hoped there would be change, others were unsure there would be any effect at all on student learning. Student mathematics scores on the Pearson Stanford 10 achievement test demonstrated sixth and seventh grade students were performing at or slightly above grade level and above the national norm. Results are similar or slightly above scores from sixth and seventh graders under previous standards. It is too early to determine whether the new mathematics standards will contribute to student performance.

The sixth and seventh grade mathematics teachers had described a change though in student learning within the classroom. Students were described as talking more, collaborating and generating multiple ideas and solutions during classroom activities. These actions demonstrate the critical thinking described by teachers and intended by the new mathematic standards. This is a different expectation of students from previous standards. However, some teachers shared that the emphasis on critical thinking under Common Core State Standards in Mathematics may also be a challenge to their students. Student learning is

perceived as now being divided–between those students able to get to that next level and other students just on the surface of understanding the idea and concept. It is too early to know if this change in classroom behavior was a result of Common Core State Standards in Mathematics.

Sequencing and Pacing of Instruction

The school culture described during school leader interviews was one where "not all teachers had to be on page five." Because of this flexibility, teachers had the authority to adjust the sequence of mathematics concepts as they chose with the expectation that the scope of Common Core State Standards in Mathematics at each grade level was being covered. Teacher grade records reflected the flexible sequence and pace of instruction. Teachers referred to the depth of the new mathematics standards, namely, covering fewer concepts yet focusing more on each one than under previous mathematics standards. Although teachers planned at their grade level to sequence and pace mathematics instruction, all stated that they individually would spend more or less time on a mathematics concept depending on the student learner and the difficulty of the concept.

The school culture may have allowed for Common Core State Standards in Mathematics to be implemented in the classroom as intended by the standards. Instruction of Common Core State Standards doesn't mean it's essential to attend to every practice standard in all mathematics lessons (Burns, 2012). Different ones are appropriate at different times. Given flexibility to sequence mathematics

concepts and instruction, sixth and seventh grade mathematics teachers implemented the new standards at a pace they perceived effective for their student learners while meeting the standards objectives.

Limitations

Findings and conclusions from the study are based on perceptions collected from sixth and seventh grade mathematics teachers of one parochial middle school implementing Common Core State Standards in Mathematics. The school is one of over 100 Roman Catholic dioceses adopting these new standards (Robelen, 2012). Findings may differ in other schools, private and public. Explanations presented in this case study were based on interpretations made from data collected by the researcher. It is necessary to consider all limitations before automatically extending the case study findings to every situation, practice or process involved in curriculum change.

The study consisted of a small number of teacher participants. Such a sample could limit the richness of teacher descriptions on the preparation provided by the school, their self-efficacy in teaching new mathematics standards and perceived effects of the new mathematics standards on student learning. Descriptions from the six teacher participants could be limited to the experience, background and education of those individuals. Perceptions and behaviors from the small number of teacher participants may not reflect perceptions and behaviors of most mathematics teachers. One cannot rule out alternative explanations possible when interpreting conclusions presented.

Specific instruments and sources of data were identified for the purpose of the current study. Data collected from teacher participants during the study− teacher self-efficacy surveys, teacher interviews and student mathematics scores on concept assessments and Pearson Stanford 10 achievement tests−are limited only to those sources. Observations were not included in this case study. The study was one of teacher perceptions only; observations conducted by the researcher could have included perceptions even with efforts to minimize bias. However, classroom observation may have provided further detail of preparation, teacher self-efficacy and effect on student learning under Common Core State Standards in Mathematics.

Although the researcher made efforts to use reliable instruments, limitations may exist in how they were administered or interpreted by either the researcher or participants. During the study, teachers described mathematics concept assessments to be teacher-created rather than generated from ConnectEd mathematics textbooks only; teachers included additional resources to supplement mathematics assessments. An assessment created from multiple resources may provide different results on student mathematics learning than one from the single resource students learn from in the classroom. Similarly, the Teacher Self-Efficacy Belief Scale survey (Erdem & Demirel, 2007) used in the study was one of many among the existing literature on teacher self-efficacy. A different teacher self-efficacy survey may have provided more accurate findings than presented in this case study.

The collection of scores from the Pearson Stanford 10 achievement test mathematics portion was intended to provide an initial description of student mathematical performance under Common Core State Standards in Mathematics. The achievement test was recently adopted by the school and was only in the second year of use and interpretation. Familiarity of the achievement test among school leaders and teachers should be considered when interpreting initial results of student performance in mathematics from this test.

A limitation of this study is in the duration of the study itself. Findings and conclusions are based on data collected during one marking period only. A study of several marking periods may provide further description of teacher self-efficacy and student learning under the new Common Core State Standards in Mathematics. Studying one specific marking period does limit the amount of data available on mathematics concepts being covered, in the amount of concepts covered and student scores on those concepts. Not all sixth and seventh graders covered the same mathematics concepts as their grade level peers during the study period. Data on student learning could not be analyzed for significant findings on student learning on individual mathematics concepts.

Although all teachers demonstrated positive self-efficacy, any teacher participant could have circumstances occurring at the time of the study that influenced their self-efficacy in teaching the new standards. Factors occurring during the second marking period, such as holidays, teacher workdays, parent-teacher conferences, evaluations of their performance and circumstances

unrelated to the school environment may have contributed to teacher perceptions of their teaching abilities.

At the time of the study, one teacher had arrived to their interview after being evaluated by a school administrator. Although evaluation was not addressed with teacher participants during interviews, teachers did not demonstrate their self-efficacy to be affected by an evaluation of their teaching under the new mathematics standards. As school leaders and teachers become more familiar with Common Core State Standards in Mathematics, one cannot rule out the expectation of evaluations based on teacher ability to implement new mathematics standards. A concern with teacher evaluations could impact teachers' self-efficacy and student learning.

Further Research

This study contributes to existing literature on curriculum change and mathematics education. Research extending from the study to other areas of curriculum change and mathematics education is also needed. Research on the implementation process occurring within other school types, such as public and independent, can also contribute to the literature on curriculum change. A comparison of efforts across two or multiple school types can be beneficial in learning best practices. Similarly, research on elementary and high school implementation of Common Core State Standards in Mathematics could provide the support middle school leaders and teachers may need in effectively meeting the mathematics needs of the middle school student.

This study provides research specific to mathematics. Common Core State Standards have also been developed for English Language Arts, Social Studies and Science. Research similar to the current study can examine how standards in additional subjects have impacted teacher self-efficacy and student learning. Ongoing research on professional development, teacher self-efficacy and student learning in multiple subject areas will always be beneficial to school leaders toward improving school culture.

At the time of the study, assessments specific to Common Core State Standards in Mathematics were not developed. Assessments are expected to be available for evaluating student learning under Common Core State Standards in 2014 (NGACBP, 2010). Future research on student learning under Common Core State Standards in Mathematics could benefit from assessments specifically aligned with the new standards.

An extension of the current study can further address mathematical challenges of middle school students. Teachers described fractions to be a struggle among sixth and seventh graders and integers among seventh grade students. Ongoing examinations of these mathematical concepts under the Common Core State Standards in Mathematics could show whether the new mathematical standards are meeting the most challenged concepts for middle school students.

Conclusions

Curriculum change is inevitable. Forty-five states have adopted the recently developed Common Core State Standards in Mathematics (NGACBP, 2010). Adoption was voluntary. However each state saw a need to make changes in teaching and learning of the mathematics curriculum in grades kindergarten through twelve. Changes to mathematics concepts and instructional strategies are expected to improve student learning. However, the changes force teachers to evaluate and adjust their scope and sequence to teaching according to what students are expected to learn.

Common Core State Standards are a shift in the way teachers instruct students in the future, specifically in mathematics and literacy (NGACBP, 2010). How students learn mathematics concepts is determined by how teachers are prepared and perceive their abilities to teach these concepts. Preparation for curriculum change, as presented by Obara & Sloan (2009), involves teachers actively reading through objectives and working on examples to better understand instruction and content of new curriculum. Based on study findings, mathematics teachers in this one school wanted more time, training, and appropriate resources to do so.

Resources specific to Common Core State Standards in Mathematics, such as those online, through publishers and on state Department of Education websites, are available to school leaders and teachers for effectively implementing the new mathematics standards. However, materials available to schools for

preparing teachers may be limited to financial and time availability for professional development. This study validated a need for extensive preparation and understanding prior to and during curriculum change and supports the existing literature in this research area.

Despite feeling a need for more training and time on Common Core State Standards in Mathematics, participating teachers demonstrated positive self-efficacy overall. All teachers adjusted the scope and sequence of mathematics concepts, as determined within their grade level and as intended under new mathematics standards. However, differences existed in teachers' beliefs and style of instruction. Teachers who changed their instruction slightly to accommodate the different thinking and ways for learning expected of new mathematics standards were more new to the teaching of mathematics. Other teachers of more teaching experience perceived to be confident of the instructional approach they've used in the classroom and its effectiveness on student learning. The present study adds to research on teacher instruction (Swackhamer, Koehlner, Basi & Kimbrough, 2009; Calvert, 2002) and teacher self-efficacy (Charalambos & Philippou, 2010, Roehrig & Kruse, 2005) during curriculum change. Teacher beliefs and experience could contribute to one's instructional approach and perception of teaching ability. From the current study, it is hard to conclude which, teacher experience or teacher beliefs of instruction, during curriculum change contributed to participants' self-efficacy to teach effectively for student learning. However, based on descriptions of preparation provided by the

participating school, the school culture itself could be a factor in the positive self-efficacy teachers demonstrated, supportive of research on teacher self-efficacy related to the context in which teachers work (Kaniuka, 2012; Ross & Gray, 2006).

Whether adapted or remaining the same, teacher instruction at this one middle school has aimed to meet new mathematics standards expectations toward improved student learning. The current study took place during the first year of implementing Common Core State Standards in Mathematics. At the time of the study (October 2012-January 2013), teacher descriptions and student grade records showed the new mathematics standards to have no perceived effect on student learning. Student achievement test scores provided baseline data on mathematics performance under the new mathematics standards. It is too early to conclude whether student learning and performance has improved as the new mathematics standards intended. Mathematics concepts, such as fractions and integers as well as basic multiplication skills – two fundamental topics needed to acquire before entry to algebra (Loveless, 2008), were perceived as still a challenge for this student population.

However, teachers described a change to student learning in the classroom. Common Core State Standards in Mathematics has emphasized a higher level of thinking within its standards (NGACBP, 2010). Teachers described the critical thinking expected by the new mathematics standards to be demonstrated by students during classroom activities. As with teacher self-

efficacy, it is hard to conclude whether the new mathematics standards could affect student learning alone or if the school or classroom culture may be the influence. Specific instructional practices accompany Common Core State Standards in Mathematics. An extension of the current research could include teacher observation to learn whether such practices are being implemented and whether the critical thinking demonstrated from these sixth and seventh graders is due to the type of instruction or mathematics itself.

The current research adds to initial studies (Gates Foundation, 2012; Achieve, 2011; Stevenson, 2008) of Common Core State Standards. Common Core State Standards in Mathematics is in its early years of implementation. Both private and parochial education has adopted the standards based on how the standards fit with the depth, understanding and higher level thinking these schools try to emphasize (Robelen, 2012). In trying to stay competitive and in line with public schools, for both student mobility as well as student achievement, the curriculum change may help students compete equally with their public school counterparts in college.

The objective of the Common Core standards is to help students develop mathematical expertise in order to be college and career ready and successful in the future (Burns, 2012; NGACBP, 2010). Previous standards have shown no improvement in student learning of mathematics (McNeil, 2011; Nichols, Glass & Berliner, 2005); the recent curriculum change is expected to provide different results. As concluded from the present study, it is too early in the change to

Common Core State Standards in Mathematics to determine improved student mathematics performance. However, teacher preparation was found to be necessary, even desired by teachers, to teach students toward improved mathematical understanding and success.

Collaboration between state education departments and companies providing resources aligned with the new mathematical standards can be the most direct means of ensuring effective implementation of Common Core State Standards in Mathematics. This study has implications though for higher education as well. One participating teacher shared preparation provided by the teacher education program she attended; it consisted of learning only where to find the new mathematics standards. Faculty in teacher preparation programs are critical players in the alignment of K-12 and higher education. Information on Common Core State Standards has to be incorporated into teacher education programs in order to prepare pre-service teachers to teach to the new standards.

This case study describes efforts by one parochial middle school to implement Common Core State Standards in Mathematics. Teacher perceptions and student learning during the initial year of implementing the new mathematics standards show more is needed – more preparation time and more time to see an effect on student learning. Even with more time needed, teacher self-efficacy was positive among sixth and seventh grade mathematics teachers. Not only do findings and conclusions from this case study benefit the participating middle

school's leaders and the school system but also other school settings of similar culture.

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APPENDIX A: TEACHER SELF-EFFICACY BELIEF SCALE SURVEY

Years of teaching experience:

Overall in any subject	<1	1-5	6-10	11+
Overall in the school	<1	1-5	6-10	11+
Mathematics	<1	1-5	6-10	11+

Highest degree: Bachelors Masters Doctorate Other _____

Certifications (list all certifications you have):

Please circle your responses to the following statements in relation to the implementation of the Common Core State Standards in Mathematics at your school since August 2012..... (SA=strongly agree, A=agree, D=disagree, SD=strongly disagree)

1. I can organize learning activities effectively.	SA	A	D	SD
2. I can organize learning materials concerned with learning objectives appropriately.	SA	A	D	SD
3. I can organize learning activities taking into account my students' characteristics.	SA	A	D	SD
4. I can decide on the most effective way to teach mathematics.	SA	A	D	SD
5. I can apply scientific theories in education to my mathematics class.	SA	A	D	SD
6. I can draw my students' attention to the lessons easily.	SA	A	D	SD
7. I can direct my students to reinforce their learning.	SA	A	D	SD
8. I can communicate with my students effectively in order to understand each other in the learning process.	SA	A	D	SD
9. I can motivate my students who are not interested in the mathematics work.	SA	A	D	SD
10. I can give appropriate reinforcement to improve the desired behavior of my students.	SA	A	D	SD
11. I can orient my students to use alternative learning strategies to reach their mathematics learning objectives.	SA	A	D	SD

12. I can correct my students' mathematics knowledge deficiencies or errors.	SA	A	D	SD
13. I can make efforts to teach my students to analyze mathematics events, situations and knowledge.	SA	A	D	SD
14. I can teach my students to offer creative solutions by investigating problems from alternative viewpoints.	SA	A	D	SD

(items adapted with approval from Erdem & Demirel (2007) Teacher Self-Efficacy Belief Scale)

APPENDIX B: TEACHER INTERVIEW PROTOCOL

Teacher Interview Protocol

The purpose of the study is to learn of the early implementation of Common Core State Standards in Mathematics in a southeastern United States parochial middle school, particularly in terms of preparation, feeling of self-efficacy, and perceived effects on student learning. This study will describe how leaders and teachers of sixth and seventh grade mathematics view the motivation for implementing Common Core State Standards in Mathematics during the 2012-2013 academic year.

1. How familiar are you with the new Common Core State Standards in Mathematics?
2. Based on your knowledge of the new standards, what you do you consider the major difference between the old and new standards in mathematics?
3. How were you prepared for the implementation of the new standards?
    a. Describe any special training and instruction in the new standards.
4. How well do you feel you were prepared to teach mathematics under the new standards?
5. How have the new standards affected your approach to teaching mathematics?
6. What do you believe is the effect of the new standards on your students?
7. Have you notice any change in student performance due to the new standards?
8. What parts of the implementation process could have been done better?

9. Under the new curriculum standards, do you perceive your students to be more interested in learning mathematics?
10. Any other comments regarding the new curriculum standards, the old standards, your teaching and student performance you'd like to share?

APPENDIX C: SCHOOL LEADER INTERVIEW PROTOCOL

School Leader Interview Protocol

1. When did you implement Common Core State Standards in Mathematics?
2. Why adopt the new standards at this time? What led to the adoption?
3. What was student performance before Common Core State Standards in Mathematics? Do you expect it to change/be different with this implementation?
4. What kind of training was provided to teachers for instructing the new mathematics curriculum standards?
5. What do you believe is the effect of the new standards on your mathematics teachers?
6. What do you believe is the effect of the new standards on your students? Middle school students in particular?
7. What plans do you have going forward in implementing the new mathematics standards?

APPENDIX D: EXAMPLE OF SIXTH GRADE TEACHER GRADE BOOK

ID	HW: fractions to decimals	CW: decimals to fractions	Quiz: fraction to decimal & decimal to fraction	HW: modeling percents	Test: Fractions, Decimals, Percents	Quiz: fractions to percent	HW: fractions to percent	Quiz: +/- fractions	Test: +/- fractions & mixed numbers	HW: multiply fractions	HW/CW: multiply fractions	HW: dividing fractions	Test: multiply divide fractions	Qtr 2
A1	100	100		100	93	100	100	90	93	100	100	100	98	95.5
A2	100	100	83	100	79	95	100	64	86	75	100	100	88	84.8
A3	100	100		100		100	100	90	86	100	100	100	95	93.5
A4	100	100	96	100	100	100	100	73	81	100	100	100	91	91.7
A5	100	100	93	100	93	100	100	97	95	100	100	100	98	96.5
A6	100	100	98	100	100	100	100	77	83	100	100	100	95	93.4
A7	100	100	100	100	99	100	100	93	77	100	100	100	86	92.8
A8	100	100	100	100	100	100	100	90	91	100	100	100	101	97.5
A9	0	100	88	100	85	95	100	85	60	100	100	100	85	82.4
A10	100	100	98	100	98	100	100	86	86	100	100	100	91	93.9
A11	100	100	90	100	98	100	100	83	83	100	100	100	101	93.8
A12	100	100		100	67	80	100	86	62	100	100	100	90	80.5
A13	100	100	100	100	100	100	100	90	97	100	100	100	91	96.8
A14	100	100	71	100	70	100	100	64	60	100	100	100	68	75.4
A15	100	100	86	100	94	95	100	64	65	100	100	100	87	84.5
A16	100	100	100	100	100	100	100	75	79	100	100	100	94	92.5
A17	100	100	95	100	98	98	100	75	74	100	100	100	90	89.9
A18	100	100	95	100	100	100	100	83	90	100	100	100	103	96.2
A19	100	100	96	100	91	100	100	83	76	0	100	100	83	89.2
A20	100	80	98	100	86	95	100	70	60	100	100	100	89	82.2
A21	100	100	98	100	100	95	100	90	90	0	100	100	95	95.5
A22	100	100	100	100	96	95	100	97	79	100	100	100	88	90.7
A23	100	100	88	100	74	100	100	64	65	100	100	100	73	79.7
A24	100	100	100	100	94	100	100	77	60	100	100	100	92	88.3
A25	100	100	100	100	98	100	100	93	90	100	100	100	98	96.8
Average	96.0	99.2	94.2	100.0	92.2	97.9	100.0	81.6	78.7	91.0	100.0	100.0	90.8	90.2

APPENDIX E: EXAMPLE OF SEVENTH GRADE TEACHER GRADE BOOK

ID	Test: Ratio, Scale Drawing, % of Number	Test: Proportion, Distance Measurement	Q1 Total	Test: Comparison statement, Fract, %	Test: Unit Ratios, Tables, Proportions	Test: +/- integers, basic integers	Test:- x/division integers, order of oper, properties	Q2 Total
A1	100.0	100.0	100.0	81.0	88.0	111.0	95.0	93.7
A2	92.0	103.0	99.0	100.0	98.0	100.0	99.0	99.5
A3	83.0	88.0	87.0	88.0	79.0	96.0	88.0	87.7
A4	96.0	89.0	93.0	89.0	97.0	96.0	88.0	92.5
A5	97.0	100.0	93.0	86.0	85.0	87.0	94.0	88.0
A6	97.0	98.0	89.6	76.0	92.0	89.0	92.0	87.2
A7	91.0	93.0	94.0	86.0	65.0	76.0	91.0	79.5
A8	101.0	105.0	95.3	97.0	86.0	96.0	102.0	95.2
A9	84.0	83.0	85.0	78.0	91.0	96.0	87.0	88.0
A10	73.0	56.0	60.3	76.0	78.0	68.0	82.0	76.0
A11	91.0	92.0	89.6	91.0	97.0	94.0	97.0	94.7
A12	56.0	77.0	65.3	69.0	70.0	74.0	69.0	70.5
A13	64.0	87.0	69.6	81.0	62.0	93.0	84.0	80.0
A14	80.0	80.0	73.3	86.0	81.0	87.0	82.0	84.0
A15	104.0	97.0	97.0	97.0	99.0	103.0	101.0	100.0
A16	92.0	106.0	94.3	97.0	103.0	95.0	107.0	100.5
A17	91.0	83.0	89.0	92.0	96.0	97.0	99.0	96.0
A18	76.0	64.0	71.3	86.0	90.0	94.0	82.0	88.0
A19	99.0	99.0	95.6	80.0	94.0	96.0	94.0	91.0
A20	59.0	43.0	61.0	56.0	77.0	83.0	86.0	75.5
A21	60.0	76.0	62.3	53.0	69.0	67.0	71.0	65.0
Average	85.0	86.6	**84.0**	83.1	85.6	90.4	90.0	**87.3**

APPENDIX F: EXAMPLE OF SIXTH GRADE PEARSON STANFORD 10 ACHIEVEMENT TEST RESULTS – MATHEMATICS PORTION 2012-2013

Total Math - Scaled Score	Total Math - Normal Curve Equivalent	Total Math - Percentile Rank	Total Math - Stanine	Total Math - Grade Equivalent	Math Prob Solv - Scaled Score	Math Prob Solv - Normal Curve Equivalent	Math Prob Solv - Percentile Rank	Math Prob Solv - Stanine	Math Prob Solv - Grade Equivalent	Math Procedures - Scaled Score	Math Procedures - Normal Curve Equivalent	Math Procedures - Percentile Rank	Math Procedures - Stanine	Math Procedures - Grade Equivalent
598	18.9	7	2	3.2	591	17.3	6	2	2.9	609	24.2	11	3	3.4
653	49.5	49	5	5.8	667	57.5	64	6	7.3	635	36.5	26	4	4.6
667	57	63	6	6.8	667	57.5	64	6	7.3	667	51.6	53	5	6
687	67	79	7	9.1	707	73.7	87	7	PHS	667	51.6	53	5	6
653	49.5	49	5	5.8	652	51.6	53	5	6.2	655	45.7	42	5	5.5
716	79.6	92	8	PHS	769	99	99	9	PHS	687	59.8	68	6	8.3
681	64.9	76	6	8.3	693	68.5	81	7	10.2	667	51.6	53	5	6
631	37.7	28	4	4.8	631	40.7	33	4	5.1	630	34.4	23	4	4.3
643	44.1	39	4	5.3	648	49.5	49	5	5.9	635	36.5	26	4	4.6
647	46.3	43	5	5.5	652	51.6	53	5	6.2	640	39	30	4	4.9
681	64.9	76	6	8.3	693	68.5	81	7	10.2	667	51.6	53	5	6
694	70.1	83	7	10	687	66.3	78	7	9.5	705	67.7	80	7	10.7
621	32.3	20	3	3.9	635	42.5	36	4	5.3	598	18.9	7	2	3.1
658	52.1	54	5	6.1	663	55.9	61	6	7	650	43.6	38	4	5.3
591	13.1	4	2	3	605	26.3	13	3	3.4	563	1	1	1	2.3
631	37.7	28	4	4.8	635	42.5	36	4	5.3	625	32.3	20	3	3.9
749	93.3	98	9	PHS	769	99	99	9	PHS	733	81.1	93	8	PHS
711	78.2	91	8	PHS	707	73.7	87	7	PHS	717	72.8	86	7	PHS
702	73.7	87	7	10.8	728	82.7	94	8	PHS	680	57	63	6	7.2
716	79.6	92	8	PHS	743	89.6	97	9	PHS	695	63.5	74	6	9.7
596	17.3	6	2	3.1	598	21.8	9	2	3.2	592	15.4	5	2	2.9
694	70.1	83	7	10	687	66.3	78	7	9.5	705	67.7	80	7	10.7
660	53.2	56	5	6.3	663	55.9	61	6	7	655	45.7	42	5	5.5
603	20.4	8	2	3.3	605	26.3	13	3	3.4	598	18.9	7	2	3.1
623	33	21	3	4.1	628	39	30	4	4.9	614	26.3	13	3	3.5
698	71.8	85	7	10.4	699	70.9	84	7	10.8	695	63.5	74	6	9.7
698	71.8	85	7	10.4	693	68.5	81	7	10.2	705	67.7	80	7	10.7
667	57	63	6	6.8	707	73.7	87	7	PHS	630	34.4	23	4	4.3
716	79.6	92	8	PHS	743	89.6	97	9	PHS	695	63.5	74	6	9.7
667	57	63	6	6.8	667	57.5	64	6	7.3	667	51.6	53	5	6
596	17.3	6	2	3.1	583	13.1	4	2	2.7	614	26.3	13	3	3.5
711	78.2	91	8	PHS	699	70.9	84	7	10.8	733	81.1	93	8	PHS
649	47.4	45	5	5.6	641	45.7	42	5	5.5	661	48.4	47	5	5.7
789	99	99	9	PHS	769	99	99	9	PHS	782	99	99	9	PHS
730	86.9	96	9	PHS	743	89.6	97	9	PHS	717	72.8	86	7	PHS
629	36.5	26	4	4.7	635	42.5	36	4	5.3	620	29.1	16	3	3.7
665	55.9	61	6	6.6	663	55.9	61	6	7	667	51.6	53	5	6
684	66.3	78	7	8.7	676	61.7	71	6	8.1	695	63.5	74	6	9.7
631	37.7	28	4	4.8	641	45.7	42	5	5.5	614	26.3	13	3	3.5
679		**67**		**7.2**	**685**		**70**		**7.1**	**674**		**56**		**6.3**

DNA: Did not attempt

2007 Norms: Fall National

APPENDIX G: EXAMPLE OF SEVENTH GRADE PEARSON STANFORD 10 ACHIEVEMENT TEST RESULTS – MATHEMATICS PORTION 2012-2013

Total Math - Scaled Score	Total Math - Normal Curve Equivalent	Total Math - Percentile Rank	Total Math - Stanine	Total Math - Grade Equivalent	Math Prob Solv - Scaled Score	Math Prob Solv - Normal Curve Equivalent	Math Prob Solv - Percentile Rank	Math Prob Solv - Stanine	Math Prob Solv - Grade Equivalent	Math Procedures - Scaled Score	Math Procedures - Normal Curve Equivalent	Math Procedures - Percentile Rank	Math Procedures - Stanine	Math Procedures - Grade Equivalent	Total - Scaled Score	Total - School Ability Index
703	65.6	77	7	11.1	710	70.9	84	7	PHS	693	55.9	61	6	9.4	669	120
692	61	70	6	9.8	676	57	63	6	8.1	725	67.7	80	7	PHS	681	122
685	58.1	65	6	8.8	687	61.7	71	6	9.5	682	51.6	53	5	7.4	628	98
700	64.9	76	6	10.6	722	77	90	8	PHS	676	49.5	49	5	6.7	688	122
635	33	21	3	5	633	34.4	23	4	5.2	637	33	21	3	4.8	574	71
650	40.2	32	4	5.6	653	44.7	40	5	6.2	647	37.7	28	4	5.2	637	99
654	42.5	36	4	5.8	662	49.5	49	5	6.9	642	35.1	24	4	5	647	110
648	39.6	31	4	5.5	659	47.9	46	5	6.7	632	30.7	18	3	4.4	619	92
703	65.6	77	7	11.1	695	64.9	76	6	10.4	715	64.2	75	6	PHS	692	127
700	64.9	76	6	10.6	700	67	79	7	11.1	700	58.1	65	6	10.2	672	121
685	58.1	65	6	8.8	687	61.7	71	6	9.5	682	51.6	53	5	7.4	630	98
687	59.3	67	6	9.1	665	51.1	52	5	7.1	736	71.8	85	7	PHS	650	111
689	59.8	68	6	9.4	691	63.5	74	6	10	687	53.7	57	5	8.3	696	128
719	72.8	86	7	PHS	722	77	90	8	PHS	715	64.2	75	6	PHS	663	117
662	46.3	43	5	6.4	672	54.8	59	5	7.7	647	37.7	28	4	5.2	596	84
666	48.4	47	5	6.7	669	53.2	56	5	7.5	661	43	37	4	5.7	663	114
706	67	79	7	11.8	705	68.5	81	7	12.8	707	61	70	6	11.1	660	114
728	77	90	8	PHS	716	73.7	87	7	PHS	752	77	90	8	PHS	685	125
728	77	90	8	PHS	739	84.6	95	8	PHS	715	64.2	75	6	PHS	685	124
732	78.2	91	8	PHS	730	79.6	92	8	PHS	736	71.8	85	7	PHS	645	109
709	68.5	81	7	PHS	710	70.9	84	7	PHS	707	61	70	6	11.1	696	132
700	64.9	76	6	10.6	722	77	90	8	PHS	676	49.5	49	5	6.7	685	121
660	45.2	41	5	6.3	659	47.9	46	5	6.7	661	43	37	4	5.7	645	109
738	81.1	93	8	PHS	730	79.6	92	8	PHS	752	77	90	8	PHS	666	116
674	53.2	56	5	7.5	691	63.5	74	6	10	651	39	30	4	5.3		
648	39.6	31	4	5.5	656	46.3	43	5	6.4	637	33	21	3	4.8	645	110
660	45.2	41	5	6.3	662	49.5	49	5	6.9	656	41.3	34	4	5.5	621	90
650	40.2	32	4	5.6	656	46.3	43	5	6.4	642	35.1	24	4	5	616	94
672	52.1	54	5	7.3	672	54.8	59	5	7.7	671	47.4	45	5	6.3	616	94
639	35.1	24	4	5.2	643	39	30	4	5.6	632	30.7	18	3	4.4	586	76
687	59.3	67	6	9.1	679	58.1	65	6	8.4	700	58.1	65	6	10.2	642	107
654	42.5	36	4	5.8	649	42.5	36	4	5.9	661	43	37	4	5.7	663	118
685	58.1	65	6	8.8	705	68.5	81	7	12.8	661	43	37	4	5.7	672	120
751	86.9	96	9	PHS	791	99	99	9	PHS	725	67.7	80	7	PHS	675	122
674	53.2	56	5	7.5	676	57	63	6	8.1	671	47.4	45	5	6.3	663	115
709	68.5	81	7	PHS	705	68.5	81	7	12.8	715	64.2	75	6	PHS	652	110
770	93.3	98	9	PHS	765	93.3	98	9	PHS	778	86.9	96	9	PHS	675	117
672	52.1	54	5	7.3	683	59.8	68	6	8.8	656	41.3	34	4	5.5	647	107
719	72.8	86	7	PHS	716	73.7	87	7	PHS	725	67.7	80	7	PHS	666	116
706	67	79	7	11.8	730	79.6	92	8	PHS	682	51.6	53	5	7.4	672	121
676	54.3	58	5	7.7	679	58.1	65	6	8.4	671	47.4	45	5	6.3	640	104
654	42.5	36	4	5.8	649	42.5	36	4	5.9	661	43	37	4	5.7	623	94
697	63.5	74	6	10.3	695	64.9	76	6	10.4	700	58.1	65	6	10.2	669	118
695	62.9	73	6	10.1	705	68.5	81	7	12.8	682	51.6	53	5	7.4	688	128
616	21.8	9	2	3.7	627	31.5	19	3	4.9	595	13.1	4	2	3	616	94
695	62.9	73	6	10.1	700	67	79	7	11.1	687	53.7	57	5	8.3	675	121
732	78.2	91	8	PHS	730	79.6	92	8	PHS	736	71.8	85	7	PHS	675	122
682	57	63	6	8.4	653	44.7	40	5	6.2	778	86.9	96	9	PHS	616	95
716	70.9	84	7	PHS	739	84.6	95	8	PHS	693	55.9	61	6	9.4	688	122
678	55.3	60	6	7.9	672	54.8	59	5	7.7	687	53.7	57	5	8.3	663	117
689	59.8	68	6	9.4	679	58.1	65	6	8.4	707	61	70	6	11.1	647	104
719	72.8	86	7	PHS	750	86.9	96	9	PHS	693	55.9	61	6	9.4	696	128
723	74.7	88	7	PHS	765	93.3	98	9	PHS	693	55.9	61	6	9.4	660	116
674	53.2	56	5	7.5	662	49.5	49	5	6.9	693	55.9	61	6	9.4	635	104
670	51.1	52	5	7.1	683	59.8	68	6	8.8	651	39	30	4	5.3	658	116
692		**66**		8.2	**693**		**70**		8.6	**694**		**59**		7.4		

N/A: No Score Available
2007 Norms: Fall National