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RESEARCH ARTICLE

The Early Implementation of Common Core State Standards in Mathematics in a Parochial Middle School in North Carolina: A Case Study

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This article reports on research conducted on the implementation of Common Core State Standards in Mathematics at a parochial middle school in North Carolina during the 2012-2013 school year. The study examines the adoption of new curriculum standards in terms of teacher preparation, feelings of self-efficacy and perceived effects on student learning using a case study methodology. The case study provides insight to student learning and teachers' perceived abilities to teach when there is curriculum change. Results of the study may be useful in teacher training and professional development when a new curriculum is adopted.

Keywords: Common Core State Standards, Mathematics, Implementation, Curriculum Change, Student Learning, Self-Efficacy, Teacher Preparation

Over recent years, there has been a general concern about improving student learning in mathematics in all grades of school. The adoption and implementation of Common Core State Standards in Mathematics was a possible solution to this problem. In 2012-2013, students in middle school grades were 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 & O'Day, 2010). In North Carolina, the implementation of the Common Core State Standards in Mathematics was the first change to curriculum standards in over a decade.

Implementing curriculum change can be affected by how teachers believe curriculum should be taught and learned (Roehrig & Kruse, 2005; Roehrig, Kruse, & Kern, 2007). 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 training are often provided to teachers to familiarize them with new curriculum and instructional changes. The process of adopting a new curriculum involves an understanding and implementation of materials and standards and the ability and willingness to adjust one's prior and current belief system. Teacher understanding, experiences, interactions with other teachers and having to adapt to new requirements plays an important role in one's self-efficacy to teach effectively

(McCormick, Ayers & Beechey, 2005) and, in turn, can impact student learning of the curriculum.

Curriculum Change

Curriculum change is inevitable. The national effort to change how and what students learn at each grade level was intended to improve student learning, a large focus being specifically on literacy and mathematics (NGACBP, 2010). Under No Child Left Behind (NCLB), a legislative act initially set in 2001 to continue through 2014, students throughout the United States were expected to achieve grade level proficiency across all subject areas (U.S. 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 has been little evidence that student achievement in mathematics has improved (McNeil, 2011; Murray, 2008; Nichols, Glass, & Berliner, 2005).

Recent changes to kindergarten through twelfth grade curriculum, including mathematics, were intended to make teaching and learning standardized nationally instead of locally (NGACBP, 2010). Full implementation of Common Core curriculum standards took place in 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 intended for teachers to consider their instructional practices to reach all students (NGACBP, 2010).

Research on the implementation of a new curriculum is lacking and that which exists is mixed on how teachers and students respond to the learning expectations placed on them during the initial implementation of national standards (Ding & Navarro, 2004; Holliday & Wassman, 2003; Reys, Reys, Lappan, Holliday, & Wassman, 2003; Ridgway, Zawojewski, Hoover & Lambdin, 2002; Riordan, & Noyce, 2001; Robelen, 2012; Roehrig & Kruse, 2007, 2005; U.S. Department of Education, 2004, 2007). As school districts in North Carolina looked toward Common Core State Standards as a means of improving how and what students learn, teachers were being asked for the first time in almost a decade to change how and what they've taught within specific disciplines.

Studies on curriculum change report mixed findings on how teachers respond and implement new curricula. Teachers 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; Roehrig & Kruse, 2005). Teachers trained in 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 (Ghaith & Yaghi, 1997; Gordon, Lim, McKinnon, & Nkala, 1998).

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 (Reys, Reys, Lappan, Holliday, & Wassman, 2003; Ridgway, Zawojewski, Hoover & Lambdin, 2002; Riordan, & Noyce, 2001; U.S. Department of Education, 2004, 2007). Research on student

performance in mathematics at the initial point of reform can be important in determining the overall effectiveness of curriculum change on student learning and interest in the subject matter.

Common Core State Standards in Mathematics

Forty-three states have now adopted the Common Core State Standards in Mathematics (NGACBP, 2015). Adoption was voluntary. Common Core State Standards in Mathematics is still in its early years of implementation. The standards have been adopted by both private and parochial education based on how the standards fit with the depth, understanding and higher level thinking these schools are trying to emphasize (Robelen, 2012).

The Common Core State Standards in Mathematics are based on what is known about how students' mathematical knowledge, skill, and understanding develop over time (NGACBP, 2010). The standards were a result of behavioral research on learning trajectories and patterns (Confrey, 2012). The standards 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 Standards (Pape & Wang, 2003). 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 new mathematics standards was a higher expectation of student progress each year (Confrey & Maloney, 2011).

Middle school mathematics has to be taught in a way that 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 did not follow this progression of concepts effectively (McNeil, 2011; Nichols, Glass, & Berliner, 2005). The implementation of new standards has made this progression more rigorous with students expected to learn topics at an earlier grade level than before.

PURPOSE OF RESEARCH STUDY

Curriculum change has previously been studied during textbook adoptions and of curriculum taught in the classroom. There is minimal research on curriculum change regarding standards, and of that which does exist, the research is ongoing (Kober & Rentner, 2011). The purpose of this research study was to understand the adoption process and practices of new standards in mathematics during the initial implementation in terms of teacher preparation, perceived ability to teach the new standards effectively, and perceived effect on student learning. The research study was guided by the following questions:

(1) How do sixth and seventh grade mathematics teachers describe the motivation for the implementation of curriculum change in terms of preparation, their self-efficacy, and perceived effects on student learning?
(2) How do school leaders describe the motivation for the implementation of curriculum change in terms of preparation, teacher self-efficacy, and perceived effects on student learning?

THE METHODOLOGY OF RESEARCH STUDY

During the 2012-2013 school year, a case study was conducted at a parochial school in North Carolina. Teacher preparation, self-efficacy, and student performance were studied during the process of curriculum change. The change to Common Core State Standards in Mathematics is a "real-life" everyday practice of teaching and learning new to the parochial school; at the time of the study, other schools across the United States were most likely going through the same change. This case was of understanding "how" educational change occurred within the context of one school where it took place (Yin, 2004).

At the parochial school, middle school administrators and sixth and seventh grade mathematics teachers provided information related to teacher preparation, self-efficacy, and perceptions of student learning during curriculum change. The participating middle school has a similar student and faculty population and mathematics course offerings as those in most independent middle schools. At the time of the study, school enrollment included approximately 287 sixth-grade students, 256 seventh-grade students, and 327 eighth-grade students; approximately 92% of the students in grades being studied were Caucasian. The school has one principal, two assistant principals, one Dean of Students, two guidance counselors and fifty-eight teachers. Faculty racial composition is approximately 87% Caucasian. Mathematics course offerings include general mathematics, pre-algebra, and algebra.

Participants included six teachers, two male and four female, from sixth and seventh grade mathematics class in a parochial middle school. Each teacher held a Bachelor's degree as his/her highest level of education. Two school leaders of the parochial middle school, the Principal and Dean of Students, participated in interviews to provide the context of the school culture during the first year of the implementation of the new mathematics standards. Table 1 describes teachers' years of teaching experience at the participating school. For the purposes of confidentiality and anonymity, teacher participants were 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
Kevin	6-10	11+	11+
Tom	1-5	6-10	1-5
Jill	1-5	1-5	1-5
Beth	6-10	11+	11+
Susan	1-5	1-5	1-5
Ann	6-10	11+	6-10

The setting and study participants were chosen as a purposeful sample. The middle school was going to implement Common Core State Standards in Mathematics in 2012-2013. Administration decided on the timing of implementation based on state implementation; the school typically follows state curriculum guidelines although it is not required. 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 (NCDPI, 2010). Parents and the school community were supportive of the decision to implement the new standards.

The school Superintendent and Principal were interested in improving student performance in mathematics and learning teacher views of teaching new curriculum standards. Administrators describe teachers "at various different levels of their career so (the change of standards) forces everybody to revisit what they were doing." 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.

Qualitative and quantitative data were used in the case study. Qualitative data included interviews and surveys. Interviews with two middle school leaders provided the context of school culture during the adoption and practice of new curriculum standards. Written surveys (adapted from Erdem and Demirel's (2007) Teacher Self-Efficacy Belief Scale) and interview protocols extended from survey items on the Teacher Self-Efficacy Belief Scale (Erdem & Demirel, 2007) were used to collect information from the six teacher participants. Written surveys (adapted from Erdem and Demirel's (2007) Teacher Self-Efficacy Belief Scale), provided context of teacher self-efficacy in terms of preparation, ability to instruct effectively, and understanding how students learn. Surveys included fourteen closed-ended items in a 4-point Likert scale format, from strongly agree to strongly disagree, and were coded to provide description of teacher self-efficacy as "positive" or "high" to "negative" or "low." Quantitative data included standardized achievement and student test scores during the second marking period (October 30, 2012-January 17, 2013). Scores were collected to describe student learning of

mathematics under Common Core State Standards. The description generated from quantitative data intended to show the outcome of student performance and teacher self-efficacy within the event of curriculum change.

Descriptive analyses were conducted from both qualitative and quantitative data collected. Responses from participant interviews and open-ended items on teacher surveys were coded and tabulated in looking for patterns and frequencies within responses. Codes were then placed into pre-determined and emergent categories. Recurring words and phrases generated codes that fit into pre-determined and emergent themes. Table 2 shows the relationship between open- and closed-ended items and areas of the implementation process being studied. 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.

Student grade books were examined to characterize the scope, sequence and assessments of concepts taught by each teacher. Average numerical scores on sixth and seventh grade mathematical concept tests were analyzed to describe student performance in mathematics during the second marking period (October 30-January 17) under new curriculum standards. It was not possible to aggregate or compare student scores across classrooms as teachers did not administer the same assessments. Instead, student data were evaluated in terms of average student performance overall at each grade level. Average scores were calculated for each sixth and seventh grade assessment administered for concepts taught, then divided into categories of well above average (>100), above average (89-100), average, (76-88) and below average (<75), identifying initial student learning under new mathematics standards.

Average mathematics scores from Pearson Stanford 10 standardized achievement tests were reported 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 on three subtests within the Math portion—Total Math, Mathematical Problem Solving and Mathematical Procedures—for all students in grades six and seven of the participating school. 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.

TABLE 2
RELATIONSHIP OF DATE COLLECTION TO CATEGORIES OF STUDY

Data Source	Preparation/Familiarity	Instruction	Student Learning
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	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	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	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?	Q5. How have the new standards affected your approach to teaching mathematics?	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		Pacing and sequencing of mathematics concepts Assessment types and length of instruction on each concept	Scores on quizzes, tests, homework and classwork

RESULTS

The purpose of this study was to understand the adoption process and practices of new standards in mathematics during the initial implementation in terms of teacher preparation, perceived ability to teach the new standards effectively and perceived effect on student learning. Through teacher interviews, self-efficacy surveys, records of student grades on assessments, and standardized tests, teacher perceptions of the initial implementation of Common Core State Standards in Mathematics provided themes pertaining to the categories of teacher preparation, self-efficacy, and perceived effects on student learning. An additional category not anticipated prior to the study was pacing and sequencing of mathematics concepts.

Teacher Preparation Three themes emerged related to preparation: *familiarity, more training*, and *resources*. School leaders at the parochial middle school implemented Common Core State Standards in Mathematics during the 2012-2013 school year. A half-day professional development was provided, designated for mathematics teachers within the school system, to learn of and review the new mathematics standards together. Teachers described their preparation as being "not enough." Although most teachers stated they were familiar with the Common Core Standards in Mathematics, all wished they could have had another day to review them, specifically:

> a full day of all the new standards and have someone come in to help from the state or anyone go over it with us; or even grade specific time with the middle school to see who is doing what and stuff like that.

Teachers referred to the planning meetings held just prior to the start of school and those held during the initial weeks of school as their preparation.

> 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.

During the implementation of the new mathematics standards, teachers relied on resources they had been using for the past three years. Although one teacher felt the textbook was "not user-friendly," all teachers agreed the textbook used for mathematics instruction was

> 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.

School leaders shared that the textbook adoption cycle was anticipated for the following year; teachers would have the opportunity to consider other resource options at that time.

Self-Efficacy. *Comfort level* and *instructional approach* were two themes that described teachers' self-efficacy. Despite feeling a need for more training and time to learn the Common Core State Standards in Mathematics, participating teachers demonstrated positive self-efficacy overall. Teacher responses to interview questions and the self-efficacy survey were

consistent, with most teachers perceiving themselves as having high self-efficacy. Table 3 shows the means and standard deviations for self-efficacy as measure by teacher responses on the self-efficacy survey.

TABLE 3
Means and Standard Deviations of Teacher Self-Efficacy in terms of Preparation, Instruction, and Student Learning

Preparation	Instruction	Student Learning
M (SD)	*M (SD)*	*M (SD)*
3.50 (.35)	3.43 (.41)	3.44 (.29)

Teachers described their abilities to teach mathematics effectively as positive. As Susan reflected:

> 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.

Ann, however, described her abilities to teach under Common Core State Standards in Mathematics slightly different from their self-efficacy responses showed; this teacher was a veteran teacher although new to teaching mathematics.

All teachers adjusted the scope and sequence of mathematics concepts, as determined within their grade level and as intended under new mathematics standards. Although most teachers felt positive in their abilities to teach to new standards, some had changed their instructional approach slightly. Those teachers with less than five years teaching experience had to "rethink" their instruction. Instead of just being direct teaching like we learned the old school way, definitely going back and having the kids do more critical thinking." Teachers with more years of experience were teaching as they had in the past:

> 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.

All teachers described wanting to "push students all the way through, to that next level and really reinforce" the critical thinking intended by the mathematics standards.

Perceived Effects on Student Learning. Student scores were analyzed descriptively in learning student performance on mathematics concepts under Common Core State Standards in Mathematics. 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 on assessments covering integers also showed to be low. Mathematics concepts, such as fractions and integers as well as basic multiplication skills—fundamental topics needed to acquire before entry to algebra were still a challenge for these grade levels.

Responses from teacher interviews on perceived effects on student learning generated two themes: *no effect* and *critical thinking*. Teachers believed there was no effect on student learning at the time of the study. Kevin shared:

> 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.

Student learning was perceived as 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. Students were coming in from different schools with different learning levels as seen in most middle schools. Teachers found that trying to get all students on the same "page," as intended by the new standards, created even more of a separation between "those that can and those that can't."

> 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.

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. 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. Overall, student performance among sixth and seventh graders on subtests within the Math subtests (Mathematical Problem Solving, Mathematical Procedures and Total Math Ability) 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 subtests, an average score of 7.19 in the Total Math subtest and 7.14 in Mathematical Problem Solving. Performance was at grade level on the subtest of Mathematics Procedures with an average score of 6.29. Results on all three subtests were very similar to results on all three subtests of the 2011-2012 test. However, Total Math and Mathematical Problem Solving average scores were slightly higher during the study year. Average Percentile Rank for the sixth grade students also showed mathematics performance to be slightly higher than the previous year. Mathematical Problem Solving at a higher percentile rank than other mathematics subtests, although all three subtests were above the national norm. Table 4 shows a comparison of the mean Grade Equivalent and standard deviations for sixth grade student performance across the three mathematical subtests between the school years of 2011-2012 and

2012-2013. Figure 1 shows the mean Grade Equivalent for sixth grade student performance for the two years. Table 5 shows the mean Percentile Rank and standard deviations for sixth grade student performance across the three mathematical subtests. Figure 2 shows the mean Percentile Rank for sixth grade student performance.

TABLE 4
Comparison of Sixth Grade Average Grade Equivalent Scores on Pearson Stanford 10 Achievement Test – Math Portion Subtests for 2012-2013 and 2011-2012 school years

School Year	Average Grade Equivalent Score for Total Math	Average Grade Equivalent Score for Mathematical Problem Solving	Average Grade Equivalent for Mathematical Procedures
	M(SD)	M(SD)	M(SD)
2012-2013	7.19 (2.33)	7.14 (2.07)	6.29 (2.17)
2011-2012	7.08 (2.18)	7.57 (2.11)	6.08 (2.20)

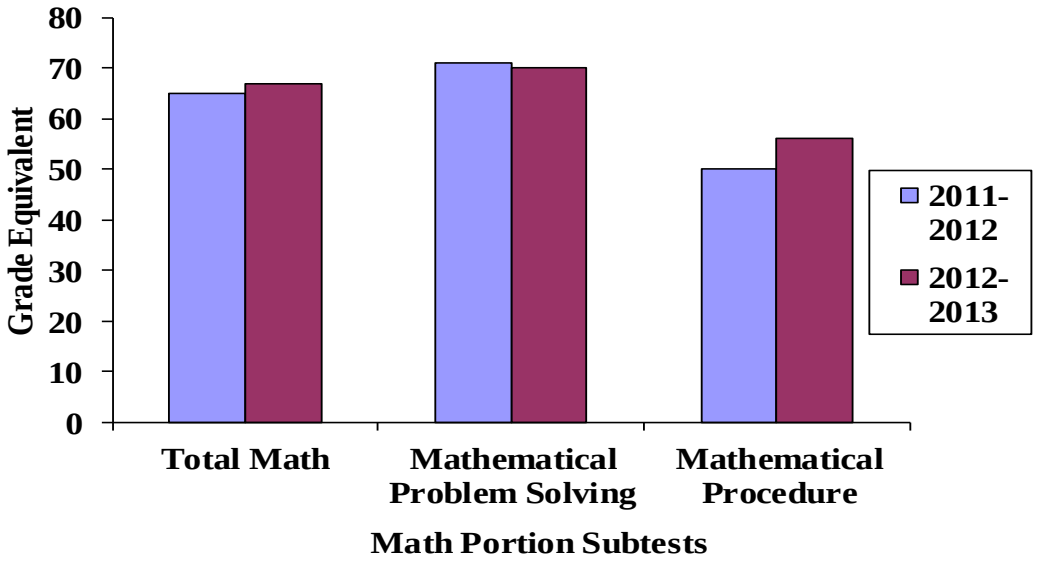

Figure 1. Comparison of sixth grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Grade Equivalent averages

TABLE 5
Comparison of Sixth Grade Average Percentile Rank Scores on Pearson Stanford 10 Achievement Test – Math Portion Subtests for 2012-2013 and 2011-2012 school years

School Year	Average Percentile Rank for Total Math	Average Percentile Rank for Mathematical Problem Solving	Average Percentile Rank for Mathematical Procedures
	M(SD)	M(SD)	M(SD)
2012-2013	66.87 (25.50)	70.20 (23.88)	55.58 (26.32)
2011-2012	64.59 (24.59)	70.54 (21.91)	49.51 (25.75)

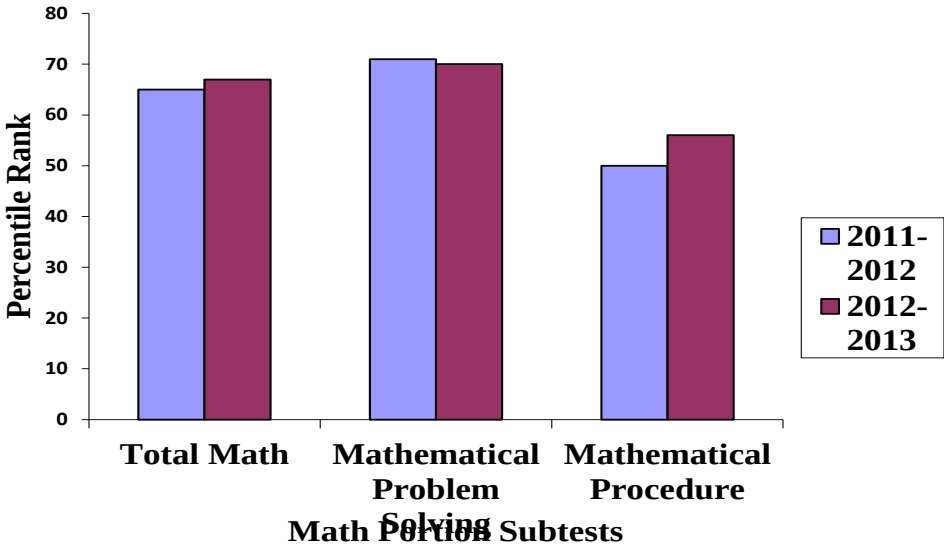

Figure 2. Comparison of sixth grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Percentile Rank averages

These findings are consistent with sixth grade teacher perceptions on student learning; there was no noticeable effect on student learning under Common Core State Standards in Mathematics at the time of the study compared to the previous year. 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 Grade Equivalent averages on all three mathematics subtests of the 2012-2013 Pearson Stanford 10 achievement test to be similar, although slightly higher, to those obtained on the 2011-2012 test. Seventh grade students performed above grade level on Total Math ability (8.18) and Mathematical Problem Solving (8.59), at grade level on the Mathematical Procedures (7.42) subsection of the 2012-2013 Pearson Stanford 10 achievement test. The Average Percentile Rank for seventh grade students indicated above average performance, and slightly higher, in all subtests compared to 2011-2012 average scores. These results show seventh grade students continue to rank above the national norm and slightly higher than the year prior. Table 6 shows a comparison of the mean Grade Equivalent and standard deviations for seventh grade student performance across the three mathematical subtests between the school years of 2011-2012 and 2012-2013. Figure 3 shows the mean Grade Equivalent for seventh grade student performance for the two years. Table 7 shows a comparison of the mean Percentile Rank and standard deviations for seventh grade student performance across the three mathematical subtests between the school years of 2011-2012 and 2012-2013. Figure 4 shows the mean Percentile Rank for seventh grade student performance across the two years.

TABLE 6
Comparison of Seventh Grade Average Grade Equivalent Scores on Pearson Stanford 10 Achievement Test – Math Portion Subtests for 2012-2013 and 2011-2012 school years

School Year	Average Grade Equivalent Score for Total Math	Average Grade Equivalent Score for Mathematical Problem Solving	Average Grade Equivalent for Mathematical Procedures
	M(SD)	M(SD)	M(SD)
2012-2013	8.18 (2.05)	8.59 (2.20)	7.42 (2.22)
2011-2012	7.69 (2.05)	8.45 (2.21)	6.66 (2.21)

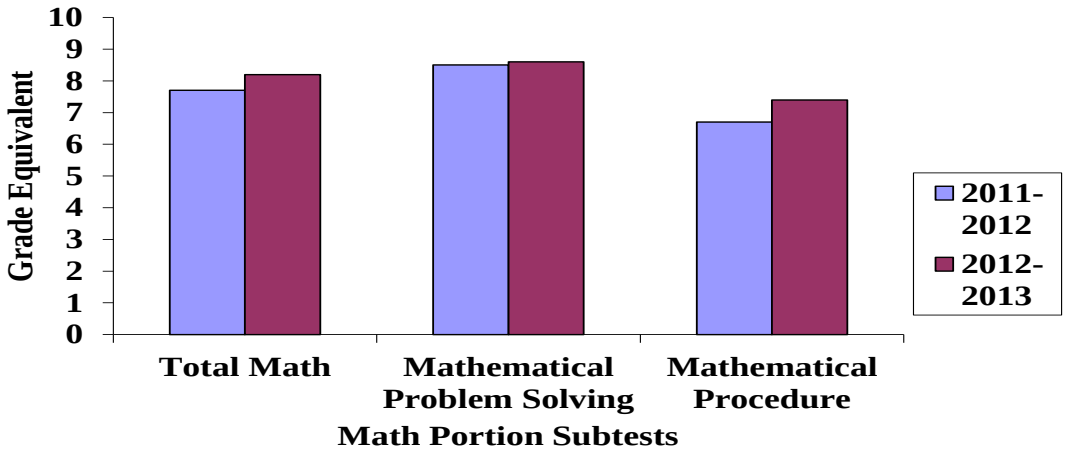

Figure 3. Comparison of seventh grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - Math portion Grade Equivalent averages

Table 7
Comparison of Seventh Grade Average Percentile Rank Scores on Pearson Stanford 10 Achievement Test – Math Portion Subtests for 2012-2013 and 2011-2012 school years

School Year	Average Percentile Rank for Total Math	Average Percentile Rank for Mathematical Problem Solving	Average Percentile Rank for Mathematical Procedures
	M(*SD*)	*M*(*SD*)	*M*(*SD*)
2012-2013	66.21 (21.14)	69.66 (20.33)	59.00 (22.33)
2011-2012	60.24 (22.83)	68.01 (21.40)	47.90 (22.93)

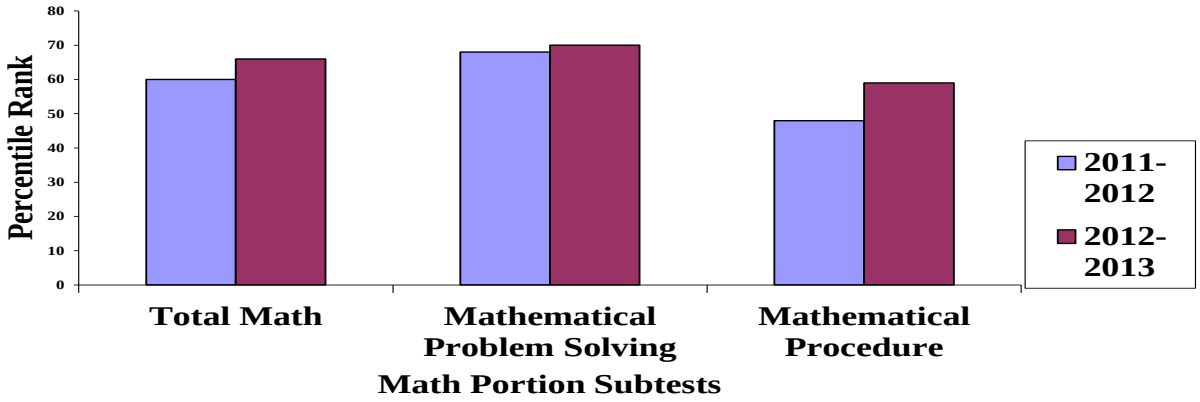

Figure 4. Comparison of seventh grade student performance 2011-2012 and 2012-2013 Pearson Stanford 10 achievement test - math portion Percentile Rank averages

At the time of the study, seventh grade 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 continue to 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 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.

Teachers did describe a change to student learning in the classroom. The critical thinking expected by the new mathematics standards by students improved during classroom activities. Beth shared "the more complex critical thinking has really pushed the kids to form multiple ideas and not be bogged down with just one right answer." Teachers were mixed on whether the new mathematics standards would affect student learning a 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.

Sequencing and Pacing of Instruction. An additional category, not originally considered for the study, emerged from school leader descriptions of the school culture as well as teacher interviews and student grades. Two themes were generated: *depth* and *flexibility*.

The school culture was one where teachers had the authority to sequence concepts to be learned by students as they felt appropriate as long as the scope of what needs to be covered at each grade level is addressed. All teachers stated there was a scope and sequence of Common Core State Standards in Mathematics for them to follow. Kevin compared the new standards to previous mathematics standards:

> 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.

Prior to and during the implementation of Common Core State Standards in Mathematics, mathematics teachers met weekly within their grade level to determine the sequence of mathematics concepts based on what students needed to learn before moving to the next grade. During the implementation, teachers continued to guide the sequence of concepts to be taught as they felt appropriate for their students. Jill described teachers' approach to covering expected topics:

> 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.

Teachers 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 reflected the flexibility teachers have in pacing and sequencing their mathematics instruction.

CONCLUSIONS

This case study, using both quantitative and qualitative descriptive research, described the efforts of one parochial middle school in North Carolina in implementing the Common Core State Standards in Mathematics. Findings and conclusions from the study are based on perceptions collected from sixth and seventh grade mathematics teachers of that school. The participating school is one within over 100 Roman Catholic dioceses adopting these new standards (Robelen, 2012).

The case 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. The sixth and seventh grade mathematics teachers seemed confident in their instructional approach and abilities for student learning to occur. The school culture may have allowed for an easier implementation of the Common Core State Standards in Mathematics in terms of teacher self-efficacy.

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. However, student learning during classroom activities was described as being demonstrated differently from mathematics learning under previous mathematics standards. Students were described as talking more, collaborating, and generating multiple ideas and solutions during classroom activities. This behavior demonstrates the critical thinking intended by the new mathematic standards. Conducting the study during the initial implementation year, it is hard to conclude whether the new mathematics standards would affect student learning in the future or if the school or classroom culture would be the influence.

It is necessary to consider limitations before automatically extending the case study findings to every situation, practice, or process involved in curriculum change. Findings may differ in other schools, private, and public. Findings and conclusions from this case study can benefit the participating middle school's leaders and the school system but also other school settings of similar culture.

At the time of the study, one teacher had arrived to their interview after being evaluated by a school administrator. Although her first observation of the school year under new mathematic standards, Jill's interview responses suggested she felt comfortable teaching the new standards given the limited preparation teachers were provided. 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.

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. Study findings are from the initial implementation year and should be considered as such. 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. 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. Additional research on the implementation of Common Core standards, such as longitudinal studies and in other school settings, can add to the baseline data provided by this study in determining best practices toward improved student learning and teacher preparation during curriculum change.

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