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# Teacher Perceptions on Changing Instructional Practices in Mathematics with the Implementation of the Common Core State Standards

Esther M. Underwood
*Dominican University of California*

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Esther Underwood

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School of Education and Counseling Psychology
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**Changing Instructional Practices in Mathematics**

## Signature Sheet

This thesis, written under the direction of the candidate's thesis advisor and approved by the Chair of the Master's program, has been presented to and accepted by the Faculty of Education in partial fulfillment of the requirements for the degree of Master of Science. The content and research methodologies presented in this work represent the work of the candidate alone.

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| Esther Underwood<br>Candidate | Date<br>December 1, 2015 |
| Madalienne F. Peters, Ed.D.<br>Thesis Advisor | Date<br>December 1, 2015 |
| Elizabeth Truesdell, Ph.D.<br>Program Chair | Date<br>December 1, 2015 |

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# Changing Instructional Practices in Mathematics

## Abstract

As schools across the U.S. begin to implement Common Core State Standards in Mathematics (CCSSM), teachers must shift their instructional practices from a traditional emphasis on procedures and algorithms to a conceptually based model in which students engage more meaningfully with mathematical concepts. The purpose of this study is to examine participants' perspectives about the influence of CCSSM on their instructional practices, and the challenges they face in effectively implementing these changes. The literature reveals the need for professional development, standards aligned materials, and ongoing support of teachers in order for them to make substantial changes to their instructional approach. The study's sample group consists of eleven K-8 teachers in a rural Northern California school. In this quantitative study, participants completed a short survey detailing their instructional shifts, and the challenges and successes they experienced in moving from procedures and practices to a more conceptually based instructional approach. Results indicate that participants are making instructional changes in mathematics; however, they report that their progress is being hampered by lack of quality professional development and CCSSM aligned curriculum.

Keywords: Common Core State Standards in Mathematics (CCSSM), conceptually based model, collaboration, professional development.

# Chapter 1 Changing Instructional Practices in Mathematics

In early September 2012, thirteen faculty members sat around a table at a staff meeting in an elementary school in the San Francisco Bay Area. On the agenda were several issues that teachers felt were a priority to discuss. At the top of the list was the impending implementation of the Common Core State Standards (CCSS) in both English Language Arts and Mathematics. Lacking CCSS aligned curriculum and professional development, teachers were concerned that they were not prepared for the coming changes. The principal dismissed this concern, commenting to the staff that there was no need to worry about that now since 2013-14 was a transitional year and full implementation was not expected until 2014-2015.

Fast forward to September 2013. Teachers were expected to begin familiarizing themselves, and experimenting with CCSS math curricula. A committee was formed to research mathematics materials the state of California was considering adopting. In the meantime, each teacher began to research, order, and implement various mathematics programs, this resulted in each K-8 teacher doing something different, with little discussion among them as to what math content and instruction should look like across grade levels.

The school district hired a consulting firm to provide district-wide professional development on the major shifts in English Language Arts (ELA) and mathematics in the CCSS. After two days of training were complete, an overwhelming majority of staff members expressed the opinion that the mathematics' training was of little help in moving them closer to

understanding exactly what the CCSSM look like in practice. In May of 2014, the mathematics curriculum review committee reported back that the County Office of Education did not recommend purchasing any curricular materials in mathematics, as publishers have not yet released CCSS aligned textbooks. By June 2014 with no curriculum and little training, the staff felt no more prepared for full implementation of the CCSSM in the approaching school year.

**Statement of Problem**

The implementation of CCSSM requires a deep understanding of the standards, mathematic concepts, pedagogical approaches, and instructional shifts, called for by the newly adopted standards (Marzano Center Teacher and Leadership Evaluation, n.d.). Creating profound shifts in practice and understanding is difficult and requires sustained effort on the part of all stakeholders. Districts and school sites must be diligent about selecting CCSSM aligned instructional materials, training their teachers in their use, and clearly articulating and supporting instructional change in classrooms (Achieve, 2012). Without a thoughtful, systematic plan for implementation that includes in-depth, ongoing professional development, and time for teacher collaboration, teachers may be unable to shift their instructional practices in an effective and meaningful way.

This study documents the experience of a select group of teachers' views on CCSSM to support claims in the problem statement, and presents a survey of the barriers to implementation as seen by the participants. The study adds to the literature by providing further insight into the impact of CCSSM on teachers' instructional practices from the instructor's point of view. The survey also identifies specific shifts in the methods and approaches to teaching mathematics that

instructors have undergone as called for by the developers of the CCSSM. It also substantiates previous literature on the barriers that are present at the district and school site levels that make changes challenging for classroom teachers when attempting to implement new content standards.

**Statement of Purpose**

The purpose of this study is to examine K-8 educators perceptions of how CCSSM is influencing their instructional practices. Research suggests that the success of standards reform movements depends upon the interpretation and implementation at the classroom level (Spillane, 2005). It is therefore essential to identify teachers' perspectives and understanding of the standards they must teach, and how the standards inform their teaching pedagogy. This study also considers the key components that support the transition and use of new instructional practices to achieve the overarching goals of the content and practice standards outline in the CCSSM.

**Research Questions**

In designing research questions for this study, it is important to consider participants' understanding of the new content standards, their depth of knowledge of mathematics, their attitude toward the adopted standards, and finally, the support in terms of professional development and curriculum as they attempt to make instructional changes. In summary, the process includes recognition of the scaffolding necessary to support the second order change, beyond a surface change, that is part of changing the approach to teaching.

Questions for the present study include the following:

What are participants' perspectives on changing instructional practices with the implementation of Common Core State Standards in mathematics? What factors influenced changes in instructional practice?

Definition of Terms

Instructional practices refer to the methods teachers utilize in the classroom to move students forward in their learning. Classroom discussions, differentiation, and use of concrete learning tools are examples of classroom practices.

CCSS is a set of voluntary academic standards in mathematics and English language arts/literacy, which have been adopted by over 43 states and the District of Columbia. They explain the knowledge and skills students must have at each grade level, Kindergarten through 12th grade (California Department of Education, 2015, b). The CCSSM also include the Eight Mathematical Practice Standards which "address both 'habits of mind' that students should develop to foster mathematical understanding and expertise and skills and knowledge…" (California Department of Education, 2013, p. 2).

Procedural mathematical knowledge involves knowing the steps or discrete skills involved in solving a problem. Knowledge of rules, algorithms, and procedures are examples of procedural knowledge (Ber-Hur, 2006).

Conceptual mathematical knowledge differs from procedural knowledge in an important way. Conceptual knowledge is the why behind the how. "Conceptual knowledge involves the

ability to understand concepts and recognize their application in various situations" (Ber-Hur, 2006, p.3, para. 8).

**Theoretical Rationale**

This study is rooted in the fundamental question of how to bring about deep, meaningful change that will be sustained over time. Over the past several decades school reform movements have sought to improve educational outcomes for millions of students across the country, standards reform being one of them (Consortium for Policy Research in Education, 1993). The adoption of a new set of educational standards in the U.S. calls for second-order change at an organizational and individual level. Second-order change demands a complete transformation of how something is done and requires new learning in order to change the status quo (The National Academy for Academic Leadership, n.d.).

Fullan's (2006) examination of change theory, or more specifically, theory of action provides insight into the process that districts, schools, and teachers undergo as they attempt to apply new pedagogy and academic standards. Change comes from a shifting of attitudes, gaining new information, and time to reflect and then adjust one's practice. The process of creating change takes place in the context of a school's culture; therefore social interactions and collaboration amongst teachers greatly influences the degree of change. Successful instructional change often includes professional learning communities where teachers are provided with time to collaborate with colleagues to enhance the process of sense making as they engage in new practices. Once the desired changes are articulated and understood in terms of classroom practice,

teachers must be continuously evaluated, and provided feedback and support in maintaining these changes.

In order to achieve a long-term goal of change, school leaders and teachers must have a clear understanding of educational policy behind the implementation of the CCSSM. This process is intended to clearly delineate the steps that a district and school need to support educators in bringing about the desired change in instructional practices (Achieve, 2012). This process includes identifying what is being done in schools and classrooms at present, what shifts need to occur, and then providing the ongoing professional development that is required to produce a common understanding and the desired results (Spillane, 2005; Spillane, Halverson, & Diamond, 2001).

**Assumptions**

This study assumes that teachers are attempting to make changes to the way they teach mathematics with the implementation of CCSSM. The researcher began this process with the assumption that participants would struggle with implementing substantial changes in instructional practices. Since the study relies on the self-reporting of teachers' perception of change, there is an assumption that teachers will be critical self-evaluators and honest reporters of their instructional practices. This study also assumes that a random approach by school districts and individual schools within a district has a negative impact the effectiveness of CCSSM implementation and shifts in instructional practice. For example, schools that lack a clear vision of professional development for teachers focused on understanding standards and new curriculum as well as shifts in instructional practice and classroom implementation of

standards, will lack consistency and efficacy in changing teachers' instructional practices. Therefore, the goal of long lasting and meaningful change will be impacted.

**Background and Need**

The National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO), who wanted to promote "fewer, clearer, higher" internationally benchmarked content standards that promoted 21st Century skills, led the development of the CCSS. This movement came out of concern over U.S. student performance outlined in two international studies the Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA). U.S. students performed in the 17$^{th}$ percentile in reading, 27$^{th}$ percentile in math, and 20$^{th}$ percentile in science compared to their international peers on the 2012 PISA (California Department of Education, 2014). According to the California Department of Education (2014), teachers are meant to address these concerns through the CCSS by teaching critical thinking and problem solving skills. The new CCSS outline three major shifts in mathematics that are intended to improve student performance: focus, coherence, and rigor. In an important body of work, Rothman (2013) identifies four important features of the standards in mathematics that distinguish them from previous standards: fewer standards allowing in-depth mastery, a coherent sequence both within and across grade levels, emphasis on mathematical reasoning to strike a balance between proficiency with procedures and conceptual understanding, and the inclusion of mathematical practices. Schmidt's study (Achieve the Core, 2014) of U.S. mathematics standards prior to CCSS found that the standards were "a mile wide and an inch deep," but that CCSS make a significant departure from this model with fewer topics

that allow for greater mastery with less repetition. As past studies focused on standards instructional policy reforms have shown, in order for standards implementation to orchestrate change in classroom practices teachers must be provided with the proper supports. This includes, but is not limited to short and long term plans to support change and deliberate learning and practice with reflective feedback in order for teachers to master new approaches (Achieve, 2012; Spillane, 2005).

Though research on the successful implementation of the CCSSM is just beginning to emerge, what is available, clearly points to the need for well-planned systematic implementation, which includes substantial professional development. In order to help all students prosper, school leaders, teachers, and parents must work together to create a new vision of our public schools framed by the Common Core State Standards. Teachers must collaborate to identify student needs, and create rigorous curriculum and formative assessments that guide instructional practices in the classroom while at the same time providing learning scaffolds for English Language Learners, Students with Disabilities, and other struggling students (Manley & Hawkins, 2013).

In a recent survey Schmidt (2013) emphasized that full potential of CCSS in mathematics would not be realized if they were not implemented well, and noted that teacher preparedness was an area of concern with only 50% of teachers in grades 1-5, and 60% of teachers in grades 6-8 feeling well prepared to teach common core mathematics standards. During a presentation of Schmidt's findings, Michael Cohen, President of Achieve later reiterated this point, "Because the Common Core State Standards demand such a fundamental shift in classroom instruction, if implemented well, they will increase student achievement and close achievement gaps. We must

now focus on supporting our teachers and the education community as they work toward full implementation across all grades." (Achieve, 2012)

In light of the importance of teacher preparedness as a key element of effective implementation of the Common Core Standards in Mathematics, this study will provide useful data on the perceptions of teachers in their first year of implementing these new mathematics standards.

**Summary**

The CCSS hold great promise in raising the academic achievement of all students in the nation, but standards alone will not create success. School leaders and teachers must be knowledgeable about the standards and what they mean for instructional practices in the classroom. Teachers are integral in helping students meet the rigorous requirements of the new Common Core standards. In order for teachers to satisfy the demands of focus, coherence, and rigor that the CCSS call for, they must examine their current practices, identify effective strategies that are currently used, and then adjust or add pedagogical approaches that guide students to mastery of mathematical content. Teachers must be empowered through quality professional development that builds their content knowledge, provides guidance in meaningful collaboration within and across grade levels, and supports the development and use of formative assessments.

# Chapter 2 Review of the Literature

## Introduction

The researcher utilized peer reviewed research articles obtained from scholarly databases. Articles from reliable reporting agencies and educational research organizations were also used to provide background on the topic. Web based educational resources aimed at providing educators with open teaching sources that illustrate mathematical shifts in classroom practices were used by the researcher as well.

During the 1990s many states enacted standards-based reforms in an attempt to improve public schools based on the belief that high standards are necessary to improve schools. However, past research has found that top-down standards that are vague and unclear, with maligned assessments, impeded school improvement and student learning outcomes. Proponents of the new the Common Core State Standards hope this standards movement will be different. In order to assure greater success at the school and classroom level, massive collaborative efforts are underway by states to create curriculum and design professional development to support school districts with implementation (Rothman, 2013). With a majority of states in the U.S. adopting CCSS, it is the first time that a common baseline for academic knowledge and skills that also align with high quality international standards, has been established (Partnership for 21st Century Skills, 2011). With common standards across the country as well as the digital tools to collaborate and share expertise and resources, there is much greater potential for these new standards to impact classroom practices and student learning outcomes in a significant way. This section is an examination of the research literature on the development and implementation of

the CCSS as a standards reform movement, the major shifts in mathematics standards and instruction that these standards call for, and the factors that must be present in a school or district culture to support long-term, significant change. New academic standards are just the beginning of educational reform. Since classroom instruction is one of the most important factors in student success, meaningful change depends deeply on what is happening at the classroom level.

## Historical Context

### *Formation of the Common Core*

With academic standards varying in quality and rigor from state to state, and U.S. students' academic performance stagnating or dropping, a reform effort aimed at improving achievement levels for students across the country was developed. The Common Core State Standards Initiative (2015b) is being led by two organizations, the National Governors Association Center for Best Practices (NGA) and the Council of Chief State School Officers (CCSSO), which represent the nation's governors and education commissioners. Bidwell (2014) emphasizes the collaborative effort of teachers, parents, school administrators, state leaders, and experts from across the country, in the development of the CCSS. When deciding what exactly should be included in the language arts and mathematics standards, the authors relied on over a decade of research as well as the input and feedback of national organizations such as the International Reading Association, American Federation for Teachers, National Council for Teaching Mathematics, and the National Education Association. The mathematics standards draw on scholarly research, and on "findings from TIMSS and other studies of high-performing countries that the traditional US mathematics curriculum must become substantially more

coherent and focused in order to improve student achievement," (Common Core State Standards Initiative, 2015b, para.12). Common Core standards in Language Arts and mathematics were developed with the goal that all students would gain the cognitive and social skills that would enable them to deal with the complex challenges of the future as well as enter college and careers with the skills to succeed. With a majority of states in the U.S. adopting the CCSS, a common baseline for academic knowledge and college readiness skills that also align with international benchmarks, has been established for the first time.

Implementation, and the development of curriculum and materials used by teachers to implement the standards, has been left up to individual states. With the onus on states and local districts to develop quality curriculum and materials that align with Common Core, states have dedicated a tremendous amount of energy into developing professional development and online resources for districts and teachers (Rothman, 2013; Manly & Hawkins, 2013). Yet despite the time and money invested in providing resources to help teachers make the transition, as of 2015, districts across California are still without state adopted textbooks that are Common Core aligned. This is problematic since many school leaders and teachers understanding of standards is highly influenced by state and district adopted curricula (Spillane, 2005).

## Review of Academic Research

### *Common Core Math Standards*

Schmidt (2012), founder and director of the Center for the Study of Curriculum, and co-director of the Education Policy Center, conducted research in which he compared the rigor of the Common Core Standards in Mathematics, to other nations who have high performing

students in mathematics, giving them a grade of A+ in comparison. When contrasting previous US mathematics standards and curriculum to that of other top-performing nations, Schmidt and his colleges found that the US standards were "a mile wide and an inch deep." The new CC standards, he argues, are clearer, more focused, and more coherent across grade levels. In a briefing sponsored by Achieve (2012) Schmidt presents findings of a survey conducted by himself and his colleagues, which directly relates to the instructional practices of teachers. This survey is cited in a great deal of literature about common core implementation because it points to the fact that few teachers feel prepared to implement the new standards. Schmidt points to teachers' lack of mathematical background and understanding of the instructional shifts. Misinterpretation of standards and teachers' lack of background has negatively impacted student outcomes in the past and is therefore very relevant to the task of CCSSM implementation.

In an interview in *Education Next* (2012), Ze'ev Wurman, former U.S. Department of Education official, and W. Stephen Wilson, professor of mathematics at Johns Hopkins University who served on NGA-CCSSO Common Core standards feedback group, don't agree with Schmidt's assertion that the CCSSM are "fewer, higher, and clearer". Wurman argues that though the standards are of higher quality than many states, they fall short when compared to previous mathematics standards in states such as California and Minnesota. Wilson affirms Wurman's assertion that the CC mathematics standards are not superior to those they are replacing in California, the District of Columbia, Florida, Indiana, and Washington, but are far superior to previous math standards in more than 30 other states. Wilson also asserts that a focus on arithmetic, fact fluency, and knowledge of standard algorithms continues to be important, and that CCSSM do well with both, but Wilson criticizes standards that were developed by NCTM,

which have heavily influenced Common Core Mathematical Practices. He argues that mathematical practices should be imbedded in the context of learning mathematics, and that they are no more important than the content standards. Though they may be imperfect, there are many proponents of the Common Core Standards in mathematics who feel that the standards provide an opportunity to improve education for millions of American Students.

Manley and Hawkins (2013), claim that with the implementation of the new Common Core State Standards (CCSS) there is the potential for greater focus on equality for all students. Authors argue that academic achievement in the U.S. has declined as wealth has become more concentrated, but the CCSS hold the promise of promoting success for all students nationwide, despite the wealth disparity, because they are common set of far more rigorous standards than many of the poorest states had previously. The authors lay out a roadmap for implementation, which details the roles of school leaders, teachers, and the greater school community in helping make the transition to common core standards successful. A great deal of emphasis is placed on the need for quality curriculum developed at a local level along with formative assessments that inform the daily instructional practices of teachers. The blueprint for implementation that Manly and Hawkins' provide, point to the importance of targeted professional development that empowers teachers to make significant changes to their teaching practices. These authors are proponents of the CCSS because they believe the standards have the potential to level the playing field, and will help overcome issues of poverty.

### *Instructional Shifts*

Achieve the Core (2014) was founded by Student Achievement Partners, a nonprofit organization. It was created by some of the lead writers of the Common Core State Standards

(CCSS), David Coleman, Susan Pimental, and Jason Zimba, to provide free digital tools and resources to teachers and school leaders to assist them in implementing the CCSS efficiently and effectively. Resources include research articles, news articles, CCSS aligned exemplar lessons, assessments, and professional development. The website provides resources that focus on helping school leaders and teachers thoroughly understand and carry out the three main shifts call for by the CCSS in mathematics: focus, coherence, and rigor. Rather than teachers attempting to briefly cover a myriad of mathematical topics, focus demands that fewer topics be covered with a greater depth that leads students toward mastery. "We focus deeply on the major work of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the math classroom" (Achieve the Core, 2014, para.1). Documents that specify the content standards teachers should focus on at each grade level are available to facilitate this process. Coherence is described as linking concepts across grades so that teachers are able to build on students' previous understanding. The logical progression of concepts taught across grade levels facilitates teachers' ability to focus on the major concepts that are important in grade level cluster, such as arithmetic in K-5. Coherence also refers to linking concepts within a grade level. Major concepts such as multiplication of whole numbers in fifth grade, is extended to fractions, decimals, area, and volume. Another major shift is rigor. Rigor, though often thought of in terms of challenge, also indicates the need of students to understand and apply mathematics in a variety of ways. Rigor is described as the pursuit of conceptual understanding (place value), procedural skill and fluency (quick and accurate math fact recall), and the application of mathematics to problem-solving situations across subject matter with equal intensity (Achieve the Core, 2014).

## Changing Instructional Practices in Mathematics

Rothman (2013) states that Common Core State Standards have the potential to significantly change the way teachers teach. In his book, he lays out the historical context that led to the development of the Common Core State Standards, identifies four important shifts in Mathematics instruction that need to be made by teachers as they implement the CCSS, and identifies key challenges that states face during the transition to these national standards. The first of the shifts in mathematics that he describes is teachers having fewer standards to focus on, especially at the elementary level, allowing them to go more in-depth with topics. The second shift Rothman describes is how teachers can develop coherence both within and across grade levels by following the progressions that are provided in the Common Core standards materials. If followed, teachers will be able to rely on and build upon students' prior mathematical knowledge. The third shift, which Rothman claims will put an end to the "math wars," is a greater balance between procedural fluency, conceptual understanding, and an emphasis on problem solving. The fourth shift in mathematics is the addition of the eight Mathematical Practices which Rothman states emphasize ways of doing mathematics, or mathematical habits. One of the major hurtles that teachers face in the implementation of the standards is their understanding of them and what that implies for instruction. This understanding Rothman claims, comes from quality professional development and support for teachers.

### *Change Theories*

Common Core mathematics standards call for a significant departure from current practice, and are meant to contrast sharply from previous standards with a greater balance between procedural knowledge and conceptual understanding (Rothman, 2013). Changing classroom practice is not always easy; it involves a great deal of understanding, collaboration,

and trust. Understanding research on creating and sustaining systematic change is therefore important.

Kritsonis (2004) summarizes and compares five change theories: Lewin's Three-Step Change Theory, Lippitt's Phases of Change Theory, Prochaska and DiClemente's Change Theory, Social Cognitive Theory, and Theory of Reasoned Action and Planned Behavior. The author argues with rapid societal and cultural changes, effective processes for implementing change within organizations must be continually researched using either one, or a combination, of the theories outlined in the paper. The author argues that change theory must take into account self-efficacy in order to result in successful change. As a wide body of research illustrates, elf-efficacy and motivation play a key role in changing instructional practices. More recent educational scholars, as applied to educational reform, explore change theory, more in depth.

Fullan's (2006) work examines the importance of change theory and "theories of action" as applied to education reform with greater depth. He argues that in order for change to occur, people must make their theory of action explicit to those implementing the change. The paper focuses on three main ideas: (1) inadequate change theories that do not bring about the desired instructional changes in classrooms; (2) effective theories of action that facilitate desired change, and why that is; and (3) using "change knowledge" to identifying barriers that may get in the way of deep, systematic change. The most effective change models outlined in this paper include seven key premises. The most important premise of change is motivation. The other six premises outlined by Fullan (2006) directly support and influence participants' motivation. A second premise is capacity, with a focus on results. Capacity building involves the "collective effectiveness of a group to raise the bar and close the gap of student learning" (Fullan, 2006, p. 9). Those participating in change must develop new capacities if they are to sustain change

overtime. These new capacities are developed through learning in context, the third premise in an effective change model. Professional development that is imbedded in daily classroom practices of teachers in which there is a continuous loop of observation, feedback, and discussion in order to sustain learning. The opportunity for reflective practice is fundamental for growth, and eventually leads to changing the context itself. This leads to the fourth premise: changing context. Changing context refers to the larger context where there is collaboration between schools and school districts, where shared visions are developed. Premise five, a bias for reflective action, is directly related to learning in context. This premise states that, "people learn best through doing, reflection, inquiry, evidence, more doing and so on" (Fullan, 2006, p. 10). The last two premises reflect the importance of collective and sustained effort by schools and their communities, districts, and the state. Adequate support and time for reflection and adjustment must be given in order for change to occur. With the enormous transformations being asked of educators with the implementation of CCSS, persistence and flexibility become key factors for change.

Achieve's (2012) website, a nonprofit, bi-partisan organization dedicated to providing information and supports for the implementation of CCSS, details recommendations for effective implementation of the Common Core State Standards in mathematics and English language art/literacy. Organizations such as Achieve, call for states and districts to fundamentally rethink their education systems by abandoning former ways of approaching standards reforms in favor of a more thoughtful, and systematic approach that leads to lasting and meaningful instructional reforms in education. The steps outlined by Achieve ask districts to review their system's capacity for implementation, organize teams to drive implementation, develop a communication strategy that provides an opportunity for dialogue between critical stakeholders, select aligned instructional materials, and provide comprehensive training for teachers in the use of the

materials. These are very ambitious ideas considering the already overwhelming demands on school administrators' and teachers' time. Resources the website provides to help make these recommendations concrete are samples of high quality, CCSSM aligned math tasks; videos demonstrating quality teaching practices; and information to help educators evaluate the quality of instructional materials.

### *Theory to Practice*

When major educational reform efforts are put into place, it is essential to examine how standards are translated into practice within the classroom setting. Research by Richardson (1990) addresses elements that must be in place to bring about significant change in teaching practices. This research suggests that teacher change should come from a combination of research based practices and teachers' practical knowledge embedded in theory. This article finds that active teacher involvement and buy-in, the nature of the school culture–a trusting environment, and teacher personality, or belief system, shape instructional change.

Another important element in shifting instructional practices is having models to base the change on. Barlow, Frick, Barker, and Phelps (2014) examine the impact of "Modeling Instruction" professional development on participating teachers' instructional practices. Though the article focuses on instructional practices in science, the information about effective models of professional development and changing instructional practices is relevant to all subject areas. As with other studies, effective professional development was found to strengthen teachers' content and pedagogical knowledge in a subject matter. Instructional practices were much more likely to change when teachers were provided with justifications, research, modeling, and time to reflect on their practices in a trusting and collaborative environment.

## Changing Instructional Practices in Mathematics

Spillane (2005) studied the implementation of new math standards in nine schools in Michigan, and summarizes why previous state mathematics reforms have not been successful. Spillane found that the success of standard reforms depended a great deal on how leaders interpreted standards, and with what efficacy they were able to communicate common understanding about standards and classroom practice to teachers. This article's findings are relevant to the topic of CCSS implementation in mathematics in CA, especially in relation to outcomes of teachers' instructional practices based on their understanding of the standards and the support they received during implementation. The teachers, who understood and agreed with the standards, were able to make changes to their instruction practices much more successfully than the teachers that did not have a depth of understanding.

As discussed early in this section, standards reform literature points to the need for a clear understanding of what academic standards actually mean not only in terms of the content that is being taught at any given level, but also the instructional methods that get at the heart of the goals of a reform movement. The level of technology available today provides educators with unprecedented access to professional development, independent of that provided by their school districts. Many educational organizations have created digital spaces that provide resources for teachers to help them better understand exactly what the CCSS in mathematics look like in the classroom.

The National Council of Teachers of Mathematics (2013) attempts to define and describe high quality instruction in *Principles to Actions* that will help every student to be successful in mathematics. Built off the principle that "actions determine impact" (p. 5, para. 1), NCTM

emphasizes the integration of research-based mathematics teaching practices into every math lesson. These practices include establishing clear learning goals, promoting reasoning and problem solving, orchestrating mathematical discussions, using purposeful questioning to guide student learning, building procedural fluency upon a foundation of conceptual understanding, allowing students to actively engage in productive struggle in which they grapple with mathematical ideas, and eliciting students thinking to assess their progress and inform instruction. This document is directly linked to the Eight Mathematical Practice Standards, the inclusion of which mark a distinct difference from previous mathematics standards as these standards address developing higher order thinking skills such as critical thinking and application of mathematical concepts to real-world situations.

*Illustrative Mathematics (2011)*, a website dedicated to providing high quality mathematics resources to teachers, has lesson plans, instructional and math tasks, as well as many other vetted resources to help teachers implement the CC mathematics standards. This website provides an annotated version of the Mathematical Practices, along with detailed mathematical tasks that concretely illustrate how teachers might apply the practices and teach content standards in the classroom. For example, a fifth grade math task uses concrete objects to build a conceptual understanding of the commutative and associative properties of multiplication. In this math task, students use linking cubes to explore volume and to see how three numbers can be multiplied in any order with the same result. This approach to teaching mathematics illustrates a shift from a didactic model of teaching with a traditional emphasis on procedures in which teachers explain the rule, and then have students practice, to a more conceptually based teaching model where students are provided with greater problem solving

opportunities.

Mongeau (2014), an educational reporter, provides further clarity on what the CCSSM might look like in action in an elementary classroom. She reiterates that CCSSM requires students to demonstrate a deeper understanding of math concepts. The article illustrates the ways in which teachers will have to change their approach to teaching mathematical concepts in order to achieve this goal. She further explains that teachers will have to focus on application and problem solving skills, requiring children to explain their reasoning, and show their understanding. Teachers will need to teach math as a hands-on, exploratory activity, while also helping students to build fluency. Teachers will need to learn new concepts and different ways to teach them focusing on cooperative learning, mathematical reasoning, and constructing knowledge through concrete experiences with mathematical tools.

### *Teacher Perceptions*

Since the early implementation of CCSS, there have been many surveys, both large and small, that have tried to capture teachers' views of the standards and their implementation. Scholastic and the Bill and Melinda Gates Foundation (2013) and (2014) "Primary Sources" survey is one of the largest, with 20,157 K-12 teacher participants. Participants were sourced from a database of public school teachers. Prior to the survey, qualitative research was conducted in order to glean the issues that mattered the most to teachers. Verbatim quotes from these information sessions, and open-ended questions from the survey, are used throughout the report. The purpose of the survey was to explore teachers' views of Common Core State Standards in ELA/literacy and mathematics; illustrate the daily work and challenges of teachers in a climate

of change; identify they type of teacher evaluations that help teachers grow professionally; and demonstrate how teachers work collaboratively with colleagues, parents, and community to help students succeed.

There were myriad responses in relation to implementing CCSS and changing instructional practices. Eighty-two percent of teachers cited the constantly changing demands for both teachers and students as one of the greatest challenges in the profession. Another significant issue for teachers (51%) was the lack of time for collaborating with colleagues, a key factor in achieving and sustaining instructional change. The survey found that ninety-seven percent of teachers were familiar with CCSS, up from seventy-eight percent in 2012. The number of teachers who see classroom implementation of the mathematics standards as being mostly or fully complete is seventy-six percent overall, though this percentage varies a great deal between elementary (54%), middle (48%), and high (36%) school teachers. This information is important because the length of time, and the extent to which the CCSS have been implemented in a school, impacts teachers' positive perception of the standards according to the survey data.

Elementary and math teachers have the most positive views of the beneficial impacts on students' skills and abilities, with seventy-six percent of teachers believing that the new math standards will positively impact students' conceptual knowledge, a major goal of the CCSSM. A majority of teachers feel that implementation of CCSS is and will continue to be challenging, but they also feel that implementation is going well at their school site. As schools progress toward full implementation, the percentage of teachers that feel prepared to implement the standards increases. Most teachers (74%) feel that the standards require or will require changes with classroom instructional practices.

## Changing Instructional Practices in Mathematics

Teachers perceived discussion of CCSS with their colleagues, independent research, and the use of CCSS aligned instructional materials and/or tools as the most helpful experiences in helping prepare them to teach the new standards. Resources to meet the needs of English language learners, students with disabilities, and gifted students were of the greatest concern for teachers. A follow up survey was conducted one year later. This survey found that a higher number of teachers feel prepared to teach the standards (79% in 2014 vs. 71% in 2013). Though a majority of teachers continue to feel that Common Core implementation is going well (68%), fewer are feeling as enthusiastic overall (68% in 2014 vs. 73% in 2013). With greater experience with the Common Core, many teachers continue to feel that aligned instructional materials (86%), quality professional development (84%), more planning time (78%), and collaborative time (78%) are essential to successful implementation.

A much smaller survey conducted by Education Week Research Center (2014) and supported by the William and Flora Hewlett Foundation showed similar results. The 547 teacher participants were pooled from states that have adopted the CCSS. Though teachers are participating in Common Core professional development in greater numbers, just over half reported that it was high quality. The survey found that professional development on the mathematics standards lagged behind ELA, with only fifty-five percent saying it was covered. Teachers also expressed a concern over the availability of CC aligned curricular materials, and they indicated that they felt less prepared to teach CCSS to students who were at risk academically, are ELLs, or have disabilities. Understanding the importance of supporting classroom teachers, school districts are beginning to conduct their own surveys to better understand the needs of their teachers as they continue persevere with the implementation of new standards and instructional practices.

## Summary

The literature is clear that the real work of implementing change depends upon teachers' understanding of standards, and the support services they receive in terms of school climate, high quality professional develop, curriculum and instructional resources, and collaborative time for reflection and planning. Teachers' beliefs about self-efficacy, teacher buy-in, and building educators' capacity are essential for sustaining meaningful change. In an era of unprecedented technology, there is greater access to digital resources, distance learning and collaborative opportunities for teachers today than in previous standards reform movements. The many resources available to school districts, schools, and teachers to support the successful implementation of CCSS in mathematics, and the shifts in instructional practices they entail may lead to teachers having greater success in shifting instructional practices and implementing the standards with greater fidelity, ultimately leading to greater student success. Adequate time and proper supports are essential in ensure the success of the massive overhaul that is currently underway across the U.S.

The research presented in this paper extends the literature by documenting classroom teachers' perspectives of their implementation of CCSSM and the standards impact on their teaching practices. It also further sheds light on the unique and often overlooked experiences of teachers working in small rural districts. This study contributes additional information from previous findings that emphasize the influence of supports and resources on the degree and depth of change that occurs at the classroom level.

# Chapter 3 Method

## Research Approach

This study examined participants' perceptions of changes in instructional practice in mathematics with the implementation of CCSSM. This research utilized anonymous online survey consisting of 17 questions to gather data. The data were organized and analyzed by the following themes: 1) participants' awareness and support of the CC mathematics standards; 2) participants' understanding of the Common Core standards; 4) changes in classroom practices as a result of implementing Common Core standards; 5) supports and challenges to change in classroom practice as a result of Common Core implementation.

## Ethical Standards

This paper adheres to the ethical standards for protection of human subjects of the American Psychological Association (2010). Additionally a research proposal was submitted and reviewed by the Dominican University of California Institutional Review Board for the Protection of Human Subjects (IRBPHS), approved and assigned number 10357.

## Measurement

Questions were developed following suggestions from source materials on survey questionnaire development practices (Patten, 2014). The research instrument used in this study is a teacher-created survey, which combined questions from three sources. Questions from an open source, created by Student Achievement Partners (2012b), a nonprofit education organization,

were used to identify CCSS related instructional shifts. The second source used to develop the research instrument was a national survey sponsored by the Scholastic and the Bill and Melinda Gates Foundation (2013), which measured teachers' views of the CCSS. The third source employed for the development of survey questions was Education Week Research Center's (2014) survey instrument. These surveys were distributed to public school teachers. No information on reliability and validity of instruments was documented. The questions were selected based on implementation guidelines outlined by the literature on Common Core implementation, mathematical shifts described by California Department of Education and other education reform organizations, and relevance to the research question. The researcher's expertise and the expertise of the other teachers of mathematics were also considered when selecting questions to ascertain teachers' perceptions on changing instructional practices in mathematics.

**Sample and Site**

The research subjects are employed at four elementary schools sites located within a rural Northern California school district that covers a 450 square mile geographic area. There is one teacher per grade level at each elementary school with the exception of one, which has two teachers that teach multiple grade levels (K-2 and 3-5). The 22 targeted participants were K-8 multiple subject teachers and special education teachers who teach mathematics as part of their daily schedule. The participants surveyed consisted of a convenience sample of teachers, all working within the same district, who began the full implementation of CCSSM in 2014. The participants ranged from beginning teachers with under five years of experience to veteran

teachers with five to thirty years of experience. The elementary teaching staff consisted of 23% male teachers and 77% female teachers. All four schools are designated Title 1 with 63% of students receiving free or reduced lunch and 45% designated as English Language Learners.

**Access and Permissions**

The researcher was granted permission by the principal at each of the participating elementary schools to survey each K-8 teacher. The researcher gained access to the participants through collegial relationships in the school district where she works. Data were collected through an anonymous online survey.

**Data Gathering Procedures**

Participants completed a 17-question survey detailing their instructional shifts, and the challenges and successes they experienced moving from a procedurally based to a conceptually based instructional approach with the implementation of CCSSM. The participants in this study were solicited through face-to-face contact during a staff meeting. They were also contacted via email as a follow up to the intial in person contact. During the meeting, and in the subsequent email, the reasearcher explained the purpose of this project and the potential informational outcomes of the study. The target participants were then emailed a survey via Survey Monkey. All responses were anonymous, collected through an online survey, and therefore anonymity was preserved, and participants did not report any personally identifable information. Sample of the survey used is available in Appendix A.

## Data Analysis Approach

Survey data was collected from SurveyMonkey® in the form of closed-ended, multiple choice survey questions, and open-ended responses. Answers were analyzed and organized by themes based on four areas derived from the literature on standards reforms and effective change: knowledge of standards; understanding of standards; identifying changes in classroom practices; and challenges to implementation.

The aggregate data were analyzed using percentages based on the total number of participants that selected a response (for example: 90% stated CCSSM are more demanding; 10% stated they were not sure). Open-ended survey question responses were analyzed and included in narrative summaries according to the themes outlined above. Open-ended responses were reported in full in order to capture the full breadth of views and experiences of participants. Both multiple choice and open-ended responses reflect the diverse experiences and views of participants, illustrating similarities, differences, and outliers. Statistical analysis was not used due to the small sample size.

# Chapter 4 Results

The results reported address two key questions research questions: What are participants' perspectives on changing instructional practices with the implementation of Common Core State Standards in mathematics? What factors influenced changes in instructional practice?

Research data provides limited support that teachers are using conceptually based instructional methods with the adoption of CCSSM. All results are reported in percentages based on a total of 11 respondents, unless otherwise indicated. Percentages are based on the total number of respondents for each question. Open-ended questions are directly quoted and organized by theme. The researcher analyzed 14 of the survey items that were relevant to the research questions.

## Awareness and Support of Common Core State Standards

### *Narrative Summary*

Out of ten participants, 90% felt that the CCSSM are more demanding than previous standards and raise expectations for student learning. Out of eleven participants, 73% indicated that they agree or strongly agree that CCSSM will lead to improved student learning. Out of seven participants, 90% felt the CCSSM are more rigorous than previous standards, with 64% indicating that the CCSSM would lead to greater student learning by allowing them to master key competencies, rather than just providing superficial exposure. Eighty-five percent of this same group of participants felt that the CCSSM would help their school vertically align Kindergarten through twelfth grade curriculum. Interestingly, no participants identified the CCSSM as helping them to prepare their students for college or future careers. Only 9%, one out

of eleven, disagreed that the CCSSM would help to improve student learning, indicating that the standards take a "one size fits all" approach to learning that does not take into account the needs of students who are not achieving at grade level.

***Data***

1) I believe that the Common Core State Mathematics Standards will lead to improved student learning for the majority of students I serve.

| Strongly agree | Agree | Disagree | Strongly disagree | I don't know |
|---|---|---|---|---|
| 18% | 55% | 9% | 0% | 18% |

2) For those that "agree" or "strongly agree" please identify the reasons you believe the Common Core State Standards will benefit a majority of the students you serve.

| | |
|---|---|
| They will help educators focus on what's most important. | 43% |
| They will help educators better prepare students for college. | 0% |
| They will help educators better prepare students to compete in the workforce. | 0% |
| This will ensure that a high school diploma has meaning. | 0% |
| They will provide educators with a manageable amount of curriculum to teach in a school year. | 14% |
| They will give students the opportunity to master key competencies, rather than just being superficially exposed to them. | 100% |
| They will help my school system ensure that our standards are vertically aligned from kindergarten through grade 12. | 86% |
| They will provide students a clearer understanding of what they must know in order to succeed. | 57% |

4) How would you describe the difference between the state's current academic standards in mathematics and the Common Core State Standards?

| | |
|---|---|
| The Common Core are more demanding and raise expectations for student learning. | 90% |
| The Common Core are pretty much the same. | 0% |
| The Common Core are less demanding and lower expectations for student learning. | 0% |
| I don't know. | 10% |

**Gauge Respondents Understanding of the Common Core**

***Narrative Summary***

Out of eleven participants, all report that they have read the standards and have some knowledge of them. Despite participants' familiarity with the standards, 82% reported that they did not feel prepared to teach them citing access to resources aligned to the CCSSM as an obstacle to their feeling of preparedness. Sixty-percent indicated that access to CCSSM aligned assessments was also a hindrance to being prepared to teach the new set of standards. Despite the lack of curricular and assessment resources available to educators, 73% of participants indicated they have integrated some CCSSM standards, while 27% indicated they have fully implemented the standards into their teaching practices. Participants further illustrated their understanding of the CCSSM with a majority identifying deeper focus (91%), greater coherence (73%), and developing conceptual understanding (73%) as the central shifts required by CCSSM.

***Data***

5) I feel prepared to teach Common Core State Standards in mathematics.

| Strongly agree | Agree | Disagree | Strongly disagree | I don't know |
|---|---|---|---|---|
| 0% | 9% | 82% | 0% | 9% |

6) If "no" or "I do not know," what would help you feel prepared to teach the Common Core State Standards? (Check all that apply).

| | |
|---|---|
| Access to curricular resources aligned to Common Core | 100% |
| Access to assessments aligned to Common Core | 60% |
| More information about how the standards change what is expected of my instructional practices | 40% |
| More information about how the standards change what is expected of my students | 40% |

7) Have you read the Common Core State Standards in mathematics at your grade or subject level? Y/N

| Yes | No |
|---|---|
| 100% | 0% |

8) How much do you know about the Common Core mathematics standards and content?

| I have comprehensive knowledge | I have some knowledge | I have little knowledge | I have no knowledge |
|---|---|---|---|
| 0% | 100% | 0% | 0% |

## Changes in Classroom Practices as a Result of CCSSM

### *Narrative Summary*

Survey questions eleven through thirteen identify the instructional practices teachers' are incorporating into their classrooms. The questions were selected based on the mathematical shifts as identified by the CACCSSM, NCTM, and organizations such as Partners for 21st century skills, CCSSO, and Achieve. All eleven participants reported having implemented the CC standards into their teaching expectations and practices, but to varying degrees. Only 27% stated that they have fully incorporated these standards into their expectations and practice. Out of ten respondents to question 12, all reported incorporating new curricular materials and instructional strategies. One of the most common strategies to be incorporated into classroom practice was the use of technology (78%). A majority of participants also indicated that they have increased collaboration with colleagues (67%). Just over half (56%) reported holding classroom discussions and structuring opportunities for students to develop and solve their own problems, two areas that the NCTM identifies as research-based mathematics teaching practices. Less than half of participants indicated that they are incorporating the eight standards for mathematical practices (44%), or diversifying the way they assess student learning and provide feedback. Thirty-percent indicated that they have incorporated formative assessments into teaching practices, a teaching practice that NCTM points out as "producing greater increases in student achievement…than other efforts to boost achievement, including reducing class size and increasing teachers' content knowledge (National Council for Teaching Mathematics, 2015).

Question 13 addresses the frequency with which participants felt they were incorporating the eight mathematical practices into their classroom instruction. All participants signified that

they have incorporated the eight mathematical practices to some degree. The most common practice that participants denoted incorporating into instruction practices was providing learning tools such as manipulatives and rulers with 72% indicating that they use this practice most or all of the time. The least common instructional practice teachers denoted was structuring time to build procedural skill and fluency, with 27% stating they mostly or always incorporated this practice into their instruction. A majority of teachers (73%) indicated they incorporate fluency practice "somewhat". Fifty-six percent of respondents indicated that they narrowed the number of topics they are teaching in order to focus more deeply on the standard emphasized at their grade level. Few teachers (20%) stated that they connected student learning within or across grade levels, which is one of the major shifts identified by CCSSM authors and proponents. Eighteen percent of participants indicated that they have not incorporated the practice of providing students with opportunities to solve real world problems.

***Data***

11) Have you incorporated the Common Core State Standards into your teaching expectations and practice?

| | |
|---|---|
| Yes, I've fully incorporated the Common Core into my teaching expectations and practice. | 27% |
| I've incorporated the Common Core in some areas of my teaching, in other areas I have not. | 73% |

12) [For those that responded positively to #1] What changes are you making to your teaching practice as a result of the Common Core State Standards? (check all that apply)

*Out of ten respondents:*

| | |
|---|---|
| Incorporating new curricular materials and instructional strategies | 100% |

| | |
|---|---|
| Incorporating instructional technology into classroom learning | 78% |
| Incorporating formative assessments | 30% |
| Orchestrating classroom discussions | 56% |
| Incorporating mathematical practices | 44% |
| Structuring opportunities for students to develop and solve their own problems | 56% |
| Increasing use of national resources | 11% |
| Diversifying the ways I assess student learning and provide feedback | 44% |
| Increase my collaboration with colleagues within my school and in other schools | 67% |

13) To what extent have you incorporated the following practices into your math instruction?

| | Always | Mostly | Somewhat | Not at all | I don't know |
|---|---|---|---|---|---|
| Structure class time for students to develop procedural skill and fluency in core operations (such as multiplication tables) so they can understand more complex topics | 9% | 18% | 73% | 0% | 0% |
| Narrow and deepen the scope of your focus going deeply on only the concepts that are prioritized in the standards | 11% | 56% | 33% | 0% | 0% |
| Connect student learning within and across grades so learning builds on foundations built in previous years | 10% | 10% | 70% | 10% | 0% |
| Provide opportunities for students to apply math concepts to "real world" situations | 18% | 18% | 46% | 18% | 0% |
| Maximize student learning by facilitating classroom discussions where students construct viable arguments and critique the reasoning of others | 9% | 36% | 55% | 0% | 0% |
| Use formative assessments to check students' understanding in order to adjust instructional practice | 9% | 46% | 46% | 0% | 0% |
| Provide learning tools for students to use when solving problems (manipulatives, rulers, graph paper, etc.) | 45% | 27% | 27% | 0% | 0% |
| Provide opportunities for students to explain and clarify their reasoning when solving problems | 30% | 30% | 40% | 0% | 0% |
| Integrate technology tools | 27% | 36% | 18% | 18% | 0% |

## Supports and Challenges to Achieving Change in Classroom Practice

### *Narrative Summary*

Questions 14 through 17 focused on participants' views of what supported or created a challenge for them in making changes to their instructional practices as they implemented the CCSSM. Seventy percent of participants indicated that multi-day trainings provided the best professional development opportunities. The second most helpful professional development tool

that participants indicated as being helpful was, online webinars and videos (50%). The least helpful professional development opportunities were half-day workshops (10%). One of the greatest challenges indicated by all of the survey participants was the lack of CCSSM aligned curricula and support materials. Students' prior knowledge and the lack of quality professional development were selected by 45% of participants as the second greatest challenge to implementation of the CCSSM. Thirty-six percent of participants indicated that time to collaborate with colleagues also presented a challenge to the implementation of the standards.

***Data***

14) When you participated in professional development/training on the Common Core State Standards, what type of training facilitated the best professional development/training opportunities? (Check all that apply)

*Out of ten respondents*

| | |
|---|---|
| ½ day training opportunity | 10% |
| One-day training opportunity | 30% |
| Multi-day training opportunity | 70% |
| Online webinar or video | 50% |
| Job-embedded training or coaching within my school | 30% |
| Professional Learning Communities (PLC) | 0% |

15) What do you believe will be the top three challenges to implementing the Common Core State Standards in your school or district? (Check up to three)

| | |
|---|---|
| Students' prior knowledge | 45% |
| Need more information about the standards | 0% |
| Need more formative assessments aligned to the Common Core | 27% |
| Need more quality professional development | 45% |
| Need more time to collaborate with my colleagues | 36% |
| Need more funding | 0% |
| Need more aligned textbooks and materials | 100% |
| Need more parental involvement | 9% |
| Need a state assessment aligned to the Common Core | 0% |

Question 16 and 17 (open-ended)), which focus the tools, resources, or information that would be most helpful in addressing the challenges of implementing CCSSM resulted in the following eight responses:

- Materials
- Manipulatives of all sorts, resources and information on best math teaching practices for implementing common core
- Trainings for parents to help their students with homework.
- Curriculum that is aligned to the common core - report cards that reflect the common core standards and formative assessment tools along with quality professional development.
- Professional development time to meet and plan with colleagues both onsite and district wide, as well as more time within the school day to work with students who require extra support to be successful.
- Text books and manipulatives
- The state should have been prepared with text adoption choices. Teachers are "winging" it. Give the teachers materials THEN teach.

- It is making better thinking students! I sure hope it helps align across grade levels so students have a solid foundation to build upon each year

**Themes**

There are several themes that emerged from the data collected in this survey. As research literature on change has shown, change agents, in this case teachers, must support and understand the changes that are underway. Lack of support by teachers can lead to a resistance to changes that go beyond surface level such as implementing new curriculum. Absence of understanding, or misconceptions about the necessary changes that a new set of standards call for, can also lead to superficial levels of change. The data collected indicates a high number of participants (73%) feel that CCSSM will increase student learning and are more demanding (90%), which one might interpret as support for the standards. It is significant to note that 27% of participants were either unsure or disagreed that the new mathematics standards would increase student learning. This variation in support, or belief, in the statement that CCSSM will improve student learning, could have an impact on the fidelity with which teachers implement the standards over time. None of the participants indicated having significant knowledge of the standards at the time of the survey, though 100% said they had some knowledge.

Another significant theme that emerged is the need for common core aligned curriculum and quality professional development. All of the participants in the study indicated that one of the changes that they have made in order to shift to the CCSSM is incorporating new curricular materials. Despite stating that they have implemented new curriculum, 100% of participants also indicated the need for more CCSSM aligned curriculum and instructional materials as one of the top challenges to implementation of the standards. Professional development plays an key role in

helping teachers use new curriculum and instructional strategies effectively. Almost half of the participants (45%) indicated this as one of the top three challenges to implementing CCSSM.

Despite challenges that participants face, it is clear from the data that changes in instructional practices are occurring. Ten out of eleven respondents who answered questions related to classroom instruction indicated making key changes to their instructional practices with the implementation of CCSSM. Out of ten respondents, 100% specified making changes to curricular materials and instructional strategies they were using. The most common instructional strategies specified by participants were implementing instructional technology (78%); providing time for discussions and practicing problem solving skills (56%); and incorporating the eight mathematical practices (44%).

In conclusion, in order to go beyond superficial changes such as using new curricular materials, teachers need ongoing supports to support their shift to CCSSM. These supports are ongoing, quality professional development that deepens their understanding of the key instructional shifts called for by the new standards and curricular materials that reflect the mathematical content and mathematical practices outlined in the CCSSM.

# Chapter 5 Discussion /Analysis

This study addresses the following research questions: What are participants' perspectives on changing instructional practices with the implementation of Common Core State Standards in mathematics? What factors influenced changes in instructional practice? The results of the research survey presented in this paper indicate that educators feel that they are making changes with the implementation of the new standards. The survey data indicate that there remain substantial obstacles at the district, school site, and classroom level that have made deep changes in instructional practices challenging. The greatest challenge to the participants of this study are the lack of access to CCSSM aligned curricular materials, quality professional development, and time to collaborate with colleagues.

## Summary of Major Findings

Participants indicate they are implementing instructional practices that promote a deeper understanding of mathematics. These instructional practices include facilitating classroom discussions in which students are expected to construct mathematical arguments and critic the arguments of others. Another instructional practice that the CCSSM call for is focusing on fewer topics with greater depth, which 58% of teachers stated they did most of the time. Also important to developing students conceptual understanding is the use of mathematical tools. Over 70% of teachers attest to using this instructional strategy in their classrooms. Other important findings are:

1) The eleven participants felt that they were making some degree of change to their instructional practices.
2) Forty-four percent of participants indicated they are implementing the eight mathematical practices into their mathematical teaching.
3) Participants reported a relatively high level of support for the CCSSM, indicating that they feel these standards will improve students' achievement by allowing instructional time to master key competencies.

Multi-day mathematics trainings as well as online webinars and videos are resources that participants feel supported instructional changes. The lack of CCSSM aligned curriculum and materials is a major concern to all of the participants surveyed (100%), and under scores their feelings of being under prepared to teach the standards (82%). Two years into the implementation of the standards in California and in the district where this study took place, access to curricular materials and instructional supports continues to be a major challenge as the need for more quality professional development (45%). Exacerbating this problem, as indicated in the survey data, is the lack of time for collaboration (36%) in order vertically align curriculum, discuss instructional strategies, share lesson ideas, and observe and provide feedback on instructional practices. When asked what resources would be most helpful to the implementation, one participants response summed it up in this statement: "Curriculum that is aligned to the common core - report cards that reflect the common core standards and formative assessment tools along with quality professional development."

**Comparison of Findings to the Literature**

As indicated in the literature on changing instructional practices, educators' positive perception of standards is an important element of change. Ninety percent of the participants in this study indicated support for the CCSSM. The literature indicates that past standard reform movements have failed to bring about the desired change in educators' instructional practices for several reasons. First, the level of support among districts implementing new standards can vary a great deal. Spillane's research (2005) indicates that district curriculum policies had the greatest impact on teachers as the attempted to implement new math standards. Teachers in Spillane's (2004) study indicated professional development, curriculum frameworks, and school leaders' communication about instructional approaches, which clearly aligned with standards goals, as the most influential on their classroom practices. State and district support in terms of quality professional development and clear curriculum frameworks were reported as lacking by the participants of this study. When implementation is not well planned and teachers are not provided the necessary supports, the level and quality of standards implementation can very greatly. Teachers' support and perception of change can also be negatively impacted as is evident in this participants comment: "The state should have been prepared with text adoption choices. Teachers are "winging" it. Give the teachers materials THEN teach."

Equally important as emphasized by Spillane (2005) and Fullan (2006) is the link between educators' knowledge of the standards and what that implies in terms of classroom practice, and the depth of change they are able to make. When educators have a limited understanding of the pedagogical shifts, in addition to limited opportunities to reflect and discuss standards, instructional theory, and curriculum, their progress toward meeting new standards and

achieving significant change. Participants in this survey expressed only being somewhat familiar with the standards, and as needing more time to collaborate with colleagues. As stated earlier in the review of literature on this topic, teachers perceived their discussion of CCSS with their colleagues, independent research, and the use of CCSS aligned instructional materials and/or tools as the most helpful experiences in preparing them to teach the new standards.

**Limitations/Gaps in the Research**

Due to the limited number of participants, as well as the geographic setting, the findings of this study cannot be generalized. Since there were only eleven participants, the small sample size limits the applicability of this study to the general population of educators in California or in other states implementing the CCSSM. Research results reflect participants' own perceptions of the changes being made to their instructional practices; the results include an inherent bias. The study did not collect data on what practices were in place in classrooms prior to the implementation of CCSSM, which would have provided comparative data. The results of this research would be enhanced by adding expert observations of instructional practices that focus on the main shifts in mathematics instruction outlined by the CCSSM.

**Implications for Future Research**

There is often a mismatch between teachers' perceptions of their instructional practices and what they actually do (Hieber & Stigler, 2000). Teachers' perceptions do not always match up with actual practice, which indicates that further research include classroom observation and/or video analysis of classroom lessons, in conjunction with teachers' perceptions of the

changes they are making, would provide a more comprehensive picture of the instructional changes teachers are undergoing. A more through analysis of the district level implementation plan, and professional development and supports provided at the district or school site level would provide insight into the context and its influence on teachers' practices in the classroom. Since the implementation of the CCSSM in California is in its infancy, it is important there be continued research on the progression and success of this standards reform movement. Now that state assessment data are available, the inclusion of students' data linked to research-based classroom practices will enhance educators' knowledge of what practices have led to student success.

**Overall Significance of the Study**

California is now in year two of full implementation of CCSSM. As this state as well as others across the country move forward in their implementation research, such as this study, provides important information to states, districts, and school sites that illuminates the successes and struggles teachers are experiencing with implementing the standards. The data presented in this paper can be used in conjunction with other larger studies to analyze educators' needs in terms of professional development, access to standards aligned curriculum, and classroom supports that facilitate teachers in making the necessary instructional changes called for by CCSSM.

In addition to adding to the now growing body of literature on CCSSM implementation, this study provides important information for the district where this study took place. The data

collected in the survey provides a jumping off point for future professional development and insight into the teachers' needs.

**About the Author**

Esther Underwood has been teaching in an upper elementary classroom for fourteen years, and was a 2006 recipient of the Golden Bell Award. She is a dedicated teacher who has continuously sought after professional learning opportunities to enrich her teaching. She works closely with her colleagues and community to bring learning to life by incorporating environmental education, project based learning, music, and art into her classroom.

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## Appendix Survey Questions

# Instructional Shifts in Mathematics Teacher Survey

**Survey**

**[Objective 1: Assess respondents' awareness and support of the Common Core]**

1. **I believe that the Common Core State Mathematics Standards will lead to improved student learning for the majority of students I serve.**
   - ☐ Strongly Agree
   - ☐ Agree
   - ☐ Disagree
   - ☐ Strongly Disagree
   - ☐ I don't know

2. **[For those who answer "agree" or "strongly agree"] Please identify the reasons you believe that the Common Core State Standards will benefit the majority of the students you serve. (check all that apply)**
   - ☐ They will help educators better prepare students for college.
   - ☐ They will help educators focus on what's most important.
   - ☐ They will help educators better prepare students to compete in the workforce.
   - ☐ They will ensure that a high school diploma has meaning.
   - ☐ They will provide educators a manageable amount of curriculum to teach in a school year.
   - ☐ They will give students the opportunity to master key competencies, rather than just being superficially exposed to them.
   - ☐ They will help my school system ensure that our standards are vertically-aligned from kindergarten through grade 12.
   - ☐ They will provide students a clearer understanding of what they must know in order to succeed.
   - ☐ Other: _____

3. **[For those who answer "disagree" or "strongly disagree" to #3] Please identify the reasons you believe that the Common Core State Standards will not benefit the majority of students you serve. (check all that apply)**
   - ☐ Our current state standards are better than the Common Core.
   - ☐ The Common Core are too rigorous for many students I teach.

- ☐ The Common Core excludes important concepts that students should learn.
- ☐ The Common Core embraces a "one size fits all" approach that will not help many students I teach.
- ☐ The standards do not provide educators the flexibility needed to help students who are not on grade level.
- ☐ Other: _____

4. **How would you describe the difference between the state's current academic standards in mathematics and the Common Core State Standards?**
   - ☐ The Common Core are more demanding and raise expectations for student learning.
   - ☐ The Common Core are pretty much the same.
   - ☐ The Common Core are less demanding and lower expectations for student learning.
   - ☐ I don't know.

**[Objective 2: Gauge respondents' understanding of the Common Core]**

5. **I feel prepared to teach Common Core State Standards in mathematics.**
   - ☐ Strongly Agree
   - ☐ Agree
   - ☐ Disagree
   - ☐ Strongly Disagree
   - ☐ I don't know

6. **If "no" or "I do not know," what would help you feel prepared to teach the Common Core State Standards? (Check all that apply).**
   - ☐ Access to curricular resources aligned to Common Core
   - ☐ Access to assessments aligned to Common Core
   - ☐ More information about how the standards change what is expected of my instructional practice.
   - ☐ More information about how the standards change what is expected of my students
   - ☐ Other: _____

7. **Have you read the Common Core State Standards in mathematics at your grade or subject level? Y/N**

8. **How much do you know about the Common Core mathematics standards and content?**
    - ☐ I have comprehensive knowledge.
    - ☐ I have some knowledge.
    - ☐ I have little knowledge.
    - ☐ I have no knowledge.

9. **Which of the following are the central shifts required from the Common Core State Standards in math? (check all that apply)**
    - ☐ Focus deeply on the concepts emphasized in the standards to help students build strong foundations for learning
    - ☐ Create coherent progressions within the standards from grade to grade so student knowledge and skills build onto previous learning
    - ☐ Introduce multiplication and division earlier in students' learning as foundations for math concepts taught in later years
    - ☐ Develop students' conceptual understanding, procedural fluency, and their ability to apply math in context with equal intensity
    - ☐ Teach each math topic as an independent, new concept that is distinct from topics taught earlier or later

10. **The Common Core State Standards will help me know what content to teach my students and in what sequence to teach it in order for them to fully master key competencies.**
    - ☐ Strongly Agree
    - ☐ Agree
    - ☐ Disagree
    - ☐ Strongly Disagree
    - ☐ I don't know

**[Objective 3: Assess changes in classroom practice that result from Common Core implementation]**

11. **Have you incorporated the Common Core State Standards into your teaching expectations and practice?**
    - ☐ Yes, I've fully incorporated the Common Core into my teaching expectations and practice.
    - ☐ I've incorporated the Common Core in some areas of my teaching, in other areas I have not.

- ☐ No, I have not incorporated the Common Core into my teaching expectations or practice.
- ☐ I don't know.

**12. [For those that responded positively to #1] What changes are you making to your teaching practice as a result of the Common Core State Standards? (check all that apply)**

- ☐ Incorporating new curricular materials and instructional strategies in my teaching
- ☐ Incorporating instructional technology into classroom learning
- ☐ Orchestrating mathematics discussions
- ☐ Incorporating mathematical practices into my lessons
- ☐ Incorporating formative assessments
- ☐ Structuring opportunities for students to develop and solve their own problems
- ☐ Increasing my use of national resources on teaching
- ☐ Diversifying the ways I assess student learning and provide feedback
- ☐ Increasing my collaboration with colleagues within my school and in other schools
- ☐ Other: _____

## Changing Instructional Practices in Mathematics

**13. To what extent have you incorporated the following practices into your math instruction?**

| | Always | Mostly | Somewhat | Not at all | I don't know |
|---|---|---|---|---|---|
| Structure class time for students to develop procedural skill and fluency in core operations (such as multiplication tables) so they can understand more complex topics | | | | | |
| Narrow and deepen the scope of your focus going deeply on only the concepts that are prioritized in the standards | | | | | |
| Connect student learning within and across grades so learning builds on foundations built in previous years | | | | | |
| Provide opportunities for students to apply math concepts to "real world" situations | | | | | |
| Maximize student learning by facilitating classroom discussions where students construct viable arguments and critique the reasoning of others | | | | | |
| Use formative assessments to check students' understanding in order to adjust instructional practice | | | | | |
| Provide learning tools for students to use when solving problems (manipulatives, rulers, graph paper, etc.) | | | | | |
| Provide opportunities for students to explain and clarify their reasoning when solving problems | | | | | |
| Integrate technology tools | | | | | |

**[Objective 4: Assess supports/challenges to change in classroom practice that result from Common Core implementation]**

**14. When you participated in professional development/training on the Common Core State Standards, what type of training facilitated the best professional development/training opportunities? (Check all that apply)**

- ☐ 1/2 day training opportunity
- ☐ One-day training opportunity
- ☐ Multi-day training opportunity
- ☐ Online webinar or video
- ☐ Job-embedded training or coaching within my school
- ☐ Professional learning communities (PLC)
- ☐ Other (Please explain) _____

**15. What do you believe will be the top three challenges to implementing the Common Core State Standards in your school or district? (Check up to three)**

- ☐ Students' prior knowledge
- ☐ Need more information about the standards
- ☐ Need more formative assessments aligned to the Common Core
- ☐ Need more quality professional development
- ☐ Need more time to collaborate with my colleagues
- ☐ Need more funding
- ☐ Need more aligned textbooks and materials
- ☐ Need more parental involvement
- ☐ Need a state assessment aligned to the Common Core
- ☐ Need more time to help all students really learn the standards
- ☐ Other (Please explain) _____

**16. What tools, resources, or information would be most helpful in addressing the challenge(s)? (open-ended)**

**17. Is there anything else you want to share about how California's transition to the Common Core State Standards is affecting you, your school, or your students? (open-ended)**