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Integrating the Common Core State Standards for Mathematics in a Secondary School

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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2017

Abstract

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MS, Walden University, 2005

BA, Dillard University, 2000

Doctoral Study Submitted in Partial Fulfillment

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Abstract

The problem that anchored this study was district leaders' and administrators' lack of clarity regarding teacher concerns about the Common Core State Standards for Mathematics (CCSSM) implementation in high school math. The purposes of the study were to (a) examine the perception of high school math teachers regarding the barriers for successfully implementing the CCSSM, and (b) to elicit recommendations for teacher preparation. Ely's theory of change was utilized to relate the entity of the CCSSM to this new shift in education. To better understand this phenomenon, 2 research questions accompanied this study. The research questions were geared to not only understanding teacher perceptions but also discovering strategies to assist educators with implementing the new CCSSM. Using purposeful sampling, 5 participants participated in this case study; the data collection components were an open-ended survey, interviews, and field notes. Data were analyzed by hand, using inductive reasoning and the process of coding to determine themes. The results indicated that teachers needed to know more about the standards and needed the time to gain this efficacy. Based on the themes of the study, a professional development was chosen to represent the project. Implications for positive social change are to bring awareness to teachers who are implementing the CCSSM in secondary schools, by ensuring teachers articulate consistent conversations with stakeholders, gain a form of self-efficacy, and think not only procedurally but conceptually to implement the standards. Teachers will acquire knowledge and skills to effectively educate students to become thinkers and problem solvers. This outcome will contribute to the development of college and career ready individuals.

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Dedication

I would like to dedicate the completion of this study to my Lord and Savior, along with my mom, Gwen, and my sister, Robin. With all my personal issues, they continued to encourage and push me to accomplish this dream. Therefore, I complete this journey with them by my side. Additionally, I understand that my journey is through the strength of my Savior: “Trust in the Lord with all thine heart; and lean not unto thine own understanding. In all thy ways acknowledge him, and he shall direct thy paths” (Proverbs, 3:5-6; KJV).

Acknowledgments

This journey has been longer than I anticipated. I would like to take this opportunity to acknowledge some special people who made this journey possible. First, I would like to thank my chair, Dr. Kebritchi. She continued to push me even during those moments when I wanted to quit. Secondly, I would like to thank my second committee member, Dr. Harrison. She assumed the role of my committee person as a replacement and was phenomenal with providing immediate feedback and guidance. Thirdly, I would like to thank and acknowledge Dr. Wells and Dr. Wilson. Those two women have been instrumental in this journey. They are not only my friends but also my sorority sisters. Without them as my inspiration, I am sure I would have given up a long time ago. Next, I would like to acknowledge Dr. Robert Mack for being my inspiration to pursue this life-long dream. I would also like to thank Ms. Cunningham and Ms. Guidry for serving as my editors in these final moments. Finally, I send all my hugs and kisses to my daughters Kyra and Janiya. They are everything to me, and the reason I make my life decisions. I love you girls!

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Section 1: The Problem

This section provides a detailed background on the state of mathematic achievement among high school students in the United States and describes the problem at large related to the study. It also provides the overall significance of targeting a rural high school in a southern state to investigate perceived barriers for implementing a new mathematics curriculum. This section also addresses derived research questions, a literature review, and implications related to the problem.

The Local Problem

High school math teachers have historically attempted to implement a variety of research-based strategies to increase student math achievement. Despite these efforts, current data show that students' scores are not improving at the appropriate rate to meet the No Child Left Behind Act of 2001 (NCLBA) goals, which include having all high school students achieve mathematic proficiency by the year 2014 (Deans & Cohen, 2010). The National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO) initiated the Common Core State Standards Initiative (CCSSI) in June 2010 as a response to the Obama Administration's Blueprint for Reform, The Reauthorization of the Elementary and Secondary Act (United States Department of Education [USDE], 2010). The priorities of this initiative include: (a) raising academic standards to produce college and career ready students, (b) improving teacher and leader effectiveness, (c) providing information to families to help improve schools and educators in order to assure improved student learning, (d) and providing support and effective interventions to low-achieving schools (USDE, 2010). Several educational

organizations have concluded that the standards would help create college and career ready students if implemented correctly (ACT, 2015; American Federation of Teachers [AFT], n.d.; National Education Association [NEA], 2014).

Students in southern states are demonstrating particularly lower numbers of mathematic proficiency, especially in the state of Mississippi. Teachers in this state are becoming increasingly concerned with what information to teach and how to address the standards in order to prepare students for high-stakes tests (Vogler & Burton, 2010). According to the 2012 accountability model, 34% of all districts throughout the state were recognized as "D" or "F" districts; these ratings consisted of state test scores from elementary, middle, and high schools (Mississippi Department of Education [MDE], 2013). Prior to 2010, Mississippi educators relied on the Mississippi Mathematics Framework Revised (MMFR), which outlined the objectives teachers needed to teach in an effort to prepare students for state assessments.

In 2010, the state department of education decided to adopt the new Common Core State Standards for Mathematics (CCSSM). These standards were developed to create college and career ready students; thus, targeting the problem of low student math achievement at the high school level (CCSSI, 2012a). Further analysis showed that the CCSSM had several shortcomings for Mississippi students. First, the CCSSM are more rigorous than the MMFR objectives (Green, 2010). This implies students will struggle to master these standards because they are currently failing to successfully master the 2007 MMRF. Second, the CCSSM do not mention several MMFR objectives, which could lead to a possible gap in student content (Green, 2010). In addition, teachers may struggle

to adapt to finding new resources for teaching the new standards, because the content will be new to the framework as whole. Finally, the CCSSM addresses objectives at lower levels; the introduction of content has moved to lower grade levels (Green, 2010). Therefore, teachers may struggle with the content at various grade levels.

In order to provide districts with an opportunity to begin incorporating the new standards while teaching the current objectives, teachers were instructed to follow a recommended timeline created by the MDE, as shown in Table 1. The new implementation schedule and the current accountability metrics impacted many school districts and teachers. Districts had to decide whether to continue teaching the current framework or follow the new implementation timeline. With accountability metrics relying on the current framework through the 2012-2013 academic year, many districts opted not to follow the new timeline and continued preparing students for the Mississippi Curriculum Assessment, Second Edition (MCT2) and the Mississippi Subject Area Test Program, Second Edition (SATP2). With the window of teacher training being narrowed, many districts are now training teachers without their input and requiring them to attend training sessions that were previously considered optional.

Table 1

Implementation Schedule

Academic Year	Grade Levels
2011-2012	K-2
2012-2013	3-8
2013-2014	9-12
2014-2015	K-12

Note. 2014-2015 represents the year where all grade levels will begin implementing the standards and the assessments are now provided by Partnership for Assessment of Readiness for College and Careers (PARCC).

In the past, state standards required teachers to rush through content, failing to teach students effective application of the skills (Jones & King, 2012). With the new CCSSM, the pace is slower and teachers must be cautious of several changes and transitions during instruction in order to successfully implement the standards. Dingman et al. (2013) found the standards' shifts included the following: changes in grade levels; changes in emphasis on particular topics; changes in the level of reasoning expectations; and changes in the number of grade levels in which math topics appeared. To understand these changes in standard implementation and to better understand the teachers' interpretation of this process, the study explored teacher perceptions about implementing the standards and elicited suggestions regarding teacher preparation.

Definition of the Problem

The educational problem that anchored this study was the district leaders' and administrators' lack of clarity regarding teacher concerns and recommendations for how

to effectively implement the CCSSM in high school math and their impact on the implementation process. In addition, high school math teachers' suggestions to overcome the barriers and better implement the CCSSM in a secondary school in Mississippi are unclear for district leaders and administrators. This lack of clarity and subsequent inadequate instruction based on the CCSSM is likely related to poor student achievement and success on standardized state assessments.

The United States has continually aimed educational efforts at ensuring students' excellence in reading and mathematics. As a result, educational governance increased in 1983 with the U.S. Department of Education's release of *A Nation at Risk* and other contributing factors such as international assessments (Dingman, Teushcher, Newton, & Kasmer, 2013). In 2002, the NLCB was initiated with an overall goal of ensuring schools were producing mathematically proficient students by 2014 (Deans & Cohen, 2010; Dingman et al., 2013). Because this goal was unattained, there has been a shift to implement the CCSSM; however, according to Vecellio (2013), when teaching new standards, the concern of implementation is not repeating the past mistakes of understanding how the standards should be taught and assessed. Therefore, preparing teachers to implement the CCSSM with fidelity is not only a local problem but also a national problem.

In order to address the issue of low math achievement, it is critical that teachers adhere to the CCSSM in their classrooms (D. Harrien, personal communication, August 6, 2013). The reality is that most teachers do not feel prepared to implement the standards due to a variety of barriers, such as a lack of resources, time, and support (Editorial

Projects in Education Research Center [EPERC], 2013). As teachers and schools try to figure out how to best implement the CCSSM, students will continue to struggle in mathematics; therefore, it is critical to understand the implementation process of the CCSSM. With teachers leading instruction for this curriculum, it is imperative that they possess a thorough understanding, acceptance, and willingness to implement changes and other innovations that are important factors for success (Cimer, Cakir, & Cimer, 2010).

With regards to the research site, Algebra I students and students in Grades 7 and 8 were not achieving proficiency on the SATP2 Algebra I and MCT2 state assessments. The unique dynamics of this high school allowed ambitious, advanced level students the opportunity to enroll in Algebra I as early as the eighth grade and, for students needing additional support, as late as their senior year of high school. Proficiency, according to the SATP2 Algebra I state assessment, was defined as students achieving a scale score of 650 and above. The MCT2 also defined proficiency as students achieving a scaled score of 150 and above (MDE, 2012b). Table 2 shows a fluctuation in proficiency percentages from 2008-2011 of the SATP2 Algebra I and MCT2 scores across grade levels. Over the years, the school in question had seen a turnover in high school teachers, which may have attributed to the rise and fall of the scores. Additionally, the years where an increase occurred are likely attributed to the support of both district math coaches and educational consultants whom specialize in mathematics achievement (D. Harrien, personal communication, August 6, 2013). With student achievement percentages in Algebra I and MCT2 being lower under the current framework, the teachers were now being asked to

implement a new set of skills, which require procedural and conceptual understandings of mathematical topics (CCSSI, 2014).

Table 2

SATP Algebra I and MCT2 Proficiency Percentages

Academic Year	7th Grade %	8th Grade %	HS %
2007-2008	43	33	52
2008-2009	42	33	73
2009-2010	69	61	92.7
2010-2011	59	68	89
2011-2012	70	70	71

Note. This table demonstrates the changes in proficiency percentages by grade from 2008-2011 on the SATP2 Algebra I and MCT2 assessments.

Rationale

Evidence of the Problem at the Local Level

The Common Core State Standards (CCSS) had appeared in the topic sections of numerous educational sites over the past several years. As teachers completed their first full year of implementation and live assessments, the CCSS have continued to be highlighted in the media (AFT, n.d; National Council of Teachers of Mathematics [NCTM], 2013; NEA, 2014). Stakeholders lacking the knowledge about the CCSS began to have an overall negative impact on the upcoming implementation phase in Mississippi. Additionally, Mississippi's Governor, Phil Bryant, released an executive order aimed at preventing federal takeover of classrooms on December 17, 2013. In this document, he asserted that the federal government did not have the right to determine Mississippi's

curricula and assessments (Pender, 2013). Although the executive order did not stop the implementation of the standards, the executive order was initiated to appease those opposing the CCSS, adding to the overall negative atmosphere towards CCSS (Pender, 2013).

In addition, Louisiana's Superintendent of Education John White announced that the state would postpone the initiation of the standards for at least two years (Fagen, 2013; McGaughy, 2013). The announcement came after months of pressure from various stakeholders including parents, teachers, and political groups, opposing the standards (Fagen, 2013). Additionally, the CCSS had also made the news with several states opting out of the testing consortiums Partnership for Assessment of Readiness of College and Careers (PARCC) or SMARTER Balanced Assessment Consortiums (SBAC) due to cost (Bidwell, 2013; McGaughy, 2013). Lack of knowledge and implementation of these standards has also made the transition and implementation process harder for educators in neighboring states, such as this study's state of interest, Mississippi.

To overcome low high school mathematics achievement of local students, the MDE adopted the implementation of the CCSS and referenced them as the Mississippi College and Career Readiness (MS-CCR) Standards (MDE, 2012a). The goal of the MDE was to have the teachers view the process as weaving the CCSS into the current fabric of classroom instruction (MDE, 2012a). This implementation process possessed numerous potential problems. First, several administrators and district leaders opted not to follow the CCSS implementation timeline due to accountability for the current Mississippi Framework Curriculum (J. Daley, personal communication, September 12,

2013; D. Harrien, personal communication, August 6, 2013). Second, teachers continued to struggle with the current framework due to various reasons including not properly interpreting the meaning of objectives in order to effectively teach students (MDE, 2012a).

Finally, teachers lack the content knowledge to teach the new skills. For instance, under the CCSS for mathematics, eighth grade teachers are asked to teach students to solve systems of equations, standard, 8.EE.C.8 (CCSSI, 2012). This concept under the Mississippi framework was an Algebra I skill (MDE, 2007). Many eighth-grade teachers were either K-6 or 6-8 certified; therefore, they were not familiar with the upper level content. Hence, preparing teachers to implement these new standards led to perceived teacher barriers regarding the implementation of the standards. Teachers were asked to implement standards with minimal training, which has been determined by district perception of need rather than the teachers' actual needs. Therefore, without understanding the requirements for the successful implementation of the CCSSM, teachers are faced with perceived difficulties and uncertainties of expectations. The AFT (n.d.) contends that the standards can improve education for all students if implemented correctly with the needed support and resources.

Evidence of the Problem from the Professional Literature

The implementation of the standards is an important factor in the ongoing success of the CCSS. The AFT (n.d.) stated that the standards could improve education for all students if implemented correctly with the needed support and resources. Ediger (2011) stated that teacher conceptual and procedural knowledge is necessary to develop self-

efficacy and competency in instruction when teaching the standards. Additionally, Vecellio (2013) noted that teachers need to be trained in an effort not to make the previous mistakes of implementing past standards. On the other hand, Tobias and Piercey (2014) elaborated on the misconception and anxiety; by reporting that teachers are not only worried about both the content and delivery the standards, they are confused about what teaching the standards actually entails. Most importantly, teachers need to understand that the standards are not viewed as a curriculum but as goals and expectations for student success (Common Core State Standards Initiative, 2012b; Tobias & Piercey, 2014)

Teacher preparation to implement the new standards will become an important issue at the local level for this school district. The problem is the lack of clarity regarding teacher concerns about the CCSS implementation in high school math and their impact on the implementation process. Many school districts have given their teachers the charge with implementing the standards; however, teachers are unclear and some suffer from anxiety on how to teach the standards (Tobias & Piercey, 2014). Teachers now have to delve deeper into understanding of not only procedural skills but conceptual understanding in order to teach the standards; teachers must be trained in a manner that allow them to balance both worlds (conceptual and procedural) (Vecellio, 2013). Additionally, teachers must help student become thinkers by implementing the standards for mathematical practices. The infusion of these standards helps students in the following ways: they can reason abstractly and quantitatively; make sense of problems;

make conjectures; and look for pattern. (Bostic & Matney, 2013; Courtney, 2014; Ediger, 2011). In summary, the standards help with conceptual development.

Purpose of the Study

The study targeted the entire high school math department and two certified inclusion math teachers on staff at a rural high school in Mississippi to examine the phenomena associated with teaching the CCSSM. Because teachers' perceived barriers for successfully implementing the CCSSM in this institution are unclear, the purpose of this qualitative case study was to investigate the perceived barriers with implementing the CCSSM as well as elicit suggestions from teachers in an effort to help overcome these barriers.

Definitions

Common Core State Standards (CCSS): The common standards that are aligned with college and career expectations, informed by other top performing countries, created to be realistic and practical for the classroom, and include rigorous content and skills (CCSSI, 2012).

Common Core State Standards for Mathematics (CCSSM): Defined as "what students should understand and be able to do in their study of mathematics" (Common Core State Standards Initiative, 2010, p. 4). Additionally, the standards are a balance between conceptual understanding and procedural skills and require students to justify their understanding of mathematics (CCSSI, 2010).

Implementation: "Defined as a specified set of activities designed to put into practice an activity or program of know no dimensions" (Halle, 2012, p. 3).

Perception: A momentary experience of blending an indefinite number of perspectival views (past and present) that is not a result of a conscious choice to perceive (Vagle, 2009).

Professional development: Viewed as a method for strengthening educational knowledge (Masuda, Ebersole, & Barett, 2012).

Professional learning community (PLC): A relationship between principals and teachers that leads to shared and collegial leadership in a school, where all grow professionally and focus on student learning by sharing the same vision and values (Hord, 1997).

Self-efficacy: Defined as a person's belief to effectively use knowledge and skills to perform a task (Stevens, Harris, Munoz, & Cobbs, 2009).

Significance of the Study

Significance to the Local Problem

Understanding the implementation process of the CCSSM in a local high school was important because the process determined the success of the standards. If the standards are implemented correctly, educators produce college and career ready students who have the mathematical expertise to have successful futures (ACT, 2010; AFT, n.d.; Burns, 2013; NEA, 2014). The transition of implementing the CCSSM involved both the teachers in the classroom and the universities preparing the next generation of educators (Courtney, 2014). Additionally, the transition involved current educators committing to changing the culture of the classroom by helping struggling students develop better reasoning strategies (Burns, 2013). Teachers should have moved from rushing to teach

students content, which lacks the foundations for postsecondary and workplace success to teaching standards, which are benchmarked to the highest performing states in the United States and other countries (Jones & King, 2012).

The results of this study would be useful to multiple stakeholders in this local arena, including school district leaders, building level administrators, and math teachers. District leaders and building level administrators will be able to organize trainings geared towards to the needs of its teachers and provide the necessary resources to assist with the implementation process. Most importantly, math teachers will have the necessary support based on their voices. Ediger (2011) noted that math teachers provide a vital role in guiding pupil progress in meeting the CCSSM; therefore, understanding teachers' perceived barriers with implementing the standards will benefit the stakeholders in this local setting.

Significance to the Profession

Studying the problem of teacher perceived barriers associated with the CCSSM will be useful to the teaching profession. Currently, forty-two states, including the District of Columbia, four territories, and the Department of Defense Education Activity have adopted the CCSS (Common Core State Standards Initiative, 2015). Understanding this phenomenon could help other teachers take a proactive stance instead of a reactive stance when implementing the CCSSM for the first time. Additionally, local universities could utilize results of this study in preparing future educators, by helping current education students understand current perceived barriers associated with implementing the CCSSM. Finally, other surrounding districts leaders with similar demographics could

utilize the results of the study to better understand teacher perceived barriers associated with the standards.

Potential to Create Positive Social Change

This study promotes potential social change by bringing awareness of potential barriers to teachers who are or will be implementing these new standards. This awareness will help determine the specific needs of teacher support which will in turn help students obtain the growth needed to be considered college and career ready. Additionally, teachers could also gain a form of self-efficacy in teaching mathematics from a different perspective, which could also be instilled in students, especially those students and teachers who struggle with various mathematical concepts. This study promotes potential social change due to teacher awareness in implementing the CCSSM by reducing potential barriers.

Research Questions

The implementation of the CCSS is a new phenomenon in today's society; therefore, very few studies exist discussing the best practice for implementation. However, several authors have mentioned the importance of a successful implementation such as failure to repeat past mistakes and reduced teacher anxiety and confusion (Tobias & Piercey, 2014; Vecellio, 2013). The questions that guided this research study were:

1. What are the perceptions of high school math teachers regarding change conditions and barriers of successful implementation of the CCSSM in a secondary school in Mississippi?

2. What are the perceptions and suggestions of high school math teachers regarding strategies to overcome barriers and facilitate successful implementation of the CCSSM in a secondary school in Mississippi?

Review of the Literature

This section begins with an overview of how the research for this section was conducted. Then there is an explanation of Ely's change theory (1999) as the conceptual framework of this study. Following that, there is a discussion of the literature on teacher perception as it relates to previous events associated with change in education. Finally, there is an analysis of the history of math education in the United States, beginning with *A Nation at Risk* (National Council on Excellence in Education [NCEE], 1983) and concluding with the implementation of the Common Core State Standards (CCSSI, 2015).

The key purpose of this literature review was to convey an understanding of the implementation of the CCSSM through change. The review began with researching various peer-reviewed articles, which address the implementation of the CCSS. The search for articles was limited to the last 5 years; however, to explain Ely's change theory and the history of mathematics education reform, resources were cited beyond the 5-year window. Because the topic of CCSS is still relatively new, that saturation was obtained rather quickly; therefore, to support the significance of the need to implement the CCSS and to better understand the gravitation to universal standards, there was additional research conducted on the history of mathematics education in the United States.

ERIC and Education Research Complete were used as primary search databases and Google Scholar was utilized as a secondary search engine. Although articles were not cited from Google Scholar, this search engine was used to help locate other resources and articles connected to Ely's theory of change and educational reform as it pertains to mathematics. The keywords and phrases used during this research process were *change, educational change, No Child Left Behind, A Nation at Risk, Common Core, Ely's change, NCTM, ESEA, mathematical reform, teacher perception, implementation, mathematics, and standards-based reform.*

To capture the essence of this literature review, approximately 50 articles were used for this section, while all others were rejected due to lack of alignment with the study. Sources that demonstrated a clear alignment to either the background, problem, theoretical framework, or history of mathematics education were chosen and included in the review. Additionally, I selected several sources that were beyond the five-year literature review guidelines to fulfill the goal of explaining the history of mathematics education reform. Saturation for this literature review was reached when search results revealed the same studies previously acknowledged throughout this process.

Conceptual Framework: Theory of Change

Implementation of the CCSS is a change in American education; however, with change comes resistance. Resistance to change is refusing a new or different way of doing something by attitudes, spoken words, deeds, or body language (Caruth & Caruth, 2013). In an effort to understand the CCSS and its relationship to change, this section explored various studies related to both concepts. Rothman (2012) found that

incorporating the CCSS would increase the percentage of college and career ready students. On the other hand, Toscano (2013) insisted that the standards were accurate but misleading. He concluded that because the standards were not a curriculum, they left gaps in teaching, and school leaders were tasked with resolving those gaps. Porter (2005) noted that successful change is achieved through patience and with careful cultivation. The implementation of the CCSS calls for a change strategy; therefore, Ely's theory of change was used as the framework for the present study in order to better understand the grounds for change in education. Ely's suggested conditions of change were used in interview questions to explore teachers' perceptions about such conditions.

Theory of change is related to the building blocks that bring about long-term goals. Ely (1990) found that socioenvironmental conditions could hinder effective change; therefore, certain socioenvironmental conditions need to be in place to ensure successful change. Ely (1990, 1999) also identified the following eight conditions of change: (a) dissatisfaction with the status quo, (b) existence of knowledge and skills, (c) availability of resources, (d) availability of time, (e) rewards or incentives exists, (f) participation, (g) commitment, and (h) leadership. Teachers' perceived barriers were compared and contrasted with the suggested conditions of change suggested by Ely's theory in the study. Conner (2011) stated that a theory of change must be grounded in how students learn and provide students with skills to be successful beyond college. The CCSS is calling for change in not only the nation's educational system but also in the state of Mississippi. There will now be an elaboration of several of the relevant

conditions suggested by the theory of change as associated with the implementation of the CCSS.

Dissatisfaction with the status quo. Although Ely (1999) mentioned that no condition contains an emerging hierarchy over the other and listed dissatisfaction with the status quo as the first condition. This condition addresses the need for change by determining who is dissatisfied (Ellsworth, 2000). Factors such as international assessments contributed to the need for change, which led to the implementation of the CCSS. For the past two decades, several international assessments, including the Trends in International Mathematics and Science Study (TIMMS), Progress in International Reading Literacy Study (PIRLS), and the Programme for International Student Assessment (PISA) have been administered to help create consistent, reliable data on students' performance of knowledge and skills.

TIMSS measures trends in mathematics and science for students in the fourth and eighth grades and PIRLS measures the reading comprehension of students in the fourth grade (TIMSS, 2011; PIRLS, 2013). The Organization of Economic Co-operation and Development (OECD) administers an international survey called PISA. This assessment differs from TIMSS because it assesses 15 year-old students to determine how they apply their educational knowledge to real-life situations (OECD, 2012). Singapore is among the top emerging countries regarding outcomes of the aforementioned international assessments. According to the 2011 TIMSS and 2012 PISA reports, Singapore ranked within the top three countries for math, science, and reading (TIMSS, 2011; OECD, 2012). America ranked within the top 10, with the exception of fourth grade math, which

held a ranking of 11th. Furthermore, according to PISA, when the students had to apply knowledge to real-life situations, the rankings dropped tremendously, and America's rankings ranged from 17th through 32nd (OECD, 2012). These international assessments help educators understand the gaps in education as compared to other countries, shown in Table 3. Additionally, the founders of the CCSS notes that these standards were created based on other top performing countries (Common Core State Standards Initiative, 2012b).

Table 3

International Assessments' Results

Assessment	Year	Score	Country	Ranking
TIMMS	2011	606 4th Grade Math	Singapore	1st
TIMMS	2011	611 8th Grade Math	Singapore	2nd
TIMMS	2011	541 4th Grade Math	United States	11th
TIMSS	2011	508 8th Grade Math	United States	9th
PISA	2012	573	Singapore	2nd
PISA	2012	481	United States	36th

Note. This table only reflects the results of the mathematical portions of the various international assessments. PIRLS is a reading assessment; therefore, not reflected in this table.

Existence of knowledge and skills. As part of Ely's (1990, 1999) conditions of change, existence of knowledge and skills is defined as providing the adopters training

through professional development, continued education, mentoring and peer support groups such as professional learning communities. Professional development and professional learning communities have become important entities in teacher growth and students' achievement. The completion of professional development develops teacher self-efficacy, the confidence of teachers to implement the strategy. Stevens, Harris, Munoz, and Cobbs (2009) found that providing teachers with professional development geared towards various math-teaching strategies built teacher self-efficacy, which in turn, built student self-efficacy. The researchers defined self-efficacy as a person's beliefs to effectively use knowledge and skill to perform a task. Furthermore, Masuda, Ebersole, and Barett (2012) found that teachers viewed professional development as a method for strengthening educational knowledge. Williams's (2012) research concluded that professional learning communities (PLCs) are clearly connected to improvement on reading scores in Texas, and Linder et al. (2012) found that creating PLCs designed to incorporate the professional levels of teachers yielded higher results.

Leadership and commitment. Ely (1999) also addressed leadership and commitment as additional entities for change. He noted that commitment is measured by the perception of those willing to implement change, and leadership targets the person in charge of leading the change, focusing on daily activities. Leadership has become an important component of school success. Yavuz and Bas (2010) stated that the success or failure of a school is linked to the success or failure of the principal. Additionally, several studies have shown that effective leadership can have a positive impact on student academic achievement (Shouppe & Pate, 2010; Williams, Persaud, & Turner, 2008).

Furthermore, leadership has also been described as the most crucial component when implementing successful change and growth (Putman, 2010). Therefore, the successful implementation of the CCSSM are linked to the leadership within a school. To adjust to this change, school leaders need to act as agents of change and play an important role in helping teachers who are reluctant to participate in the change process (Putman, 2010).

Resources, availability of time, and participation. The remaining conditions for Ely's theory of change are based on individual districts and federal funding. These conditions are based on availability of resources, availability of time, and participation (Ely, 1990, 1999). In the state of Mississippi, the legislature voted in February of 2015 to fund public schools again and to allocate the yearly raises to teachers. However, each district operates within their own abilities as to the extent of which these allocations are made. For example, in the district for which the study took place, a stipend may be given to retain a teacher based on their test scores or a previous year stipend may be decreased the following year after unsatisfactory performance of students with test scores (R. West, personal communication, May 13, 2015). Additionally, the state legislature allocated a budget of roughly $2.4 billion to MDE for the 2015 fiscal school year, and the allocations of these funds are not limited to teacher salaries but are inclusive to any and all general education (Mississippi Legislative Budget Office, 2015). Therefore, to adhere to Ely's remaining change agents, district funding plays a critical role in availability of resources, availability of time, and participation.

Teacher Perception to Change in Education

Teacher perception to change as it relates to public education has been studied by numerous researchers across the world. McGee, Wang, and Drew (2013) found that teacher perceptions towards the integration of a new curriculum changed based on the success of professional development as it pertained to education. Subramaniam and Edwards (2014) completed a study on the collaboration of librarians and mathematics teachers and found that a shift in perception for both parties would be needed to ensure a successful collaboration. Another study on teacher perception as it relates to education reported two outcomes among mathematics educators at the secondary level. In this study, Chand Dayal (2013) aimed to determine the perception of teachers regarding confidence and concerns. The researcher found that most of the teachers were confident with teaching mathematics but were concerned with the students' dislike for math. (Chand Dayal, 2013).

Like Chand Dayal's (2013) investigation of teacher perceptions related to student participation and achievement, other researchers have also provided results of findings on similar topics. A recent study on teaching creativity and teacher perception indicated that teachers' perception of creativity did not align to the true meaning of student creativity (Rubenstein, McCoach, & Seigle, 2013). Teachers wanted students to be creative but did not provide opportunities for students to give unique individual answers (Rubenstein et al., 2013). Ryan and Shim (2012) reported that teacher perceptions of teaching characteristics (mastery goals, performance goals, and teacher support) affected help-seeking behaviors of teens during early adolescence. In other words, the academic goals

and characteristics of classroom success set by teachers influenced the perceptions students gather about themselves, their work, and other peers surrounding them. In the midst of teacher perceptions and change, one study also revisited the historic misconception that boys were better at math than girls. The findings regarding teacher perceptions of students' attitudes towards mathematics indicated that on average more teachers still maintained the traditional gender stereotype that boys were better at math than girls (Schwatz & Sinicrope, 2013). Although several studies exist pertaining to teacher perception regarding change in education or student participation or achievement, the studies failed to reveal the outcome of longevity. A successful change in education is due to systemic change, with strong leadership, that takes place over several years (Schumacher, 2011). Therefore, as teacher perceptions in education continue to develop, sustained change in the environment is created when stakeholders have ownership and shared leadership (Schumacher, 2011).

History of Mathematics Education Reform

Educational reform in the United States has been defined by several important events in education (See Figure 1). This evolution begins with the 1983 publication of *A Nation at Risk* and concludes with the Common Core State Standards Initiative of 2010. In 1983, *A Nation at Risk* (NCEE, 1983) was published and detailed the conditions of America's educational system. As a response to this public report, eventually, the Reauthorization of the Elementary and Secondary Education Act (ESEA) was passed in 1994 and later renamed the No Child Left Behind Act of 2001 (Marzano, Yanoski, Hoegh, & Simms, 2013). The act emphasized the importance of standardized testing and

accountability but yielded student achievement concerns (Liebtag, 2013; Scott, 2011). Finally, in an attempt to address student achievement concerns, the CCSSO and the NGA developed the CCSS in 2010 (Liebtag, 2013). This section addresses the changes in educational reform in the United States beginning with *A Nation at Risk* (NCEE, 1983).

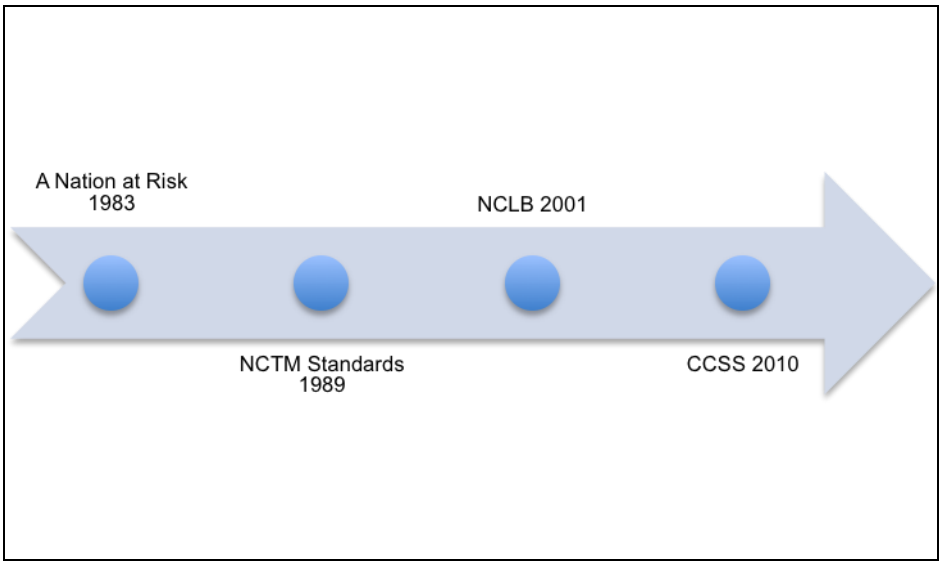

Figure 1. History of Mathematics Reform. Summarizes the history of mathematics reform beginning with the 1983 publication of A Nation at Risk and concluding with the 2010 adoption of the Common Core State Standards.

A Nation at Risk. In 1981, T. H. Bell, the Secretary of Education, created the NCEE to evaluate the state of America's education (USDOE, 1983). The outcome of this evaluation was the publication of the 1983 report, *A Nation at Risk*. Led by David Gardner, the report discussed a decline in America's education system and brought about changes in graduation requirements (USDOE, 1983). Although the evaluation of America's educational system was initially created for political gains and to help the

Reagan administration eliminate the Department of Education, the report inadvertently saved this invaluable national department (Good, 2010).

Many researchers had opposing views on the outcome of *A Nation at Risk* (NCEE, 1983). Edwards and Allred (1993) found that the report had little influence on education and that many school districts and state departments felt that certain recommendations were in place prior to the report such as increased graduation requirements. Kapalka-Richerme (2011) noted that the report caused for the reexamination of teacher certification and accountability requirements for assessments. Others felt that the report failed to discuss the importance of exceptional children and special education (The Council for Exceptional Children [CEC] Ad Hoc Committee, 1984). On the other hand, Goodwin (1988) reported five years later that small gains were being made, but the rate of increase was still unacceptably low. The report noted the following promising figures: approximately 70% of states increased the difficulty of graduation requirements; 38% of states required students to take an exit examination in order to receive a diploma; 96% of states increased education budgets as one of the largest for the state; teacher salaries increased; and the percentage of students taking Advanced Placement courses doubled (Goodwin, 1988). Meadows (2007) felt that the introduction to standard based teaching was the solution to *A Nation at Risk* (NCEE, 1983). Regardless of the opposing views, *A Nation at Risk* (NCEE, 1983) was undoubtedly been a wakeup call for America's educational system.

National Council of Teachers of Mathematics. The concept of a standards-based mathematical curriculum became the new focus during the 1980s as a possible

response to the NCEE (Meadows, 2007). In 1989, the National Council of Teachers of Mathematics (NCTM) created the first set of standards to adhere the Bush's administration idea to develop content-area standards (Marzano et al., 2013). It was recently reported that the purpose of NCTM recommendations was twofold: for students to be able to not only communicate mathematics efficiently but also defend their positions on mathematical topics (Byung-In Seo, 2015). Newton, Gellar, Umbreck, and Kasmer (2012) noted that the utilization of the NCTM standards led to students being able to make sense of mathematics beyond following procedural tasks. The standards also allowed for teachers to follow the inquiry-based model of Launch-Explore-Summary. In addition, Hennessey, Higley, and Chestnut (2012) found that the NCTM principles and standards met the criteria of both the constructive and persuasive pedagogies. In a study on teacher perception in a middle school, Perrin (2012) determined that the certification of teachers impacted their belief regarding the standards. Specifically, secondary certified teachers teaching middle school had a stronger belief in the NCTM's vision of mathematics as compared to their elementary certified counterparts.

No Child Left Behind Act of 2001. The onset of the NCLBA of 2001 created the continued emergence of standardized testing. The act was designed to encourage standards-based reform and to be an answer to the 1983 publication of A Nation at Risk (Liebtag, 2013). NCLBA became the introduction of standards based reform and outcomes included the creation of high school exit examinations by several states, including Mississippi's end of course examination (Braden, 2008; Vogler & Burton, 2010). Adequate Yearly Progress (AYP) became a major component of the NCLBA

serving as the primary definition of the status model of accountability (Braden, 2008). Additionally, the NCLBA called for high stakes testing for grades 3-8 and, once in high school, in the subjects of math, reading or language arts, and science (Deans & Cohen, 2010).

Unfortunately, although the rationale behind the act was with positive intent, the NCLBA created controversy for those who analyzed the act. Jennings (2012) reported that the NCLBA led to a test-driven reform versus a standards-based reform. Additionally, Klein, Braams, Parker, Quirk, Schmidt, and Wilson (2005) noted that since the standards varied from state to state, the act lead to discontinuity regarding standard alignment. Brown (2013) also reported that the act limited the instruction of character education within schools. From a special education perspective, Hodge and Krumm (2009) determined that NLCBA focused on highly qualified teachers (HQT) in content areas affected recruitment and retention of special education teachers in rural areas.

On the other hand, one study provided mixed opinions on the act. Al-Fadhli and Singh (2010) noted that teachers from their study overall favored the act but expressed concerns about instructional teaching time and not being able to challenge high-achieving students due to the proficiency levels of their overall classes. Similar findings for social studies and the NCLBA were also gathered. Winstead (2011) reported that social studies teachers felt that the accountability measures of NCLBA affected the amount of time dedicated to instruction was reduced. Specifically, priority was given to the tested areas of mathematics and English language arts. Starr (2012) also reported that since social studies was not identified as a core subject under the NCLBA, teachers reduced their

focus time of teaching the content. Additionally, other studies regarding teachers' perceptions of the NCLBA noted similar findings. Overall, teachers' responses were negative; they felt the goals of the act was unrealistic, increased the idea of teaching to the test, and diminished the focus and amount of time spent teaching non-tested areas (Pinder, 2013; Rose & Gallup, 2007). Needless to say, one goal of the NCLBA was to have all students mathematically proficient by 2014, and this goal was not attained (Dean & Cohen, 2010).

Common Core State Standards. The CCSS were initiated in 2010 and adopted by forty-two states, the District of Columbia, four territories (Guam, American Samoa Islands, United States Virgin Island, and Northern Mariana), and the Department of Defense Education Activity (Common Core State Initiative, 2012a). These new, more robust set of standards were created with the assistance of such organizations as Achieve, ACT, and the College Board in an effort to help create college and career ready students (Marrongelle, Sztajn, & Smith, 2013; Rothman, 2012; Wurman & Wilson, 2012). While these standards focus on what students need to know, there is no specification for how to effectively teach the content (Conley, 2012). Therefore, although these new expectations will help prepare the students, the effective implementation is hinged hinge on the success of the professional development provided to teachers. Lack of strong teachers and those without deep conceptual and procedural understanding in mathematics, will inevitably bring more challenges and disappointments with the implementation process (Marrongelle et al., 2013). Thus, districts and states must intentionally prepare by aligning current state curriculums and materials, creating effective professional

development opportunities, and designing assessments and accountability measures related to CCSS (Achieve, 2012).

Although Kemp (2010) has found that staff development, which followed the mandates of the NCLBA has positively impacted the professional growth of teachers, the research does not address the effects of staff development and the mandates of A Blueprint for Reform that includes the CCSS. Rimbey (2012) found that CCSSM professional development had a greater impact on teacher knowledge as compared to student learning. Ballard (2013) also reported that teachers actually prefer professional development that is focused around technology and presenters who entertain them with knowledge followed by active engagement from the teachers.

Various researchers also investigated the potential impact of implementing the CCSS. The results of two 2011 studies informed the research community that the implementation of the CCSSM would lead to changes in practice associated with teachers viewing their work as supporting students' development (Cobb & Jackson, 2011; Porter, McMaker, Hwang, &Yang, 2011). Conley (2012) proclaimed that teachers would lack the knowledge of how to prepare students to engage in disciplinary literacy. Additionally, two studies determined that teachers must understand the standards in order to provide interventions to students with mathematical disabilities since these students currently struggle more than the average student with current mathematical skills (Powell, Fuch, & Fuch, 2013; Wilson, 2013). Finally, Anderson and Herr (2011) found that professional development opportunities should be further developed into to professional learning communities to assist with the implementation of the CCSS.

The adoption of the CCSSM also brought about the integration of the Standards for Mathematical Practices (SMPs) and instructional shifts (Zelkowski, Gliason, Cox, & Bismark, 2013). The SMPs reflect a combination of the NCTM process standards and the mathematical proficiency strands specified in the National Research Council's Report (Common Core State Initiative, 2012c). The goal of CCSSM is to connect the content standards to the SMPs (Common Core State Initiative, 2012c). Schimidt and Houang (2012) compared that the CCSS instructional shifts of coherence, focus, and rigor to the TIMSS and found similarity in the content.

In an online survey completed by EPE Research Center (2013), teachers' perceptions of implementing the CCSS revealed certain aspects of implementing the standards. On a five-point scale, most teachers felt moderately prepared to implement the CCSS, with the average being a three. With regards to teaching to diversity such as English Language Learners, students with disabilities low-income students, and students deemed academically at-risk, the survey revealed that the teachers also felt moderately prepared to teach these students (EPE Research Center, 2013). Additionally, a similar survey found that teachers were enthusiastic about the implementation but believed more professional development and resources are needed to implement the standards (Scholastic and Bill & Melinda Gates Foundation, 2013).

In Mississippi, the adoption of the CCSS has brought additional changes to student achievement. As of the 2015-2016 academic year, the students needed to achieve a combined minimal score on all high school subject area tests and correlating classes to graduate from high school (MDE, 2015). Additionally, for the 2016-2017 academic year,

the state assessment scores constituted 25 percent of the students' final grade (MDE, 2015). Therefore, the successful implementation of the CCSS should have a positive impact on standardized tests for this state and district. The purpose of this study is to not only understand the perceived barriers with implementing the CCSSM but to also elicit suggestions from teachers in an effort to help overcome these barriers. Furthermore, I aimed to understand the needs of teachers as it relates to implementing the CCSSM. Due to the CCSS being a new national initiative, the information regarding this topic is limited.

Implications

High school mathematics teachers are charged with implementing new standards, which require not only procedural understanding but also conceptual understanding of content. Because the CCSS are new to the education realm, there is a need to understand how the implementation process should exist. Future directions of this study include the potential creation of a series of professional development workshops or curriculum evaluations. The results may also further demonstrate that teachers need support on implementing the standards, particularly that they need direction in selecting appropriate curriculum to teach the standards. After all, the standards are goals and expectations for student success and not viewed as a curriculum (CCSSI, 2012b; Tobias & Piercey, 2014). Regardless of the outcomes of this study, the results will be used to provide an understanding of the implementation process of the CCSSM based on the input from high school teachers in a rural Mississippi community.

Summary

The success or failure of the new CCSS is based on both the implementation and the assessment of outcomes. If evaluation outcomes provide evidence that the standards were implemented correctly, widespread implementation could make strides in American Education (AFT, n.d.; CCSSI, 2012b). However, teachers and educational leaders must have a clear understanding of both the implementation and assessment process in an effort to not make the previous mistakes of earlier decades regarding the implementation of new standards or objectives (Vecellio, 2013).

In recent years, educational leaders have been training teachers for the implementation process without input from the teachers themselves. However, the district leaders' and administrators' lack of clarity exists regarding teacher concerns about the implementation of the CCSSM in high school math. Therefore, to better understand this phenomenon, I chose a qualitative case study as my methodological design. In Section 2, I explain my rationale for the chosen design and provide details to other key factors in this study by describing the participants, ethical considerations, and methods for data collection and analysis.

Section 2: The Methodology

This section provides a detailed background on the methodology chosen for this study. Within this section, the research design, setting and participants, ethical considerations, role of researcher, data analysis, discrepant cases, and limitations are discussed. Section 2 is closed with a summary of conclusion.

Research Design and Approach

In order to answer the research questions posed, a qualitative case study approach was utilized to understand this phenomenon. The problem that anchored this study was the district leaders' and administrators' lack of clarity regarding teacher concerns about the CCSSM implementation in high school math and the impact on the implementation process. Due to these problems, the research questions posed center on teacher perceptions regarding the concerns and implementation of the CCSSM. The overarching research questions for the present study are:

1. What are the perceptions of high school math teachers regarding change conditions and barriers of successful implementation of the CCSSM in a secondary school in Mississippi?
2. What are the perceptions and suggestions of high school math teachers regarding strategies to overcome barriers and facilitate successful implementation of the CCSSM in a secondary school in Mississippi?

In order to address the concerns, the research questions also addressed Ely's change conditions and elicit suggestions for effectively implementing the standards. Therefore, to answer these questions and to better understand this phenomenon, I found

that a qualitative case study best aligned to this research. As the researcher, I was able to utilize the format of a case study to develop an understanding of this situation.

Qualitative designs in research employ inductive reasoning and look to summarize data using a narrative method (Lodico, Spaulding, & Voegtle, 2010). For this study, another case study was used to examine the educational change associated with the implementation of the new CCSSM. Case studies are organized as instrumental, intrinsic, and collective. For the purpose of this study, an instrumental case study was used; it provided insight into a particular phenomenon, unlike an intrinsic case study or collective case study (Creswell, 2012; Merriam, 2009). An intrinsic case study is based on an unusual case, and a collective case study is based on several cases (Creswell, 2012). Therefore, in this project study, I aimed to utilize a qualitative instrumental case study to better understand the phenomenon of perceived teacher barriers associated with teaching the CCSSM.

Initially, I considered using a quantitative design to understand this new shift in education. However, quantitative studies employ deductive reasoning to explore topics and summarize data using descriptive and inferential statistics (Lodico et al., 2010). My goal was to delve deeper into the understanding of a particular situation and not to have summarized my findings using inferential statistics. Therefore, to best understand this phenomenon in education, I needed to understand the perceptions of teacher barriers associated with teaching the new standards. My goal was to not only understand the perceived barriers with implementing the CCSSM but to also elicit suggestions from teachers in an effort to help overcome these barriers. Furthermore, I aimed to understand

the needs of teachers as it related to implementing the CCSSM. Therefore, I determined that a qualitative study would best meet the needs of my study.

Under the qualitative umbrella exists several designs: ethnography, case study research, phenomenological research, and grounded theory. Because the purpose of an ethnography study is to understand cultural groups, this design did not meet the criteria for examining my problem (Lodico et al., 2010). Additionally, I found similar results when examining the phenomenological and grounded theory designs. The phenomenological research design examines an individual's interpretation of his or her experiences, and a grounded theory design collects data over a long period of times, utilizing multiple techniques (Lodico et al., 2010). Therefore, of the four designs, I found that the case study design was the most viable choice for the study. A case study allows the reader to not only understand the details of a phenomenon, but unlike the other qualitative designs, the researcher attempts to gain insight into understanding a particular situation (Lodico et al., 2010). The purpose of this study was to examine perceived barriers and perceptions associated with implementing the CCSSM in high school math classrooms, and my goal was to report outcomes of the situation as it pertains to a high school in a rural Mississippi community.

Setting and Participants

The research took place in a small rural school district in a Mississippi. The district consisted of four schools: two elementary schools, grades K-6, and two high school, grades 7-12. The 2013-2014-district enrollment was 1,678 students, whereas the enrollment for the participating high school was 258 students. The racial component of

this high school in terms of students were 83% African American, 15% Caucasian, and 2% other. The average class size within this school was 25 students to 1 teacher.

Purposeful sampling was used for the study. Creswell (2012) defined purposeful sampling as intentionally selecting individuals or key informants to participate in a study based upon the central phenomenon. Key informants are individuals possessing some fundamental knowledge about the topic under investigation (Lodico et al., 2010). The participants chosen for this study possessed the knowledge of teaching the CCSSM content needed to understand this phenomenon.

The participants for this study included five math teachers located in one high school in the previously described school district. The five participants chosen for this study vary in teaching experience, education, and degree certification (see Table 4).

Table 4

Participants Demographics

Teacher	Degree	Years' Experience	Certification
Teacher A	Masters	32 years	Math 7-8 Elementary K-3 Elementary 4-6
Teacher B	Masters	11 years	Math 7-12 Elementary 4-6
Teacher C	Masters	7 years	Math 7-12
Teacher D	Bachelors	2 years	Math 7-12
Teacher E	Bachelors	5 years	Math 7-12

In order to gain initial access to participants, the counselor served as my point of contact. Additionally, I had received permission from the current administration to interview the teachers during their specific planning times.

Ethical Considerations

A significant difference between qualitative studies and quantitative studies is the methods for data collection. Some data collection techniques used are interviews, observations, and questionnaires that lead to more rigorous procedures for adhering to the codes of ethics. Therefore, I followed the guidelines according to the school's Institutional Review Board (IRB). Walden's IRB must ensure students comply with university ethical standards, along with U. S. Federal Regulations (Walden University Center for Research Support, n.d.). I used the Research Ethics Planning Worksheet to ensure confidentiality and protection from harm was ensured (Walden University Center for Research Support, n.d.). All participants were asked to sign informed consent documentation. All interviews took place in the school counselor's office, where she had a secondary room for completing private meetings. Completing the interviews in this location ensured confidentiality so that the participants were not concerned with others hearing their interviews. Their identities were protected by the utilization of codes on their interview and survey forms (See Table 4). To maintain confidentially, I removed participants' names from the open-ended surveys and replaced them with the previously mentioned codes. Additionally, all documents were stored within a locked box in my home office. In the event, that I relocated, all documents were scanned and saved to my

personal work computer, which contains a password that only I know. All original documents were shredded.

Another goal of the IRB was to ensure the investigators maintained a relationship built on honesty, trust, and respect with their participants (U.S. Department of Health and Human Services, n.d.). Following the guidelines of the IRB, an application was submitted, along with a letter of cooperation from the school district and school site. The application included a detailed description of the study such as timespan, procedures, data integrity and confidentiality, risks and benefits, and data collection tools (Creswell, 2012; Walden University Center for Research Support, n.d.). Upon the approval of the IRB, written consent was obtained from the participants prior to the data collection phase beginning.

Data Collection

Open-ended surveys, interviews, and field notes represented the data collection method for this case study. The initial data collection point was to have the teachers complete an open-ended survey (see Appendix B). I used open-ended surveys to determine barriers and elicit suggestions to obtain an understanding of teachers' perceptions regarding the CCSSM and the change conditions associated with this educational shift. Questions 1 through 4 related to participant demographics. By understanding the teacher demographics of the school, I could align the information with Research Question 1. On the other hand, Questions 5 through 9 were directly correlated to Research Question 1. I utilized these questions to help me understand teachers' perceptions regarding barriers and change conditions. Lastly, Questions 9 and 10, aligned

to Research Question 2. These questions elicited suggestions from the teachers, regarding solutions for both a successful implementation of the standards and a reduction in perceived barriers. The goal was to survey the entire high school math department, which consists of four math teachers and two inclusion teachers. The participants were given one week to complete the surveys. At the end of that timeframe, they could either email their surveys or return them to me personally. Once the surveys had been coded, I moved into the last two data collection points which are interviews and field notes.

The interviews were audiotaped, one-on-one, and semistructured; questions for the interviews are available in Appendix C. Semistructured open-ended interview questions ensured all participants were asked the same initial questions and created avenues for asking additional questions that were used for probing. For the purpose of this study, I utilized interview questions geared towards understanding perceptions of change and barriers associated with implementing the CCSSM. The interview questions were an extension of the survey and used to elicit more information from the participants regarding their experience, in addition to clearing up any misconceptions of the initial survey.

In alignment with the open-ended survey tool, interview Questions 1 through 6 were aligned to Research Question 1. These questions provided me with an in-depth opportunity to explore the phenomenon. Teachers were able to express concerns and challenges and discuss potential barriers associated with the implementation of the CCSSM. Additionally, they were able to relate Ely's change conditions to this new educational shift. The final two questions of the interview were utilized to elicit

suggestions for overcoming barriers and creating an ideal timeline for the implementation of the standards. Therefore, these questions aligned to Research Question 2. The ultimate goal of the interview was to gather additional information not received from the surveys in order to understand the implementation of the CCSSM in a high school math classroom.

Finally, I used descriptive field notes during the interview process. I collected field notes based upon the observation of the participants during the interview. My goal for utilizing these field notes were to capture the essence of each interview. Descriptive field notes contain a description of the events, activities, and people within the environment (Creswell, 2012). I documented the participants' demeanors and gestures, along with key content from the interview. The field notes, along with the interview and open-ended survey, were analyzed and compared to determine emerging codes to be utilized during data analysis.

Role of the Researcher

My role as a researcher did not create a conflict of interest within this study. Although I am a former teacher and math coach for the district and school, I have been gone for over three years. Of the five teachers participating in this study, I only worked with two of the teachers. These teachers served as my colleagues for two to three years, and I then served as their math coach for one year. Over the years, we have continued to maintain a professional relationship, by sharing teaching ideas and strategies. Therefore, my role as researcher did not create biases within this data collection process.

Data Analysis

Data analysis for qualitative studies involves inductive reasoning, which includes organizing, transcribing, and analyzing data (Yin, 2014). The data analysis involves analytic strategies, which evolves into rigorous empirical thinking (Yin, 2104). First, I organized both surveys and interviews into file folders and generated labels using the codes Teacher A, Teacher B, Teacher C, and so on. Next, all interviews and surveys were transcribed. Once, the data had been transcribed or converted into text, I provided the participants with an opportunity to review their information; this process was called member checking (Creswell, 2012).

Finally, I analyzed the data by hand using the coding process, which is examining the data and searching for overlapping or related topics that lead to themes or big ideas (Creswell, 2012; Lodico et al., 2010). A combination of text segment codes and in vivo codes were used to analyze the data. Text segment codes represent one method for coding data and involve using words and phrases that were used to correlate related sentences and paragraphs (Creswell, 2012). On the other hand, in vivo codes represent coding where the participants' actual words were utilized to help form descriptions of the data (Creswell, 2012). Therefore, as part of the coding process, I used a combination of text segment codes and in vivo codes. Once the coding was complete, I used the information to reduce the number of codes to create themes for the study. Creswell (2012) defined themes as codes grouped together to form a major idea about the data. Overall, my data analysis approach was analyzing the data using a "ground up" approach to determine patterns (Yin, 2014). I utilized thematic analysis to determine major themes throughout

the data. Braun and Clarke (2006) defined thematic analysis as a method for identifying, analyzing, and reporting patterns or themes within data.

The Findings

This section contains a discussion of the major themes that developed as a result of the data analysis. I obtained data through open-ended surveys, interviewing participants, and field notes. The purpose of this data collection was to better understand the lack of clarity regarding the teachers' implementation of the Common Core State Standards for Mathematics (CCSSM) or as Mississippi educators now refer to them as the Mississippi College and Career Standards (MS-CCRS) in a high school setting, (MDE, 2012). The two research questions that guided this project study and data analysis were:

1. What are the perceptions of high school math teachers regarding change conditions and barriers of successful implementation of the CCSSM in a secondary school in Mississippi?
2. What are the perceptions and suggestions of high school math teachers regarding strategies to overcome barriers and facilitate successful implementation of the CCSSM in a secondary school in Mississippi?

In an effort to better understand this phenomena, I transcribed each 30-minute interview, which took on average approximately 2.5 hours. For an additional 5 hours, I reviewed each transcript to ensure the data was correct, then emailed the transcribed interviews to the participants for verification. While waiting for the verification of the transcripts, I tallied and organized the data received from the open-ended surveys. After

verification and organization of data within the surveys, I began the process of coding all the data. With the completion of the coding process, several overlapping codes emerged, thus creating overarching themes related to both research questions. Ultimately, I used the concept of thematic coding to determine the following themes as each related to my two research questions. Themes are created to capture important information as they relate to research questions (Braun & Clarke, 2006). Therefore, and as presented in my findings, themes emerged for each research question.

Demographics

The original sample consisted of a combination of high school math educators and inclusion teachers. However, of the five participants, everyone completed the open-ended survey, and three of the five participants completed the interview. The years of teaching experience ranged from two to thirty-four years. Grades taught ranged from seventh grade to twelfth grade math subjects. Only one participant had experience with teaching upper level math courses; this participant taught eleventh and twelfth grade math content such as Pre-calculus, AP Calculus, and Trigonometry. The remaining four participants taught math courses focused on knowledge learned in the seven through tenth grade courses, such as 7^{th} Grade Math, 8^{th} Grade Math, Algebra 1, and Geometry.

Field Notes

Certain behaviors were observed that were relevant to my findings. Initially, two of the three participants appeared nervous at the beginning of the interview process. Teacher C and Teacher D initially spoke with a very soft tone. The participants were hesitant in responding to some of the questions. As the interview process continued, the

teachers demonstrated comfort and confidence by sitting up in their chairs and boldly responding to the questions presented to them. Teacher A exuded confidence from the beginning to the end of the interview. The tone of the participant was strong and in an effort to describe responses, hand gestures were sometime utilized.

Research Question 1

The purpose of research question 1 was to elicit information two-fold. Participants addressed their opinions regarding Ely's 8 conditions of change as the phenomena related to a change in education. Additionally, participants discussed barriers associated with the implementation of the CCSSM/MS-CCRS. In an effort to discuss the findings, the results of Ely's change conditions are first addressed. Secondly, as the results related to the barriers of implementation, I grouped final subthemes into three major themes: (a) teacher preparation (or lack of), (b) student preparation (or lack of), and (c) resources. The data generated based on this research question allowed participants an opportunity to provide input on the barriers associated with the change of implementing the new CCSSM/MS-CCRS.

I used the survey and interview to elicit information pertaining to the relationship between the implementation of the CCSSM/MS-CCRS and Ely's 8 conditions of change. Participants were asked to determine which conditions of change affects the implementation of the CCSSM/MSCCR. The conditions selected by 100% of the participants were existence of knowledge and skills, availability of resources, and availability of Time (See Figure 2). Ely (1990, 1999) defined existence of knowledge and skills as providing the adopters training through professional development, continued

education, professional learning communities (PLCs). The results of the survey also revealed that participants thought dissatisfaction to status quo and rewards and incentives would not bring about the successful results of change as related to the remaining conditions (See Figure 2). In other words, although these factors relate to change, participants did not believe these conditions would have a huge impact on the change as it relates to the implementation of the CCSSM/MS-CCRS.

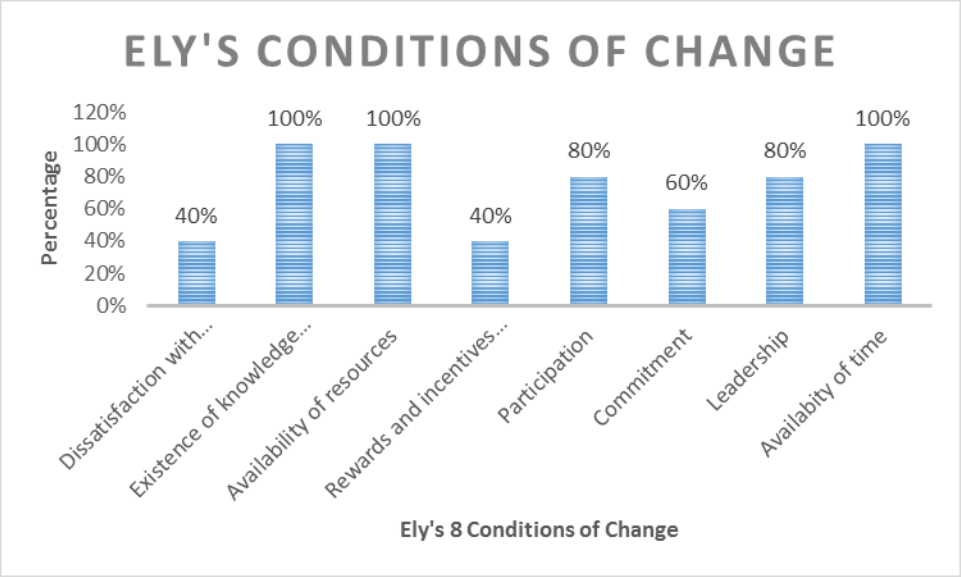

Figure 2. "Ely's Conditions of Change," summarizes the results of the open-ended survey, where participants were asked to list the conditions of change that makes the implementation process of CCSSM/MS-CCRS successful.

Theme 1: Teacher preparation (or lack of). The participants expressed concern regarding teacher preparation for teaching the new standards. During the interview, Teacher C noted, "I have to go back and research and understand what it is asking my students to master, that was the main issue I had." Participants were concerned that they were not adequately prepared to begin teaching standards that required a more in-depth

practice that expanded beyond procedural based instruction. The results of the open-ended survey echoed this concern. Teacher D wrote “deciphering the CCSS labels is a problem; they are too complex to read, when in fact they refer to some of the same concepts that had been taught previously”. With regards to the survey, teachers also felt that understanding the levels of the standards presented a barrier; teachers needed to know the progression or coherence of the standards. Teacher A wrote, “Teachers are not understanding the big picture. Teachers don’t know how the standards build from one grade to the next, so they don’t know why they are teaching something in a new or different way”. Finally, all participants alluded to the focus of continued professional development and support from math consultants to help better understand the aspects of the standards in an effort to ensure that they are better prepared to teach the standards. As part of the survey, participants shared suggestions regarding how to ensure they were prepared to teacher the CCSSM standards. Teacher A wrote “More and better PD”. Teacher B wrote, “Professional development and mentoring”. Finally, Teacher C wrote, “Providing more resources”. Teacher E elaborated by writing that teachers needed, “Subject specific workshops for teaching the toughest standards; working with other educators across the state and even the nation to build appropriate units; continued use of a math consultant; and improved technology”.

Theme 2: Student preparation (or lack of). Participants not only expressed concern for teacher preparation, all participants acknowledged lack of student preparation. During the interview, Teacher A stated, “As a high school teacher, I’m concerned about students being ready to use those standards when they come to me.” The

shift from the old standards to the new standards created gaps in both procedural and conceptual understanding for students. The participants were concerned that this gap would hinder further understanding of the content. Teacher A continued to elaborate by stating, “I guess I’m back to students not being ready for the higher level of cognitive reasoning that these standards require.” Additionally, Teacher D stated, “other challenges that I have seen deals with student’s prior knowledge; that has been a big issue”. As the results related to the open-ended survey, participants concern focused on resources as it pertained to closing student achievement gaps. Teacher E wrote, “Closing achievement gaps during the first few years of implementation” as a possible barrier with teaching the CCSSM standards.

Theme 3: Resources. All participants acknowledged lack of resources as a hindrance with implementing the standards. Teachers echoed in both the interview and open-ended survey that updated technology and the usage of math consultants as a resource would improve their understandings of the standards. Two participants raised a strong concern with finding the appropriate resources that would connect to learning activities, performance tasks, and bell ringers. As related to the interview, Teacher D stated, “Availability of resources is important; I like to do hands on activities, group activities.” On the other hand, the lack of resources was a strong concern according to the open-ended survey. Teachers C noted that having specific practice problems related to concepts would be beneficial to their instruction. Teacher C stated, “My concern now is finding really a lot more resources and different resources to bring into the classrooms and different little activities to bring into the classrooms that goes along with the college

and career readiness standards." Furthermore, Teachers A expressed concern with lack of alignment between standards and curriculum. When asked about instructional practices and lessons as related to resources, Teacher A stated, "I did not get a lot of resources, and I had to go find more resources and look at things that will work and things that will not work; what's good and what's not good."

Research Question 2

The purpose of research question 2 was to elicit information regarding suggestions to close the barriers mentioned as related to research question 1. In an effort to summarize these findings, the solutions were categorized and grouped into major themes: (a) professional development and consultants, (b) communication, and (c) time.

Theme 1: Professional development and consultants. Participants consistently echoed via interview and open-ended surveys that continued professional development and support from math consultants would alleviate some of the barriers associated with the continued implementation of the CCSSM/MS-CCRS. The participants' responses directly stated professional development should be used to enhance teacher understandings. For instance, Teacher A stated, "One of the things I would do is try to find professional development to help individual teachers not these one size fits all professional developments." Additionally, Teacher C noted, "So I think if we can overcome that [referring initially to communication] and continue to send our teachers to professional development and make sure that they are understanding the new things that are coming out of teaching the new standards, our students would be a whole lot better off. We can prepare them for life after high school." When asked on the survey for

suggestions to make participants more prepared to teach the standards, 80% of the participants listed professional development and/or consultants. Teacher A wrote, "More and better PD and having PD across the grade levels K-12." Teacher B wrote, "Professional development and mentoring". Teacher C wrote, "Communication and ongoing training." Teacher E wrote, "Specific workshops for teaching the toughest standards; work with other educators across the state and even the nation to build appropriate units; continued use of math consultants; and improved technology."

Theme 2: Communication. Although mentioned sparingly as a suggestion on the survey, 100% of the participants discussed communication as the key component to overcome the barriers associated with standard implementation. When the question presented to the participants related to ways to overcome barriers with teaching the standards, each participant eluded to communication, either directly or regarding the interpretation of the standards. Teacher A noted, "Teachers needs to be more proactive and more vocal." Teacher C stated, "I say the number one key is communication with all stakeholders like central office, the parents, the students, and the teachers that's in our department; everybody have to be on board with implementing these common core standards." Finally, Teacher D said, "One of the barriers that I have seen was the wording of it." Therefore, communication was found to be pertinent to the successful implementation of the standards.

Theme 3: Time. Time was found to also be a solution to help overcome the barriers associated with standard implementation. With regards to the interview, two of the three participants felt the timeline for implementation created problems. Teacher C

stated, “Teachers should have been provided two years to become familiar with standards before implementation.” In an effort to not create a larger student achievement gap, Teacher A felt the timeline for implementation should have taken thirteen years. According to Teacher A, “You take one group of children, and as they move, you move the standards with them so that each new group of children are ready for the standards to be implemented in their next grade and/or course. By the end of that thirteen years, when that first kindergarten class has graduated high school, then you have fully implemented those standards.” On the other hand, Teacher D was unsure, stating “A realistic timeframe for implementing, I’m not sure if they need to actually divide some things up and send some things down to lower and upper elementary.” Additionally, some participants wrote similar concerns on the surveys. They felt providing extra time would alleviate the barriers associated with the standards. Teacher D wrote, “Time to teach each standard thoroughly is one of the biggest barriers.” On the other hand, Teacher E stressed time as a factor with working with struggling learners, “extra time with struggling learners throughout the week to close achievement gaps is a barrier.”

Discrepant Cases

All data was carefully analyzed for discrepant cases. In other words, for a negative case analysis or a discrepant case, the researcher needed to determine if research questions should be revised based on the results or if an explanation would suffice (Lodico et al., 2010). This study revealed no discrepant cases.

Quality of Evidence

The outcome of this study addressed teacher perception regarding the implementation of the CCSSM. The data was validated through triangulation and the process of member checking. I crossed validated the data collected in the interview, survey, and field notes. Additionally, each participant received a copy of the transcribed data to confirm the accuracy of his or her account of the phenomena, defined as member checking (Creswell, 2012). In other words, the participants were provided an opportunity to review the created transcripts for accuracy of his or her experience. The outcome of this triangulation revealed no contradicting findings. In many cases, the results overlapped between the field notes, interviews, and surveys. For instance, according to an interview with Teacher C, when asked about concerns regarding the implementation of the new standards, the participant's response was as followed: "My concern now is finding a lot more resources and different resources to bring into the classroom and different little activities to bring into the classroom that goes along with the College and Career Readiness Standards." Additionally, when Teacher C was presented with the survey question which elicited suggestions for being more prepared to teach the standards, Teacher C reiterated, "providing more resources".

Project Description

Several themes emerged at the conclusion of my data analysis. These themes consisted of (a) Teacher preparation (or lack of); (b) Student preparation (or lack of); (c) Resources; (d) Professional Development and Consultants; (e) Communication; and (f) Time. Based on the data collected and analyzed, the logical type of project to be

developed for this study would be a series of three eight-hour long professional development sessions, with follow up. Simpson and Linder (2014) found that short, hourly professional development sessions without follow up proved to be inadequate. On the other hand, Matherson and Windle (2017) noted that teachers wanted professional development that maintained four crucial aspects: (a) sessions that are interactive, energizing to participants, and relevant to student learning; (b) sessions that are practical sessions that discuss delivery of content; (c) sessions that are teacher-driven; and (d) sessions that sustain over time. Furthermore, Jacob, Hill, and Corey (2017) determined that professional development should be designed to improve teacher mathematical knowledge; these sessions should be designed to enable more student thinking and reasoning. In all, the above-mentioned researchers noted that professional development must be teacher centered and over time. Therefore, a professional development would be ideal for this project. The project will begin with three distinct days and conclude with follow up sessions throughout the school year.

The implementation of this project will address the concerns described in the data analysis and findings. Teachers were concerned with teacher and student preparation. A portion of this series of sessions will be utilized to better help teachers and students prepare for the implementation of the standards by addressing conceptual and procedural understandings for teachers and methods for bridging gaps for students. These sessions will train teachers in the process of navigating among a plethora of sources for reliable resources to be implemented during instructional time. Finally, the sessions will close by demonstrating for teachers how to maximize instructional time.

Conclusion

The purpose of the instrumental case study was to understand the perceptions of high school math teachers regarding the barriers of successful implementation of the CCSSM. To understand this phenomena, the goal was to interview and survey six teachers from a rural high school in Mississippi. Of the initial six participants, five completed at least one component of the study. The data collection methods were open-ended surveys, interviews, and field notes. Triangulation and member checking were used to ensure creditability of this study. The results of the study will be presented in the form of a three-day power point presentation; the power point will include a detailed description of the project. In Section 3, I plan to further discuss the three-day professional development project to be developed for this school based on the data gathered from this study.

Section 3: The Project

Introduction

This section provides a detailed background on the project. Within this section, I discuss the components of the project. In the first portion of this section, I address description and goals, the rationale, and the literature review associated with this study. In the second portion of this section, I address the implementation aspect of the project. This section includes potential resources and existing supports, potential barriers, a proposal for implementation, along with timeline, and finally the roles and responsibilities of participants. In the latter portion of Section 3, I address the project evaluation and implications for social change. I close the section with a conclusion.

Description and Goals

In Section 1, I discussed the problem associated with this study. The problem that anchored this study is the district leaders' and administrators' lack of clarity regarding teacher concerns and recommendations for how to effectively implement the CCSSM in high school math and their impact on the implementation process. To understand the phenomena, I interviewed and surveyed several high school math teachers. The high school consisted of grade levels 7 – 12 and five math teachers. Based on the collection of data, I found that teachers' and district leaders' ideas of implementation varied. District leaders focused on surface level training, while teacher needs were consistent with in-depth level training. Teacher concerns targeted understanding the standards, finding resources, and bridging the gap with students as everyone transitioned from teaching the

old framework to the new framework. Therefore, I concluded that the best project for this study would be a series of professional development sessions.

This project selection is based on the results of the findings of this study. The professional development will be presented as a three-day series with eight hours per session. The sessions are developed based on the data collected and presented in Section 2. As a result, the concept of a professional development as a project was based on both research questions. The themes generated from Research Question 2 helped me determine the idea for a project: Theme 1: Professional Development and Consultants; Theme 2: Communication; and Theme 3: Time. Once the project was determined, the themes from Research Question 1 provided me the needed data to create the day to day agenda for the three-day professional development: Theme 1: Teacher preparation (or lack of); Theme 2: Student preparation (or lack of); and Theme 3: Resources. The purpose of Day 1 and 2 is to give teachers the necessary knowledge to implement the standards successfully. By Day 3, teacher leaders learn tricks to avoid and more conceptual based strategies to utilize when teaching students (See Appendix A). At the conclusion of each session, participants can complete an evaluation (See Appendix A). The purpose of the daily evaluation is to determine if I am meeting the requirements as discussed in the data analysis. My goal is to determine if the sessions are energizing and relevant, practical to content delivery, and teacher driven (Matherson & Windle, 2017). Finally, I conclude Appendix A with a copy of all materials that would be needed for this project to be fulfilled.

The goal of this professional development project is to assist teacher leaders and administrators with the implementation of the standards. The targeted audience for this professional development would be 7-12 high school math teachers, along with inclusion teachers, the district's math coach, high school principals, and other district leaders. Participants will learn to effectively deconstruct standards and chose appropriate resources to aid in teaching. Additionally, teachers will learn instructional strategies that can be utilized to bridge student gaps as associated with teaching the standards. The three-day summer professional development will be filled with ongoing knowledge and hands-on activities to ensure engagement (See Appendix A). Finally, teachers will walk away with a sense of self-efficacy as related to teaching the CCSSM. Munoz and Cobbs (2009) found that providing teachers with math professional develop built self-efficacy in teachers. My ultimate goal is to ensure teachers are confident in the content they are asked to teach to students. The outcome will in turn build student self-efficacy regarding mathematics. Appendix A contains the details of the institute, along with the learning outcomes for each session, timeline, and materials.

Rationale

The educational problem that anchors this study was the district leaders' and administrators' lack of clarity regarding teacher concerns and recommendations for how to effectively implement the CCSSM in high school math and their impact on the implementation process. Therefore, as I reflect on the outcome of the data analysis and the initial problem that anchored this study, I found that a professional development project will best suit the needs of the participants and other teachers within the same

dynamics. This project addresses the problem of this study in two ways. First, district leaders are able to provide teachers with professional development geared towards professional growth as determined by the teachers. Hirsh (2012) noted that investment of time and resources into the new standards without the proper training of educators will hinder the expected outcome. Additionally, according to the data, 80% of the participants listed professional development as a solution for the successful implementation of the standards. Secondly, teachers preferred to attend sessions geared directly towards content implementation within the classroom. According to Matherson and Windle's (2017) examination of literature, the researchers found that teachers wanted professional development learning opportunities to be teacher-driven. For that reason, this project blends the two expectations together. Leaders can provide teachers with professional development, and the sessions will be geared directly towards teacher needs based on the data collected in Section 2. The professional development sessions will provide opportunities for teachers to learn the math and develop effective classroom strategies to assist with student learning and problem solving skills (Jacob et al., 2017). Therefore, the purpose of this training is to provide teacher leaders and administrators with the knowledge needed to successfully execute change when implementing the CCSSM in the research district. The details of this professional development project are located in the Goals and Descriptions portions of this study.

Literature Review

The purpose of this literature review is to explain how professional development is an appropriate genre to address this research problem. Throughout this section, I

connect my project to my findings located in Section 2 and highlight the aspects of professional development as the appropriate project. Therefore, I discuss the thoughts on professional development and professional development as it relates to change. I address the connection between my project, a professional development, and the results of my problem based on data.

A review of literature was performed to further explore how professional development is an appropriate genre for this project and to identify the impact of teacher professional development in education. Journals, articles, reports and other dissertations were obtained from the Walden University Library. Peer reviewed journal articles within the last five years were used to complete the literature review. The data bases utilized were Academic Search Complete, EBSCO, ERIC, and Science Quest. In an effort to locate the most relevant information, the following key terms were used during this search for literature: *professional development, professional development + mathematics, professional development + teacher, professional development + definition, professional development + change,* and *professional development + education.* To ensure saturation was reached, the reference list of each articles was also reviewed for possible additional sources. Unfortunately, there appeared to be a lack of relevant resources on professional development within the last five years. Therefore, some literature did exceed the five year limitation.

Thoughts on Professional Development

Over decades, the concept of professional development in education has evolved from "sit and get" annual and regional conferences to sessions offered by colleges and

universities, by associations such as The National Council of Teachers of Mathematics or The National Science Teachers Association, and even online (Cox, 2015). Regardless of the format utilized, professional development can be connected to teacher change, and can range from various spectrums such as academic coaches, professional learning communities, action researches, and site-based field trips for teachers; these sessions can account for individual day and week-long training sessions (Clarke & Hollingworth, 2002; Hagevik, Aydeniz, & Rowell, 2012; Hartman, 2013; Schrum et al., 2016; Witterholt, Goedhart, Suhre, & Van Streun, 2012). Professional development can be viewed as a method used to give teachers various opportunities to learn from other effective teachers in an effort to improve teacher quality (Pianta & Hamre, 2016) or can be intended to build teacher capacity by addressing teacher deficiency (Avidov-Ungar, 2016). Hartman (2013) characterized academic coaches as a means for embedded professional development throughout the school day and determined its success depended on several components, such as gaining entry, perception of coach and staff, and trust and confidentiality. Some research determined that the implementation of a professional development as an action research promoted active learning of teachers and provided opportunities for teacher reflection throughout the process (Hagevik, Aydeniz, & Rowell, 2012; Rice & McKeny, 2012). Additionally, research has indicated that site-based professional development also yielded positive results for teachers who taught history; teachers' active involvement in these site-based sessions allowed them to teach concepts beyond the confinement of a history textbook (Schrum et al., 2016).

Regardless of the various descriptions of teacher professional development, most researchers agree that success comes from sustained sessions that last over a period of time and not "one-shot" approaches (Clarke & Hollingsworth, 2002; Matherson et al., 2017; Pianta & Downer, 2016; Simpson & Linder, 2014; Witter el al., 2012). Matherson and Windle (2017) determined that professional development geared towards social interaction instead of the "sit and get" method yielded more success. Furthermore, Martinie, Jeong-ttee, and Abernathy (2016) found that professional development geared towards teacher voice produced more success; these voices were characterized as the hardcore adopter, the anxious adopter, the cautious adopter, and the critical adopter. Consequently, although the research findings were consistent with detailing the success of professional development, several studies alluded to the fact that professional development generated minimal results and time was not a factor (Battey et al., 2013; Polly et al., 2014). Telese (2012) determined that professional development based on student learning unfortunately yielded adverse effects to student achievement. However, Avidov-Ungar (2016) determined that professional development must begin with training teachers to assume the role of a teacher and must continue throughout their teaching careers with ongoing teacher practice and support activities.

In Section 1, the problem that anchored this study was district leaders' and administrators' lack of clarity regarding teacher concerns and recommendation for how to effectively implement CCSSM in high school math and their impact on the implementation process. In Section 2 and with regards to the data analysis, I found that teachers suggested professional development and consultants (Theme 4) as a

recommendation for support with implementing the CCSSM standards. This recommendation was consistent with the findings of Jenkins and Agamba (2012); they found that the missing link in the CCSS initiative was professional development. Luna, Rush, and Stewart (2014) found that teachers need professional development to instruct students how to obtain mastery of standards. Additionally, Hartman (2013) found that academic coaches, which is a form of embedded professional development, produced success based on several internal components.

Overall, the concept of professional development in education led to various rationales regarding what constituted a successful professional development for teachers. Ultimately, most studies connected the concept of professional development to the "learner-center" approach. The learner-center approach ensures to address the teachers' individual needs and learning goals (Polly et al., 2014; Polly & Hainafin, 2010; National Partnership for Excellence and Accountability in Teaching [NPEAT], 2000).

In summary, various studies have identified successful professional development as meeting certain criteria. These criteria range from professional development specifically designed for math teachers to professional development across curricula. In a quantitative study of 18 elementary schools and 105 teachers, Jacob, Hill, and Corey (2017) found that successful mathematical professional development: (1) helped teachers learn more mathematics; (2) helped teachers learn how students learn mathematics; (3) helped teachers learn to use formative assessments to gain insight on what students know and do not know; and (4) helped teachers develop effective instructional strategies that allow students opportunities to problem solve. Additionally, in a qualitative study of

seven high school math teachers, Martinie, Jeong-ttee, and Abernathy (2016) found that a successful professional development required teachers to be grouped according to their voices or point of view as related to the implementation of CCSS: (a) the hardcore adaptor; (b) the anxious adaptor; (c) the cautious adaptor; and (d) the critical adaptor.

Meanwhile, other studies link professional development to all content areas. In Matherson and Windle's (2017) examination of research on professional development they concluded with four emerging themes, professional developments: (a) are interactive, energizing, and relevant to their students; (b) show practical ways to deliver content; (c) are teacher driven; and (d) are sustained over time. Voogt's et al. (2011) case study approach to analyzing articles led to the elimination of 483 articles due to lack of consistency and appropriate measurements to secure validity. The outcome of the study was the analysis of nine articles, where the researchers found the focus of a successful professional development should: (a) focus on deeper understanding of subject matter; (b) provide concrete examples of classroom application to promote change; (c) expose teachers to the actual practices instead of descriptions of the practices; (d) provide opportunities for collaboration with peers and experts for the purpose of refining practices; (e) provide follow up to sessions; (f) be in tune with teachers' professional development goals and goals for student learning; and (g) be sustained over a long period of time (Voogt et al., 2011). Regardless of thoughts on the topic of professional development, the overarching theme as indicated by the above studies found that training is teacher and student focused.

Professional Development and Change

In Section 1, I addressed change as a component to adjust to the implementation of the new CCSSM. In an effort to address this change, I analyzed the perception of teachers regarding Ely's eight conditions for change. As previously stated, Ely (1990) found that change relied on eight conditions: (a) dissatisfaction with the status quo, (b) existence of knowledge and skills, (c) availability of resources, (d) availability of time, (e) rewards or incentives exists, (f) participation, (g) commitment, and (h) leadership. Participants correlated these conditions of change as they related to the implementation of the new standards. Witterholt, Goedhart, Suhree, and Van Streun (2012) found that change and professional development were connected in an essence that professional development could be used to create a change in teachers' professional activities. Additionally, Clarke and Hollingworth (2002) suggested that professional development geared towards current topics related to "change as growth of learning perspective." In general, research shows that professional development geared towards a change in classroom practices must be associated with teacher professional needs and focus on a deeper understanding of the subject matter (Voogt, et al., 2011). Consistently, Evans (2014) determined that a successful professional development contained two critical factors: (a) teacher motivation and (b) change in teachers' cognitive discourse.

Research over the past five years has concluded that professional development can be successful with certain criteria in place. With the correct ingredients for a professional development and sustained time, teacher change is certain. However, the goal is to ensure the change is a meaningful change, by including not only the

stakeholders but their environment and materials associated with this change (Vandeyar, 2017). Additionally, district leaders in charge of change must ensure that teacher professional development experiences are not shaped by the traditional top-down approach, which findings have determined are not in the best interest of student learning and teacher development (Roseler & Dentzau, 2013).

Teaching the CCSSM requires a more in-depth look at math content; this look involves a deep conceptual approach with more practice (Carney et al., 2016). Therefore, a professional development is appropriate to share my finding with educators. The professional development meets the criteria of the research findings of this study and leaves opportunities for further teacher support in the area of academic coaches and/or professional learning communities. Professional development that leads to a teacher's active involvement in student learning yields great results, especially if these approaches target critical activities of teacher learning, investigate practice via questioning, and foster discussions based on consistent communication and analysis (Jung & Brady, 2016; Rice & McKeny, 2012). A successful professional development must be well-established and contain the necessary ingredients that will foster teacher change. Finally, in an effort to aid with the implementation of the CCSSM, professional development opportunities should be further developed into professional learning communities (Anderson & Herr, 2011).

Implementation

The successful implementation of this project is contingent on several components. In this section, I discuss these components which include the proposal for

implementation and timetable, potential resources and existing supports, potential barriers, and conclude with roles and responsibilities. Ultimately, this section will conclude with an explanation of the importance of follow up and sustainment with teacher support.

Proposal for Implementation and Timetable

The purpose of the implementation plan is to establish a time table to complete the professional development (see Table 6). The first step in the implementation process is to get approval to complete the professional development from the district's curriculum specialist. Therefore, the collaboration for this professional development will begin during the spring semester of the 2018 school year. During Week 2 of this timeframe, the findings from this study will be presented to the district's curriculum coordinator and other members of the team. This meeting will represent the first of many sessions with the district's curriculum coordinator and other team members. By the conclusion of this meeting, we will establish some tentative dates for the three-day professional development which will take place during the timeframe of Weeks 24-28 of the summer months. During the month of February (Week 6, Spring Semester 2018), the dates for the teacher professional development will be finalized to begin during the previously stated timeframe. The rationale for waiting several weeks to finalize the dates is to give the district curriculum coordinator an opportunity to present the information gained to the school board members for final approval. Contingent on approval, the professional development will be scheduled during the Weeks 24-28. The final implementation meeting will take place during Week 29 (see Table 6). The focus of this meeting will be

to discuss the outcome of the three-day professional development and to discuss the need for follow up visits by the presenter, the math coach, or consultant. Research states that professional development is more successful when it extends over a period of time or as follow ups (Luna et al., 2014; Matherson et al., 2017; Simpson & Linder, 2014; Voogt et al., 2011) and is contingent on sustainment (Matherson & Windle, 2017; Voogt el at., 2011). Therefore, the completion meeting with the district math coach and/or a representative from a consultant firm is necessary to ensure the successful continuation of the knowledge gained from the professional development. These individuals will understand how to continue support of the teachers based on the results of the three day professional development. Additionally, this meeting will be used to address additional resources needed and follow up days to visit with teacher participants. Appendix A provides the extended details of the three-day professional development training.

Table 5

Implementation Timeline

Action	Date
Make initial contact with district curriculum coordinator	Week 2, Spring 2018
Initial implementation meeting (schedule dates)	Week 4, Spring 2018
Follow-up implementation meeting (finalize dates)	Week 6, Spring 2018
Three-day implementation institute	Weeks 24-28, Spring 2018
Final implementation meeting	Week 29, Spring 2018

Potential Resources and Existing Supports

The potential resources will be discussed in two components. I will address the resources needed for the implementation meeting sessions and then conclude with the potential resources needed for the professional development. For the purpose of the meeting sessions, the meeting room must be able to accommodate the researcher/presenter, at least four district representatives, and the high school principal. The meeting room should contain a rectangular conference style table, along with a flip chart and markers. The usage of the table allows the stakeholders ample space for note-taking via paper/pencil or personal laptop. Additionally, technology will be needed for the presentation of the first meeting. The researcher will supply the MAC, projector, and presentation remote to present findings.

Additional resources for utilization will target the actual professional development. A list of daily materials are provided in the latter portion of Appendix A. For the successful implementation of the three day professional development, a large room that accommodates at least 20 seated participants will be needed. This room should contain a minimum of four conference style tables to seat teacher leaders, inclusion teachers, principals, and district representatives. Another resource, provided by the researcher/presenter, will be refreshments (chips, water, coffee, breakfast bars, etc.). The funds to accommodate this resource will be allocated from the researcher's company's budget. The final resource to be recommended but not mandatory is individual laptops. The purpose for this recommendation is to provide participants with an opportunity to share resources such as websites, graphs, notes, etc.

Although several resources are needed, existing supports could eliminate or decrease the cost of other needed resources and materials. Some existing supports include a large room for meeting, tables and chairs, up to date technology, and materials such as flip charts, markers, and teacher assigned laptops.

Potential Barriers

Several potential barriers could exist regarding the implementation of this project. Although the dates for this professional development is established prior to teachers leaving for summer break, some teachers may ultimately decide they prefer not to give up summer vacation days to attend. To counter this potential barrier, district leaders can mandate that teachers participate in the professional development or can encourage teacher participation by giving them a monetary incentive. Another potential barrier is teacher leaders and inclusion teachers missing a day of the professional development due to a previously planned summer trip. To counter this barrier, district leaders must ensure all participants get the proper notification prior to summer vacation beginning. The final potential barrier is not having a large enough space available to host the professional development during the summer months. Unfortunately, this barrier could lead to another barrier associated with allocating the funds to reserve a space large enough for the three-day session.

Roles and Responsibilities

In order to ensure that the professional development is successful for all participants, several components will be needed. First, the district curriculum coordinator and the researcher will be responsible for determining the dates for the three-day institute.

Second, the district will be responsible for determining which teacher participants will attend the three-day institute and making contact with the school principals in a timely fashion. The participants will be responsible for attending the sessions and getting involved with the activities in an effort to gain teacher-efficacy, as it relates to teaching the CCSSM standards. The researcher will also serve as the presenter. Therefore, the researcher's task will be to ensure that sessions are interactive, teacher-driven, and geared towards learning the math by providing concrete strategies (Jacob, Hill, & Corey, 2017; Matherson & Windle, 2017; Evans, 2014; Voogt et al., 2011). As the developer of the professional development, the researcher will also be responsible for providing the curriculum coordinator with the findings of the study. Finally, the researcher will analyze evaluations, providing the district curriculum coordinator and math coach with the initial results based on the three-day professional development.

Project Evaluation

The purpose of an evaluation on professional development is to determine if the professional development achieved its intended purpose and goals (Guskey, 2002). Therefore, to evaluate the outcome of this three-day professional development, formative and summative evaluations will be utilized. The formative evaluations will be conducted daily at the end of each session to determine if the learning outcomes and goals were met for each day. The survey will contain a combination of four Likert and three open-ended items and conclude with a comments section to elicit additional information. Warmbrod (2014) defined Likert-type items as those which express a belief, preference, judgment, or opinion; this scale can be used to summarize individual responses to assist in the

evaluation process. Ultimately, the completion of the summative evaluation on a professional development will be utilized to determine participant perceptions in an effort to make adjustments or notate modifications for future sessions (Haslam, 2010). Appendix A contains the details of the summative evaluation.

Each professional development day was comprised with different goals and learning outcomes, which are associated with the outcome of the research. Therefore, the imperative nature of completing daily evaluations is crucial to the evaluation of this project. At the conclusion of the professional development, the results will be analyzed and presented to the stakeholders of the district. These stakeholders will be comprised of the high school principal, district math coach, and other district administrators. The focus of the analysis will be to determine if teachers (a) have gained the necessary knowledge needed to implement the Common Core State Standards for Mathematics and (b) are willing to accept and adjust to this new change in education. The results of the study and professional development will lead to the discussion of the revised role of the district math coach and the creation of professional learning communities within the school and/or district. Professional development leading to professional learning communities allows teachers to continue to be actively involved in the learning process and fosters sustainment and discussion (Matherson & Windle, 2017; Roseler & Dentzau, 2013; Voogt et al., 2011).

Implications Including Social Change

Local Community

The problem that anchored this research was district leaders and administrator's lack of clarity regarding teacher concerns and recommendations for how to effectively implement the CCSSM in high school math and their impact on the implementation process. The outcome of the study acknowledged a strategy in the form of a professional development to address teacher needs. This project is the most effective option of choice because it builds capacity in teachers. Teachers may possibly walk away with a form of self-efficacy with regards to teaching these new standards. In return, students grow academically. Additionally, teachers' new awareness of these standards may possibly allow them to articulate consistent conversations with families and community partners. District leaders and principals walk away knowing their teachers have a better understanding of the implementation process of the standards. The ultimate job of these new standards is to ensure students become college and career ready. The implementation of the project brings great awareness to all stakeholders to ensure this goal for students are obtainable. The evaluations of this project may shed some light on a possible directions for implementing the CCSSM.

Larger Context

The benefits of this research and project to the local community is linear in nature to a larger context. Currently, there is a wealth of information regarding the success or lack there-of on professional development in education. Research indicates that professional development that is sustained over time, teacher-driven, and engaging yields

successful results (Evans, 2014; Jacob, Hill, & Corey, 2017; Matherson & Windle, 2017; Voogt et al., 2011). However, in my search, I found that limited research exists on the effectiveness of professional development as it related to the implementation of the CCSS. By developing and offering professional development in association to the implementation of the CCSSM, district leaders may potentially gain insight on providing teacher support with regards these math standards. The results of professional development evaluations may possibly provide other districts with a road map to supporting their teachers with the implementation of the CCSSM.

Conclusion

Section 3 outlined the guidelines for the potential project as a result of the findings presented in Section 2. The outcome of the findings yielded a professional development as the most viable project option for this study. This section began with not only the description and goals for the project, but also a scholarly rationale. Section 3 also contained a literature review that supported the notion of a professional development. The literature review contained research based on the thoughts on professional development and professional development as it relates to educational change. The section also discussed a potential time table, potential resources and existing supports, and roles and responsibilities. Section 3 concluded with a discussion of the project evaluation and the implications for social change. Section 4 will include overall reflections and conclusions about the study, the project, and my experience as a scholar completing this milestone.

Section 4: Reflections and Conclusions

Section 4 contains a summary of my role as reflexive scholar and practitioner. The section begins with an overview of the project's strengths, limitations, and recommendations. Then the focus becomes an analysis of my work as a scholar, practitioner, and project developer and evaluator. Section 4 concludes with a description of the project's potential impact on social change, along with implications, applications, and directions for future research.

Project Strengths

The 3-Day Summer Professional Development was created to address the problem of teachers in need of professional development to implement the CCSS. Schoenfeld (2014) noted that the new math standards are about thinking mathematically; therefore, teachers must produce students who are powerful mathematical thinkers. In order for teachers to produce such students, they must possess the conceptual understandings of the content standards, be able to translate the performance standards, and understand how to help students meet the goals of the standards (Madison, 2015).

A strength of this professional development is its design. The design was based on the outcome of the research findings. The design addressed the components teachers felt would help them with the implementation of the standards. Day 1 targeted the reasoning for the standards, along with the protocol used to code the standards. Day 2 focused on misconceptions in teaching mathematics, the process standards, and the instructional shifts. On the other hand, Day 3 concluded with providing teachers hands-on practice with teaching some of the standards through classroom activities. A component of a

successful professional development is giving teachers an opportunity to learn from seeing others effectively teach content; this method may provide insight on improving teacher quality (Pianta, Downer, & Hamre, 2016).

Another strength of this project is that it provides an opportunity for open communication regarding the creation of effective professional learning communities. Additionally, the project may help establish new ways the district academic or math coach can provide support to teachers. The professional development project creates an entry way for collaboration regarding instructional strategies and other resources. Therefore, a professional learning community may provide opportunities for teachers to develop bonds as they increase instructional effectiveness (Stahl, 2015).

Although this project contains several strengths, the final strength is the effectiveness of addressing the research problem. The focus of this study was to address teacher perceptions and the district leaders' understanding of this perception with regards to implementing the CCSSM. The outcome of this study was the design of a professional development that catered to the needs of the teachers within the proposed district. The project addressed all aspects of implementation knowledge from the basics such as reading the codes of a standard to the more moderate but important information such as standard deconstruction and concluded with strategies for implementation within a classroom, along with resources.

Project's Limitations

The primary limitation with this project is elapsed time. I began this process approximately four years ago. Unfortunately, teacher turnover has increased

tremendously over the last three decades (Simon & Johnson, 2015). Therefore, in an effort to complete this project with the same targeted audience for the study could pose a threat, if teachers have chosen to depart from the district.

Another limitation with this project is the sample size. The sample chosen for the study consisted of four high school math teachers and two inclusion teachers. Of the six teachers offered to participate in the study, three teachers completed both aspects of the study. The other two teachers failed to complete the interview due to summer vacations. The limited number of participants confines the outcomes of this study.

A third limitation is lack of participation by not only the teachers but also school leaders. Although the study describes teacher perceptions with the implementation of the standards, leaders must know how to continue this conversation with teachers as they complete pre- and post-observations. During the summer months, teacher and most leaders typically plan and take vacations. Therefore, if this project is not strategically scheduled to meet the needs of teachers and leaders vacation time, they may choose not to attend.

The final limitation of this project is the math focus. If the reader is interested in understanding teacher perceptions for teaching the CCSS for English Language Arts, then the reader may struggle to decide whether design of the project is applicable for their demographics (Lodico et al., 2010). This notation holds true for not only English Language Arts, but also the subjects of science and social studies.

Recommendations for Remediation of Limitations

In the previous section, I discussed limitations. Now, I will discuss a few recommendation to counter each limitation. First, teacher turnover has become an issue in many districts. If teacher turnover has affected this district, then a possible recommendation will be to have new teachers complete the survey and interview questions prior to the professional development. This solution gives the presenter new outlooks on the participants, which can allow for adjustments to fit the needs of the targeted audience.

To address the limitation of the small sample size, this study could be expanded to other rural schools within the area. The sample only targeted one high school in the southern state. By inviting more participants from surrounding school districts with the same demographics, the validity of the study is increased.

Administrators have very busy schedules, especially during the summer months. Therefore, if these leaders are unable to attend the full day sessions, then a recommendation will be to complete a follow up summarized sessions for school and district leaders. Instead of a full three day session eight hours daily, these sessions could be reduced to possibly a day and half. Additionally, the professional development could be divided into webinars over a series of weeks.

Finally, to combat the discrepancy in subject area, leaders could utilize the evaluations to determine the positive aspects of the project. The district curriculum specialist could create a vertical alignment chart to compare the components of the math standards to the ELA standards and then make the needed revisions. This process could

also be utilized in relation to science and social studies subject areas, especially with the new implementation of the Next Generation Science Standards, NGSS.

Recommendations for Alternative Approaches

In this section, I will discuss an alternate way to address my research problem and present alternative definitions and solutions to the local problem. First, an alternate way to address teacher perceptions regarding the implementation of the CCSSM is to create a curriculum plan. This curriculum plan would include all the information presented in the professional development but in the form of a document. Instead of teachers learning to deconstruct standards, all standards would be completely deconstructed. The components of this plan would include unit based instruction, the focus of each unit, the connection or coherence of the standards to other grade levels, standard deconstruction, sample assessment items, a deconstruction calendar for teaching each unit, and would conclude with sample strategies and resources.

Another alternative is to offer the three day professional developments as a series of mini sessions throughout the academic school year. These mini sessions would include a series of webinars. The mini sessions and webinars would scaffold the information to teachers instead of presenting everything during the summer. As an educator, when I am presented with a wealth of knowledge all at the same time, I find it difficult to implement not even 50% of what was learned.

A final alternative is to conduct a program evaluation of the current resources or programs being utilized by teachers. The district has already invested funds into many different programs and resources for teachers. Another approach to this study could have

been to determine teacher perception regarding the usage of these resources and programs. Instead of asking the teachers for input relating to the barriers of implementing the CCSSM, the study could have focused on teacher perception as it related to resources already purchased by the district. The outcome of this alternative study could have concluded with the elimination of programs deemed unsuccessful by the teachers using them.

Scholarship, Project Development, and Leadership and Change

This doctoral process has been a life changing experience. I have gained a wealth of knowledge regarding literature and conducting a scholarly research. I received my masters from Walden University in 2005 and was always hesitant in returning because I did not believe that I could conduct and write a research study. The trials and errors of this process strengthen not only my writing skills, but also my knowledge of the APA format. Most importantly, I gained the confidence to recognize that I have the ability to write a scholarly document. Additionally, I have obtained a better grasp in analyzing the research of others. Prior to this point, I knew how to read and summarize research, but my experience here at Walden has taught me how to evaluate and reference any piece of literature thoroughly.

As a prior student of Walden, I possessed minimal concern regarding the course work; I knew the expectations of this university. As I progressed through the coursework, I gained the confidence to expand beyond my original goal, which was the completion of a specialist degree. I learned the correct way to annotate a bibliography. In participating in two residencies, I gained one-on-one and small group exposure to analyzing resources

and developing a valid problem statement. I learned the key components to look for when analyzing research; these components included article title, source journal, author, study type, article type, and questions and hypothesis (Walden University, n.d.). Therefore, when completing my second to last course, I switched from the specialist program to the doctoral program.

Project Development and Evaluation

In my many years of education, I was successful with accomplishing many goals. I began as a classroom teacher and even served as an educational consultant. My years as a consultant proved to be my most fruitful. During that time, I had an opportunity to co-author a deconstruction document. Although, I take great pride in my previous accomplishments, I have gained a great appreciation for project development and evaluation. I learned that in order to be successful, one must have a clear purpose and know the targeted audience's needs. In my past line of work, the purpose was not always linear to the targeted audience. This process taught me how to better develop projects through extensive planning, designing, and referencing of data. Many times, I had to reflect back on the outcome of the data to ensure I maintained my focus. As a teacher, we are always taught to begin with the end in mind. This process taught me that even with research, you must begin with the end in mind. Therefore, I have become more knowledgeable of the factors needed to produce a productive project, along with its evaluation.

Leadership and Change

I remember in 2008 starting my new teaching job as a high school math teacher in a rural town. After several observations, the assistant principal approached me and asked if I had ever thought about becoming a principal. I remembered giggling and saying no way. This principal became the first of many educators to ask me similar questions. Each time, I was informed that I had a leader quality and should not settle at only being a classroom teacher. For the first time in years, I imagined myself as more than a classroom teacher, but a leader in education. This constant thinking and reflection pushed me to attend Walden University and focus on a degree in leadership. The coursework and project have taught me a great deal about being an effective leader. Through my experience, I learned to distinguish between principals who completed an actual leadership programs versus those who participated in alternate pathway school leadership programs. Now coupled with my experience as a lead teacher, serving on a leadership team, I have become more cognizant about the various leadership styles discussed in my coursework. I have learned that an effective leader has the ability to bring about change by including stakeholders in the decision making process. Additionally, I have learned that successful change involves not only knowing and understanding the problem and target audience but also utilizing research to determine meaningful pathways to adjust to this new phenomenon. These new insights and experiences has helped redefine my role as an upcoming leader of education. I now view myself as having the leadership style of either situational leader or instructional leader. Lestrom (2008) stated that a situational leader adapts his or her leadership behavior to that maturity of the staff. In other words,

this leader does not apply the one size fit all approach when supporting teachers. On the other hand, an instructional leader embraces four roles; the leader serves as a resource provider, an instructional resource, a communicator, and maintains a visible presence (Marzano, Walters, & McNulty, 2005). The completion of this process has given me the confidence to move forward with becoming a future educational leader who understands the impact of effective change.

Analysis of Self as Scholar

Throughout the project development, I initially thought that I accomplished more as a scholar when I met my other needs such as family and work. Unfortunately, times existed when I allowed these needs to take control of my life. I eventually realized that I was not functioning as a true scholar. Therefore, once I regained focus on the bigger picture, I would spend countless hours attempting to ensure my research was not only written but represented the work of a scholar. Reviewing my accomplishments after each submission motivated me to work harder; therefore I created a detailed work schedule and forced myself to meet all deadlines. This schedule was shared with my family and colleagues; they had to understand that I needed time for my studies.

Throughout the years, I have had many life changing incidents. Times existed where I thought I would not have the strength to complete the program. However, my drive to continue kept me motivated through the process. I noticed a change in my articulation, both verbally and written, a need to want to justify others' theories and opinions, and a need to justify my own thoughts and opinions. Although the process has been long, I have developed the necessities to continue to exhibit the works of a scholar.

Analysis of Self as Practitioner

My first and only love has been education. Times existed when I thought I needed a career change but those changes in careers always lead me back to education. This process have taught me how to become a better practitioner in my field. First, I learned the importance of staying current with scholarly research. Understanding the changes in education is pivotal when attempting to maintain growth. I learned how to apply this knowledge to my own educational atmosphere.

Additionally, I learned to become more self-discipline and to separate my biases from facts. Initially, I assumed the outcome of the project; however, this assumption was based primarily of my own experiences. Although I feel my experiences are valid, this process has shown that data and facts promote true discipline of a sound research.

As a practitioner in my field, I have learned the criteria needed to become a leader in this industry of education. Previously, I doubted my ability to serve as a leader in education. Through the coursework and experiences of this process, I learned aspects of leadership that will help me build teacher capacity. As not only an educator but also a practitioner, my goal is to continue researching and reviewing literature regarding changes in education; however, my primary focus will continue to involve professional development, change, and the implementation of the Common Core State Standards. As a lead teacher, I want to take my knowledge to assist teachers within my schools with research based strategies and implementation plans geared towards teaching these new standards.

Analysis of Self as Project Developer

The development of this project was tedious. I conducted numerous research on the Common Core State Standards. The research involved base level of how to code the standards properly. I learned the difference between content and process standards. I learned how to deconstruct a standard by evaluating various resources on standard deconstruction. By understanding the standards, I chose activities that best captured the conceptual aspects of different standards; in some cases, this involved me creating or revising lessons based on my new found knowledge. As the developer of this project, my goals was to ensure it met the needs of the teachers and that I was indeed an expert in the field. Now that I have gained the knowledge and skills of developing a sound project with feasible outcomes, my confidence in project development has improved. I am ready to utilize these skills to develop more projects that will aid in the implementation of the standards. Post-graduation, my goal is to continue learning more about the standards and implementation process using research based literature.

Reflections on the Importance of Work

When I initially began this journey, limited research existed on the impact of the implementation with regards to the standards. Although representing a small portion of study on the CCSS, this project has an impact on larger scale community because it gives a possible road map for assisting teachers with implementing the math standards. Considering the focus on implementing the math standards specifically, other districts may see the project as a means for not only assisting math teachers but revising to provide support to English Language Arts teachers. This revised support could potentially

reduce teacher turnover within schools because these educators will develop self-efficacy as it relates to teaching the CCSSM.

Implications, Applications, and Directions for Future Research

The desired outcome for this project is to provide district leaders and teacher leaders with guidance on teaching the CCSSM. Although the literature review conducted for this project reflected the usage of professional development and professional development as a means for educational change, minimal research existed regarding professional development and the implementation of the CCSS and the CCSSM. Future research should focus on professional development and the implementations of these new standards, not only in mathematics but English Language Arts also. Ultimately, if the CCSSM is implemented with fidelity, we have an opportunity to achieve consistency among states (Schoenfield, 2014). In conclusion, I have learned that the effective development of a project takes research; the outcome is always objective and never subjective.

The approach for this study was a qualitative case study. An implication for this chosen method was the number of participants and the location of the participants. The participants for the study was a purposeful sample, resulting in math teachers from a rural high school. A recommendation for future studies is the utilization of a quantitative study. This approach allows for a varied range of math teachers to participate in the study. One method of data collection for a quantitative study is closed-ended surveys. These surveys could be electronically emailed to teachers throughout various school

districts, and the outcome could be generalized through not only a rural setting but also a city setting.

Conclusion

Section 4 contained a reflective analysis of my project's strengths and weaknesses, along with implications and the potential impact on social change. Additionally, I provided insight on my growth as a practitioner, scholar, and project developer and evaluator. I began this process over five years ago. As I reflect on my journey from the student taking EDAD 8040 to now, my growth as not only a teacher but teacher leader has culminated in this study. I embarked on this journey wanting to make a difference in not only education but also learning more about the Common Core State Standards. In my opinion, I achieved the goals and learned methods for embarking on new ways to impact change in education. In conclusion, the outcome of this process was to ensure teachers understood that the CCSSM is the new educational change, and in order for success to prevail, they must embrace the fact that the CCSSM is about thinking mathematically (Schoenfield, 2014). The growth of teachers leads to the growth of the students they teach.

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Appendix A: Project

Professional Development Training: Instructional Focus on the Common Core State Standards (3 – Day Summer Professional Development)

Project Purpose

The purpose of this training is to provide teacher leaders and administrators with the knowledge needed to successfully execute change when implementing the CCSSM in the research district. This professional development is developed based on the results of Research Questions 1 and Research Question 2.

Project Goal

The goal of this professional development project is to assist teacher leaders and administrators with the implementation of the standards.

Additional Project Goals by Day

Day 1

To inform the district leaders and administrator about how to address the problem of implementing the CCSSM.

Day 2

To inform teachers and district leaders how to address deconstructing standards associated with CCSSM.

To inform teachers and district leaders how to address bridging student achievement gaps related to the shift in framework.

Day 3

To inform teachers and district leaders how to address the concerns regarding lack of resources to teach CCSSM.

Learning Outcomes

Day 1

The learning outcomes for Day 1 session are associated with Research Question 1, Theme 1: Teacher Preparation (or lack of). Participants will be able to:

- Articulate the rationale for the implementation of the CCSSM.
- Be able to correctly reference a standard.
- Understand the three instructional shifts associated with the CCSSM.
- Articulate the difference content and process standards.
- Use the standards for mathematical practices (process standards) in conjunction with content standards in a classroom.

Day 2

The learning outcomes for Day 2 session are associated with Research Question 1, Theme 1: Teacher Preparation (or lack of). Participants will be able to:

- State the steps of Backwards Design.
- Use Backwards Design to create assessments and plan lessons.
- Use standards in grade specific course to prepare for the school year.
- Develop units associated with standards.
- Deconstruct standards.

Day 3

The learning outcomes for Day 3 session are associated with Research Question 1, Theme 2: Student Preparation (or lack of) and Theme 3: Resources. Participants will be able to:

- Recognize tricks associated with math equations and reframe from using during instruction.
- Implement instructional strategies into the classroom.
- Connect instructional strategies to various and individual standards.
- Recognize how to incorporate the Standards of Mathematical Practices in every strategy by discussing alignment before and after each strategy.
- Identify quality resources to assist with lesson planning.

Targeted Audience

The targeted audience is 7 – 12 high school math teachers, inclusion teachers who service students with mathematics, district math coach, high school principals, and other district leaders.

Timeline and Activities Agenda

Table 6

Instructional Focus on the CCSSM Standards Agenda: Day 1

Meeting Time	Event
7:30 a.m. – 8:00 a.m.	Registration and Social
8:00 a.m. – 9:00 a.m.	Session 1: Introductions/Icebreaker Purpose of Institute The Need for Change
9:00 a.m. – 10:00 a.m.	The Need for Change, cont.
10:00 a.m. – 10:10 a.m.	Break: Refreshments
10:10 a.m. – 11: 00 a.m.	Session 2: Organization and Design
11:00 a.m. – 12:00 p.m.	Lunch
12:00 p.m. – 1:20 p.m.	Session 3: Instructional Shifts
1:20 p.m. – 1:30 p.m.	Break: Refreshments
1:30 p.m. – 2:45 p.m.	Session 4: Standards of Mathematical Practices
2:25 p.m. – 3:00 p.m.	Wrap-up Wow and Wonder

Table 7

Instructional Focus on the CCSSM Standards Agenda: Day 2

Meeting Time	Event
7:30 a.m. – 8:00 a.m.	Registration and Social
8:00 a.m. – 9:00 a.m.	Session 1: Introductions/Icebreaker Reflections Unit Development
9:00 a.m. – 10:00 a.m.	Unit Development cont.
10:00 a.m. – 10:10 a.m.	Break: Refreshments
10:10 a.m. – 11: 00 a.m.	Session 2: Backwards Design
11:00 a.m. – 12:00 p.m.	Lunch
12:00 p.m. – 1:20 p.m.	Session 3: Standard Deconstruction
1:20 p.m. – 1:30 p.m.	Break: Refreshments
1:30 p.m. – 2:45 p.m.	Session 4: Standard Deconstruction cont.
2:25 p.m. – 3:00 p.m.	Wrap-up Wow and Wonder

Table 8

Instructional Focus on the CCSSM Standards Agenda: Day 3

Meeting Time	Event
7:30 a.m. – 8:00 a.m.	Registration and Social
8:00 a.m. – 9:00 a.m.	Session 1: Introductions/Icebreaker Reflections Math Standards in Focus (Nix the Tricks)
9:00 a.m. – 10:00 a.m.	Math Standards in Focus (Nix the Tricks), cont.
10:00 a.m. – 10:10 a.m.	Break: Refreshments
10:10 a.m. – 11: 00 a.m.	Session 2: Instructional Strategies, Pt. 1
11:00 a.m. – 12:00 p.m.	Lunch
12:00 p.m. – 1:20 p.m.	Session 3: Instructional Strategies, Pt. 2
1:20 p.m. – 1:30 p.m.	Break: Refreshments
1:30 p.m. – 2:45 p.m.	Session 4: Instructional Strategies, Pt 3 Resources
2:25 p.m. – 3:00 p.m.	Wrap-up Wow and Wonder

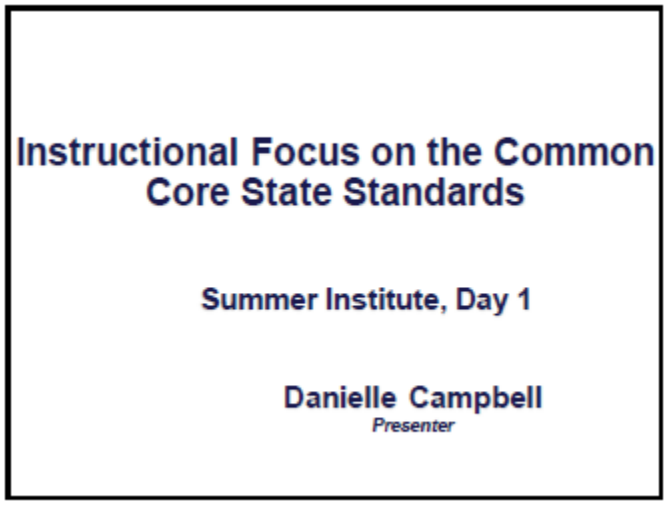
Summer Professional Development for Teacher Leaders and Administrators, with Trainer Notes

This summer professional development workshop is designed to enrich teacher leaders and administrators with the knowledge of implementing the Common Core State Standards for Mathematics (CCSSM), using the appended presentation of slides below. The various components adhere to the various themes associated with the outcome of research. Presenter notes are included prior to the presentation of the slides.

Day 1

Presentation Slide 1

The title page for Day 1 session. Instructional Focus on the Common Core State Standards, Summer Institute, Day 1. Presenter – Danielle Campbell

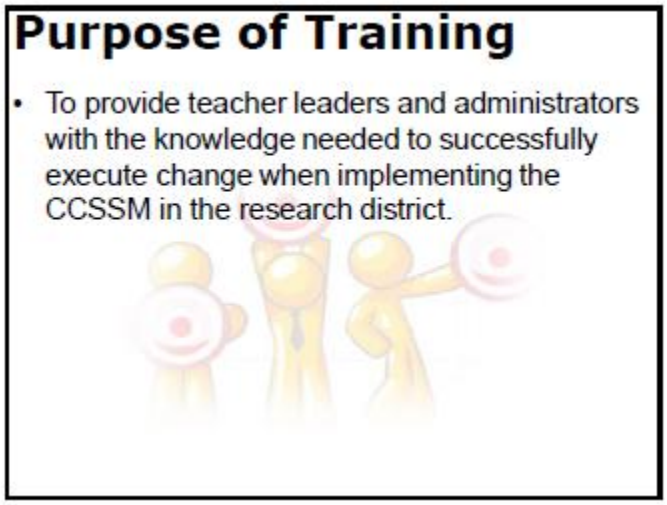


Session 1 – 8:00 a.m. to 10:00 a.m.

Presentation Slide 2

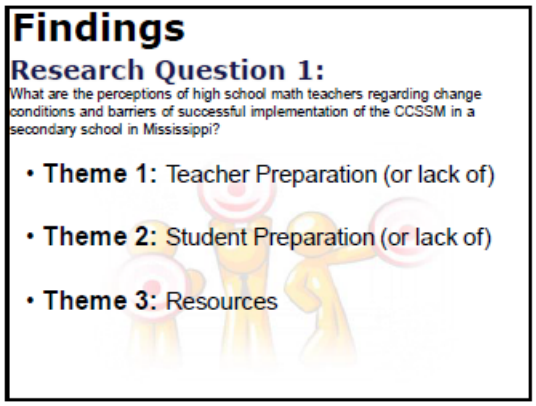
Purpose of Training

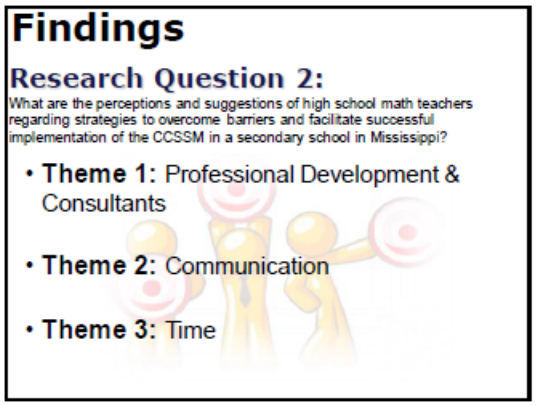
The recent analysis of data revealed several themes associated with the implementation of the CCSSM. Therefore, the purpose of this training is to provide teacher leaders and administrators with the knowledge needed to successfully execute change when implementing the CCSSM in the research district. This professional development is developed based on the results of Research Questions 1 and Research Question 2.



Presentation Slides 3 and 4

Discussion of Findings from research. With these slides, the presenter discusses the emerging themes associated with both research questions.

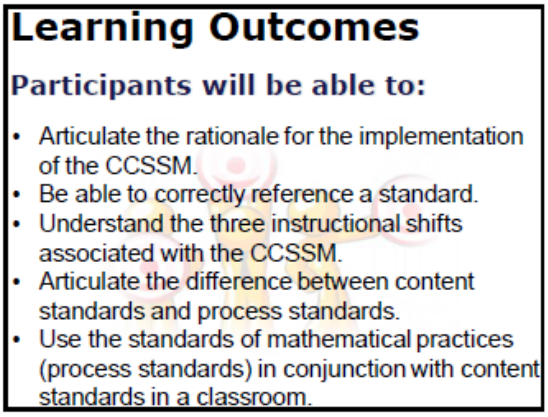


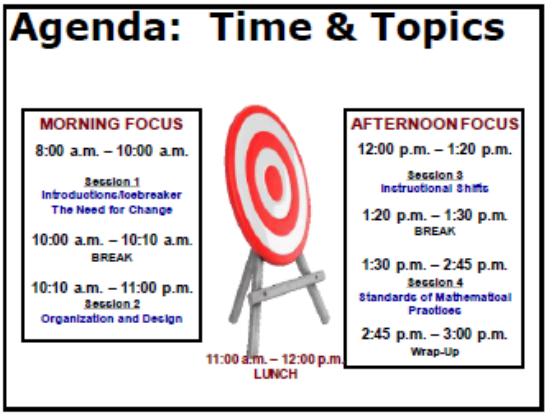


Presentation Slides 5 & 6

Learning Outcomes and Agenda for Day 1

The presenter briefly discusses the connection between the learning outcomes and the research questions and then proceed to review the Learning Outcomes for the day, followed by the agenda. The learning outcomes for Day 1 session are associated with Research Question 1, Theme 1: Teacher Preparation (or lack of).

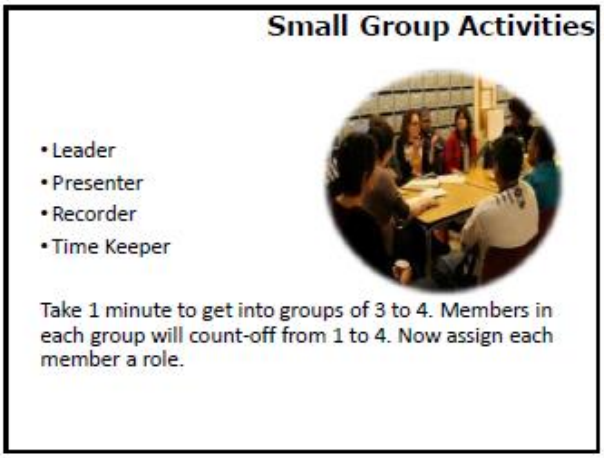


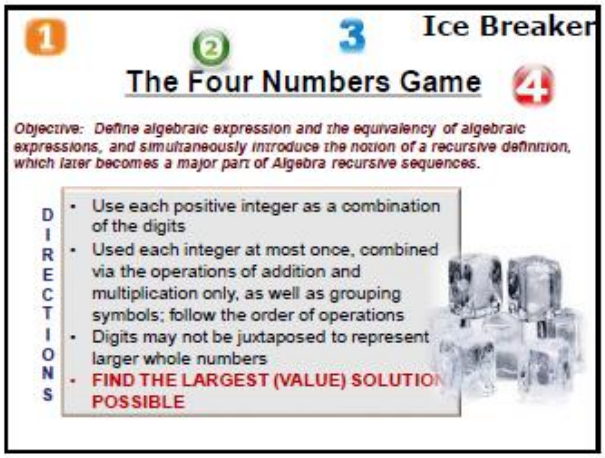


Presentations Slides 7 and 8

The presenter inform the participants that they will complete small group activities throughout the three day professional development session. Therefore, they will need

assume roles and responsibilities (see slide 7). Afterwards, the presenter moves to Slide 8 for the first of many activities.



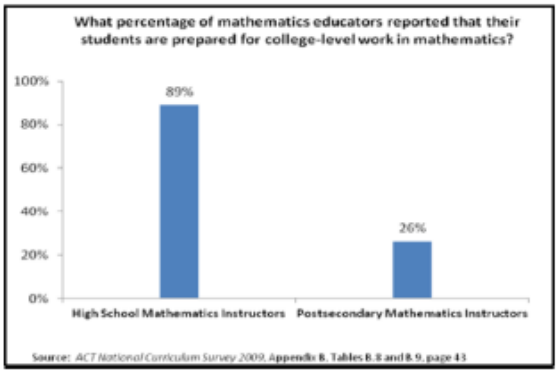


Presentation Slides 9 – 28

Need for Change

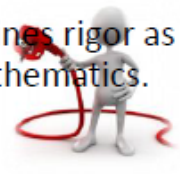
The presenter used the following slides to discuss a need for a change as it relates to the new standards and education. These slides address the need for change. The presentation begins with an interesting fact designed to promote discussion on the difference between high school mathematics instructors and postsecondary mathematics instructors, regarding student readiness for college-level work and the disconnect associated with phenomena. With Slides 13-23 participants evaluate the results of actual mathematical problems and strategies presented by students and to students. The latter slides of this section promote the Principles to Actions as developed by the National Council of Teachers of Mathematics (NCTM).

An Interesting Fact



Reason for Disconnect

- College Faculty defines rigor as a deeper understanding of core math.
- High School Faculty defines rigor as breadth of topics in mathematics.



Phil Daro- Math Chair, CCSS Initiative

Warm Up

Jon said, "m – 1 is always greater than 1 – m." Do you agree with Jon?

- What are anticipated student responses?
- How do you respond to incorrect responses? Correct responses?

Dougherty, B. Concept of variable A, 2013

13

"Answer Getting vs. Learning Mathematics"

United States:

- **"How can I teach my kids to get the answer to this problem?"**

Japan:

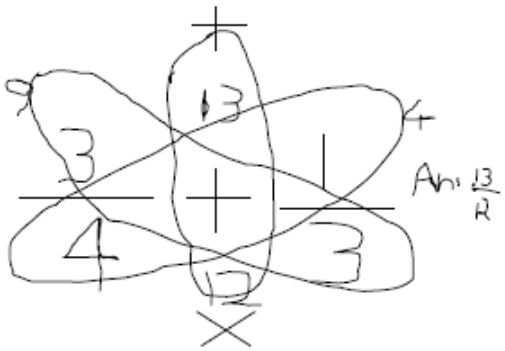
- **"How can I use this problem to teach the mathematics of this unit?"**

To Learn Mathematics

- Answers are part of the process, they are not the product.
- The product is the student's mathematical knowledge and know-how.
- The 'correctness' of answers is also part of the process. Yes, an important part.

"The Butterfly Method"

$$\frac{3}{4} + \frac{1}{3}$$



Why is change necessary?

8 + 4 = [ ] + 5

Turn and Talk

8 + 4 = [ ] + 5

	Percent Responding with Answers			
Grade	7	12	17	12 & 17
1st - 2nd				
3rd - 4th				
5th - 6th				

Thinking Mathematically: Integrating Arithmetic & Algebra in Elementary School. Carpenter, Franke, & Levi Heinemann, 2003

8 + 4 = [ ] + 5

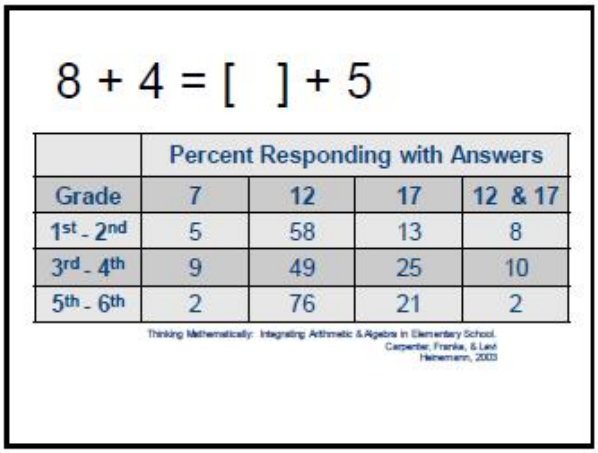
	Percent Responding with Answers			
Grade	7	12	17	12 & 17
1st - 2nd	5	58	13	8
3rd - 4th				
5th - 6th				

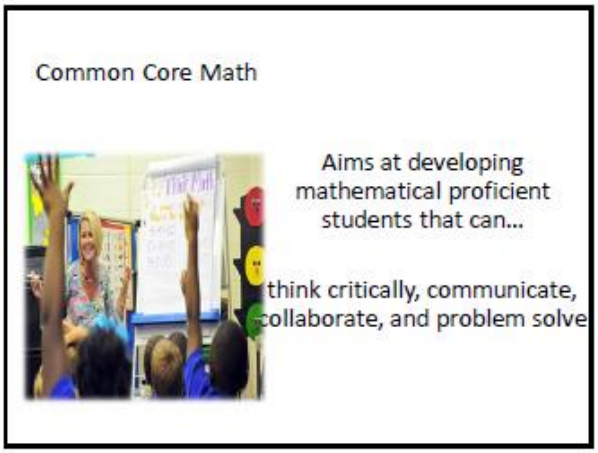
Thinking Mathematically: Integrating Arithmetic & Algebra in Elementary School. Carpenter, Franke, & Levi Heinemann, 2003

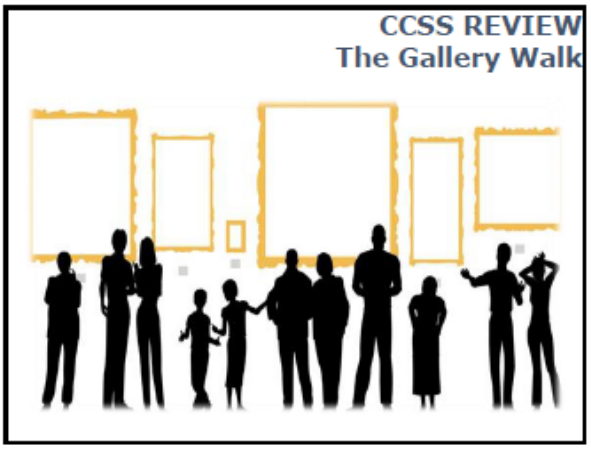
8 + 4 = [ ] + 5

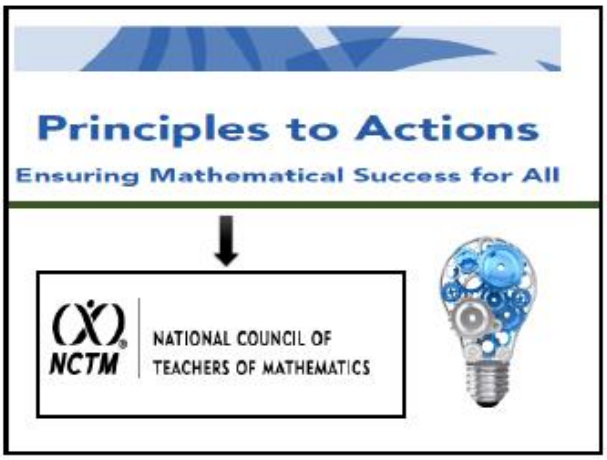
	Percent Responding with Answers			
Grade	7	12	17	12 & 17
1st - 2nd	5	58	13	8
3rd - 4th	9	49	25	10
5th - 6th				

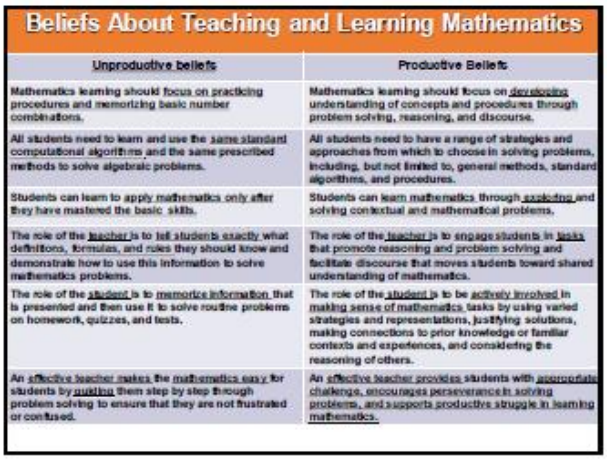
Thinking Mathematically: Integrating Arithmetic & Algebra in Elementary School. Carpenter, Franke, & Levi Heinemann, 2003











Break – 10:00 a.m. to 10:10 a.m.

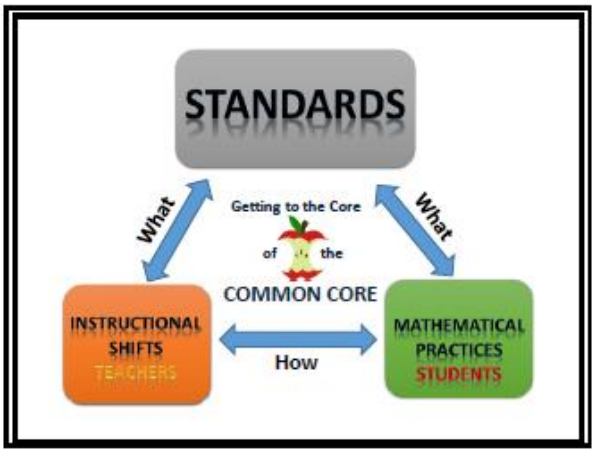
The presenter allows the participants to take a ten minute break after slide 28.

Session 2 – 10:10 a.m. to 11:00 a.m.

Presentation Slides 29 – 40

Organization and Design

The presenter informs the participants that the next slides targets the organization and design of the CCSSM. The focus of this session is to ensure participants understand the correct way to reference a math standard. Teacher leaders and administrators learn that domains change by grade levels and each standard is composed of a unique set up: grade level, domain, cluster header and standard (i.e. 8.NS.A.1, where 8 represents the grade level, NS represents the domain [The Number System], A represents the cluster header, and 1 represents the standard number).



Major Components

- Standards for Mathematical Content
  - K-8 Grade Level Domains
  - High School Conceptual Categories
- Standards for Mathematical Practices
- Glossary
- High School Appendix A

Standards for Mathematical Content

Grade Level Domains

K – 5

- Counting and Cardinality
- Operations and Algebraic Thinking
- Number and Operations in Base Ten
- Number and Operations – Fractions
- Measurement and Data
- Geometry

6 - 8

- Ratios and Proportional Relationships (6-7)
- The Number System
- Expressions and Equations
- Functions (8 only)
- Geometry
- Statistics and Probability

High School Conceptual Categories

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

ORGANIZATION OF THE MATHEMATICAL CONTENT STANDARDS

Domains are expressed in one to two words and articulate big ideas that connect standards and topics.

Note: Standards from different domains may sometimes be closely related.

Cluster Heading is indicated in bold and summarizes the major skills and concepts taught in a group of standards.

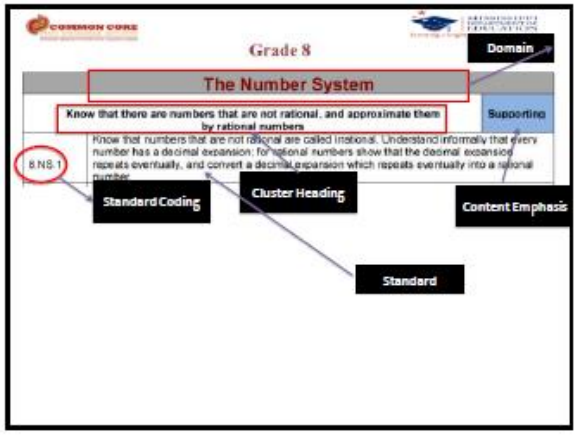
Clusters are groups of related standards.

**Note: Standards from different clusters may sometimes be closely related.*

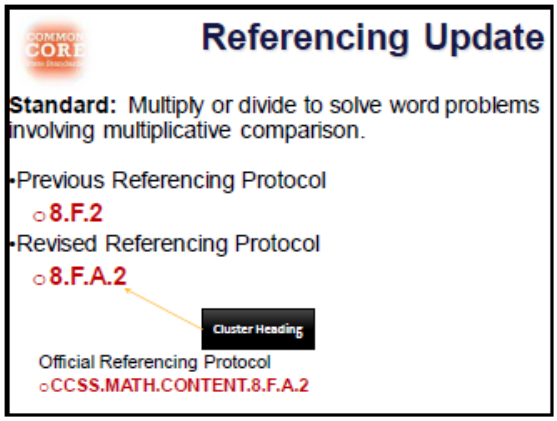
Standards define what students should understand and be able to do.

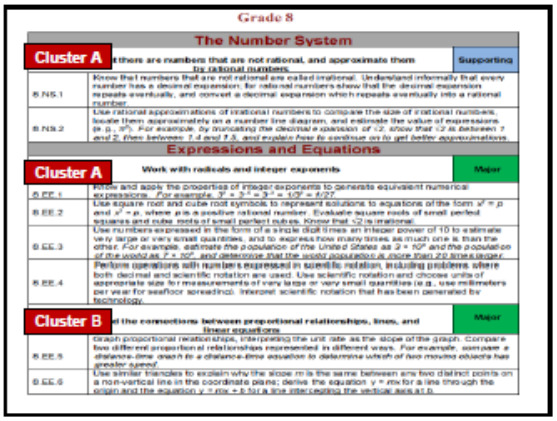
Domains for Grades 6-8

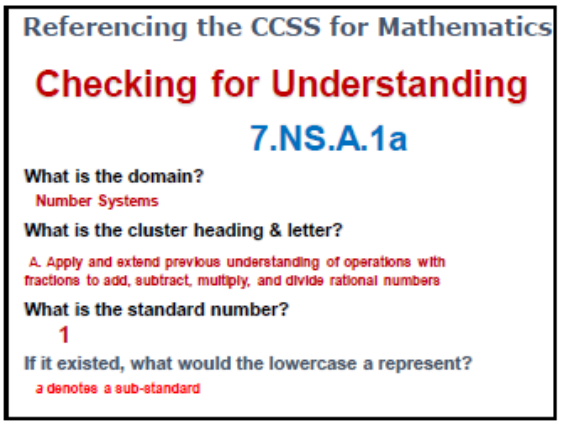
- RP = Ratios and Proportional Relationships (6-7)
- NS = The Number System
- EE = Expressions and Equations
- G = Geometry
- SP = Statistics and Probability
- F = Functions (8 only)

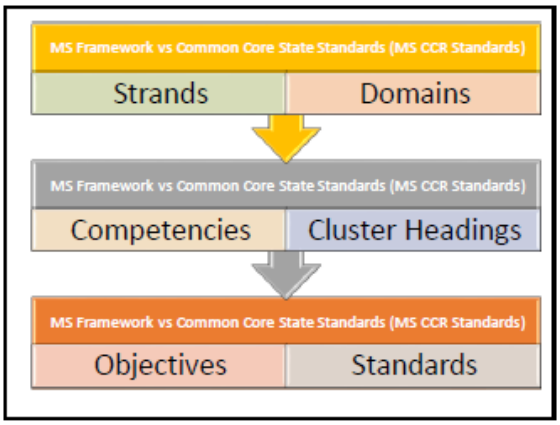


Referencing Update









Lunch – 11:00 a.m. to 12:00 p.m.

The presenter allows participants to break for lunch, reminding them that lunch is scheduled for 1 hour and that Session 3 will begin promptly at 12:00 p.m.

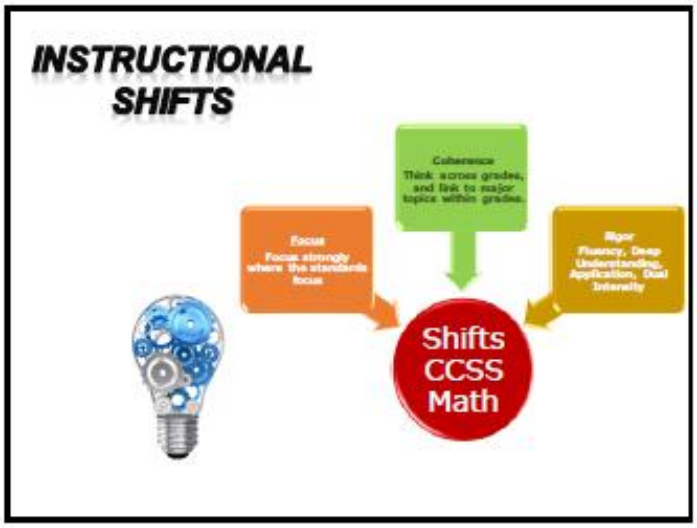
Session 3 – 12:00 p.m. to 1:20 p.m.

Presentation Slides 41

Instructional Shifts

After lunch, the presenter recap briefly on the morning sessions and introduce the focus of Session 3, which is the instructional shifts associated with the CCSSM. The presenter informs the participants that the shifts are related to teacher behaviors and are needed for

the successful implementation of the standards. Teacher leaders and administrators learn the three shifts are focus, coherence, and rigor.



Presentation Slides 42 – 48

Pre-Assessment Activity

The presenter inform participants that they will complete a pre-assessment on the instructional shifts, based on the brief descriptions just presented. In groups, participants will find one set of cards with the 6 instructional shifts (the Rigor Shift is broken apart) and another set of cards with teacher behaviors. The participants' task will be to match the instructional shift with the teacher behavior it is addressing. The presenter will inform participants that the rigor shift has been divided into fluency, deep understanding, application, and dual intensity. Once participants have matched all cards with the associated shifts, the presenter will review the answers (slides 43-48).

Instructional Shifts Pre-Assessment

- You will find one set of cards with the 6 instructional shifts and another set of cards with teacher behaviors.
- Your task is to match the instructional shift with the teacher behavior it is addressing

FOCUS

Teachers use the power of the eraser and significantly narrow and deepen the scope of how the time and energy is spent in the mathematics classroom.

They focus deeply on the concepts that are prioritized in the standards so that students will have a strong foundational knowledge and deep conceptual understanding in order to transfer mathematical skills and understanding across concepts and grades.

COHERENCE

Principals and teachers carefully connect the learning within and across grades so that, students can build new understanding onto foundations built in previous years.

Teachers can begin to count on deep conceptual understanding of core content and build on it.

Each standard is not a new event, but an extension of previous learning.

RIGOR - FLUENCY

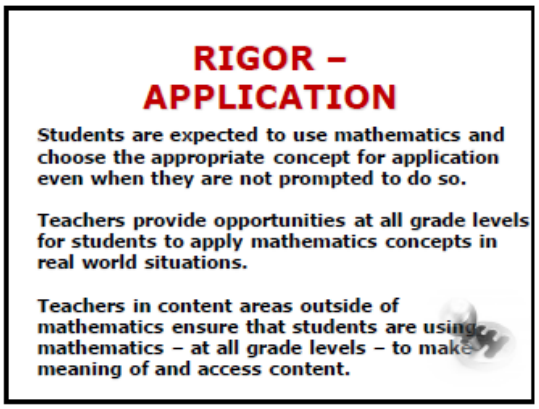
Students are expected to have speed and accuracy with simple calculations;

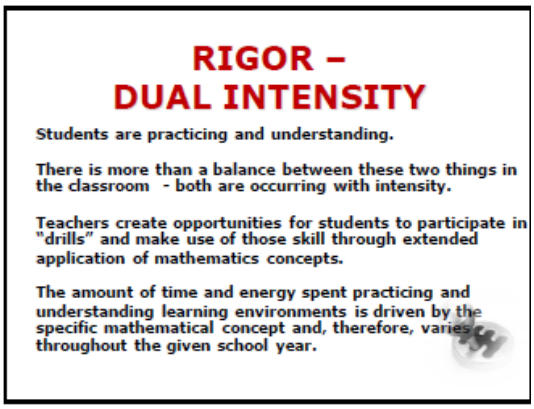
Teachers structure class time and/or homework time for students to memorize, through repetition, so that they are more able to understand and manipulate more complex concepts.

RIGOR – DEEP UNDERSTANDING

Teachers teach more than "how to get the answer" and instead support students' ability to access concepts from a number of perspectives so that students are able to see mathematics as more than a set of mnemonics or discrete procedures.

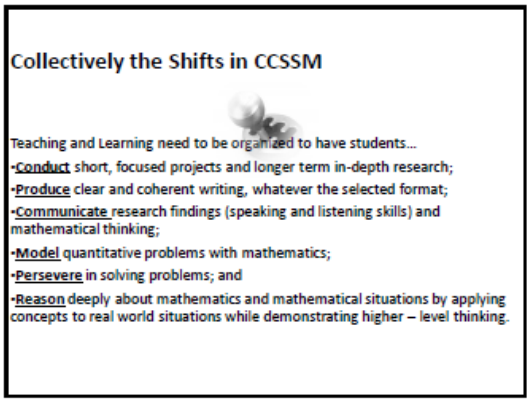
Students demonstrate deep conceptual understanding of core mathematics concepts by applying them to new situations as well as by writing and speaking about their understanding.





Presentation Slides 49 – 70

Now that participants have completed the pre-assessment, the presenter must delve deeper into each shift, as denoted by slides 49 – 61. After this brief sit and get portion of the professional development, the presenter allow the participants to participate in a hands-on activity called Fluency Wars (beginning on slide 62). The presenter reads the directions on these slides as written.



FOCUS

- Teacher's do not have to race to cover topics in today's mile wide, inch deep curriculum. Teachers use the power of the eraser and significantly narrow and deepen the the way time and energy is spent in the math classroom.

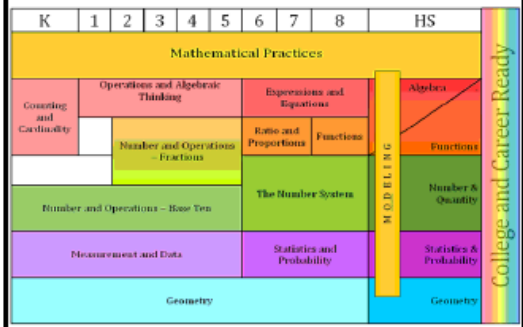
Coherence

COHERENCE

- Thinking across grades: The standards are designed around coherent progressions from grade to grade.
- Linking to major topics: Instead of allowing additional or supporting topics to detract from the focus of the grade, these topics can serve the grade level focus. For example, instead of data displays as an end in themselves, they support grade-level word problems.

MMF Approach

CCSS Approach



Curriculum Development

The Differences

Curriculum Development

- Learning progressions were developed with the assumption that the students mastered the competencies and objectives in the previous grade-level
- Prior to new skills and objectives, teachers are expected to review previously taught skills and objectives with a focus on increasing complexity
- Competencies and objectives (skill- based)
- Pacing Guides focused on teaching particular objectives during a identified period of time

Curriculum Development

- The CCSSM are not a curriculum!
- The CCSSM give states, curriculum developers, administrators, and teachers the opportunity to determine how academic goals are reached.
- The CCSSM supports the view that mathematics as a content area is inherently aligned with the 4Cs:
  - Critical Thinking - Communication
  - Collaboration - Creativity
- The CCSSM focus on solving problems that haven't been solved before, finding proofs, puzzling, understanding patterns and finding meaning in statistics

Rigor

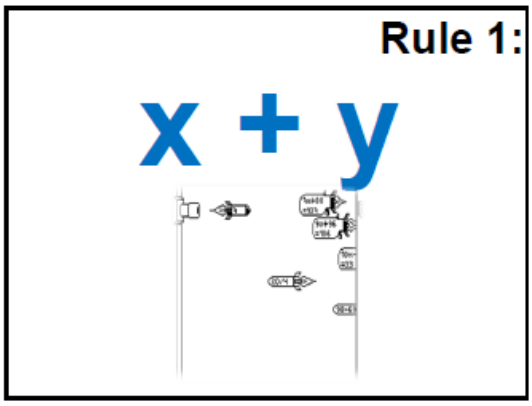
Rigor

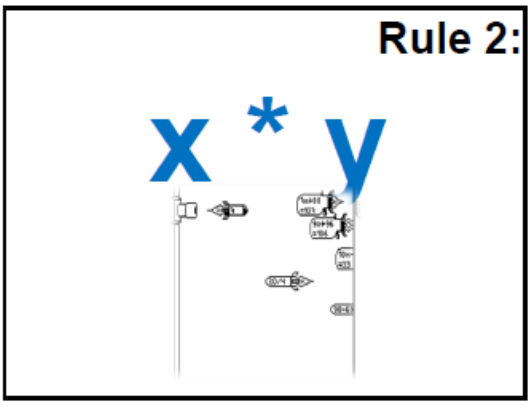
Required Fluency

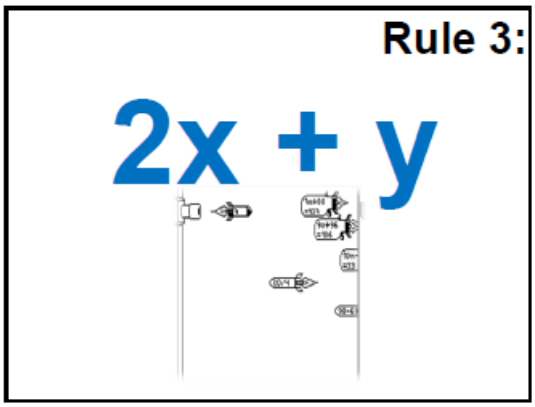
Grade	Required Fluency
K	Add/subtract within 5
1	Add/subtract within 10
2	Add/subtract within 20[1] Add/subtract within 100 (pencil and paper)
3	Multiply/divide within 100[2] Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2×2 systems by inspection

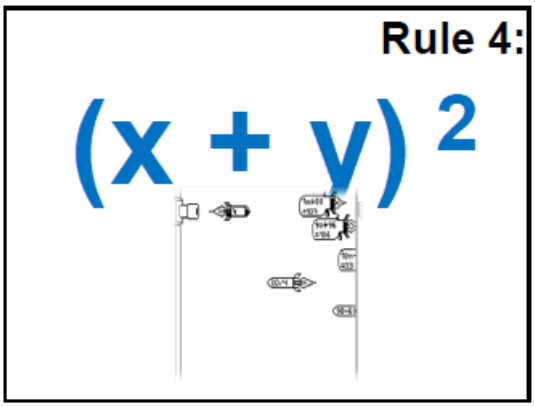
BUILDING FLUENCY

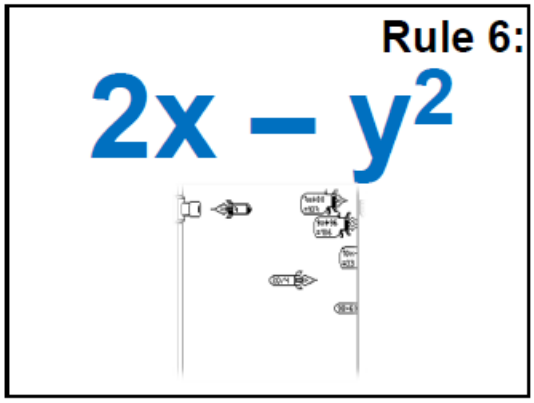
Fluency Wars

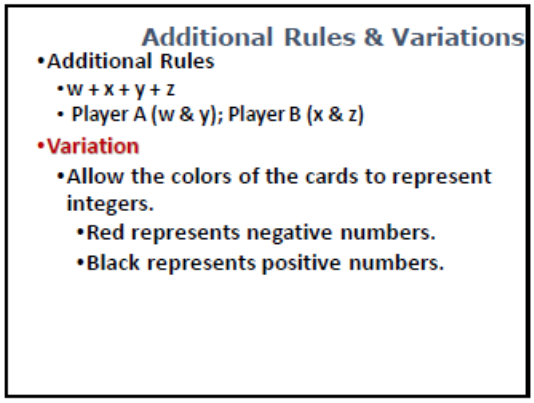












Break – 1:20 p.m. to 1:30 p.m.

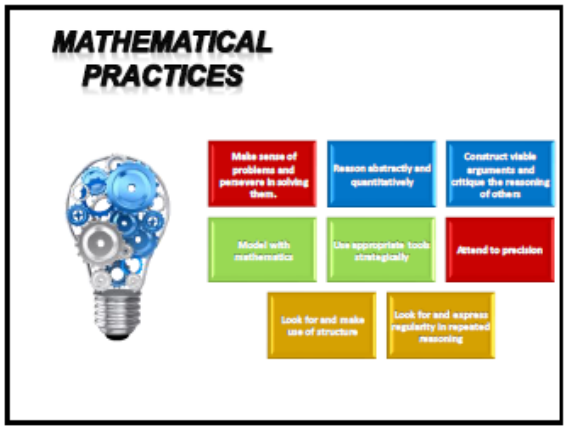
The presenter allows the participants to take a ten minute break after slide 70.

Session 4 – 1:30 p.m. to 2:45 p.m.

Presentation Slides 71

Standards of Mathematical Practices (the process standards)

The focus of this session is to make participants aware of the process standards associated with the CCSSM. To successfully teach the CCSSM, participants must teach not only the content standards but also the process standards. Teachers must understand that just as the instructional shifts are teacher behaviors, the standards for mathematical practices are student and in classroom behaviors.



Presentation Slides 72 - 80

Pre-Assessment Activity

Based on the brief descriptions of the mathematical practices, participants are asked to complete an activity. In groups, participants will find one set of cards with the 8 mathematical practices and another set of cards with student and classroom behaviors. The participants' task will be to match the mathematical practices with the student and in classroom behavior it is addressing.

Mathematical Practices Pre-Assessment

- You will find one set of cards with the 8 mathematical practices and another set of cards with student and in classroom behaviors.
- Your task is to match the mathematical practice with the student and in classroom behavior it is addressing.

Activity: MATH PRACTICES

Which Mathematical Practice is demonstrated based on the behaviors below?

MP 1: Make sense of problems and persevere in solving them.

Students:
- Check intermediate answers and change strategy if necessary
- Think about approaches to solving problems before beginning
- Have patience to complete multiples examples in trying to identify a solution
- Start by working a simpler problem
- Make a plan for solving the problem

In the Classroom:
- Groups look at a variety of solutions approaches and discuss their merit
- Groups compare two different approaches to look for how they are connected
- Students discuss whether a particular answer is possible in a given situation and explain their thinking
- Time is allotted for individual thinking time and for sharing of thoughts and ideas

Activity: MATH PRACTICES

Which Mathematical Practice is demonstrated based on the behaviors below?

MP 6: Attend to precision

Students:
- Specify units of measure in their answer
- Define symbols and variables that they are using
- Use vocabulary appropriately
- Measure accurately
- Calculate precisely
- Label graphs and tables correctly
- Recognize and discard extraneous solutions

In the Classroom:
- Teacher models appropriate mathematical vocabulary
- Teacher models calculating with units throughout a problem, not just adding them on at the end
- Groups discuss appropriate accuracy of answers
- Groups discuss differences between a sketch and a graph
- During group presentations, other class members and the teacher help to clarify the language and explanations

Activity: MATH PRACTICES

Which Mathematical Practice is demonstrated based on the behaviors below?

MP 2: Reason abstractly and quantitatively.

Students:
- Connect numbers/symbols with a concrete model
- Write and manipulate symbols to solve a problem
- Generalize a pattern
- Approximate the answer by reasoning before doing the actual calculation

In the Classroom:
- Students explain the meaning of a given expression or equation in terms of a situation
- Students interpret an answer in the context of the problem
- Students discuss and choose "the most likely answer" to a given situation without actually doing any calculations

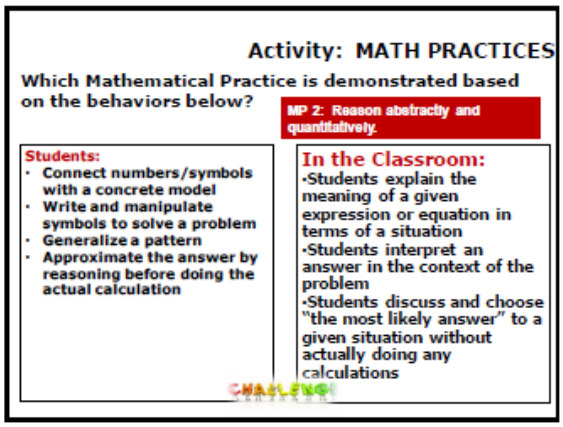
Activity: MATH PRACTICES

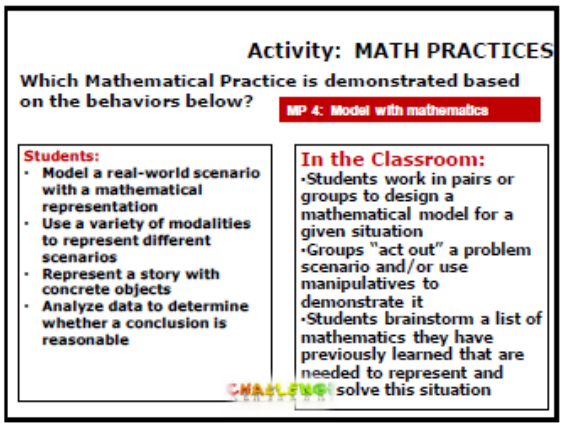
Which Mathematical Practice is demonstrated based on the behaviors below?

MP 4: Model with mathematics

Students:
- Model a real-world scenario with a mathematical representation
- Use a variety of modalities to represent different scenarios
- Represent a story with concrete objects
- Analyze data to determine whether a conclusion is reasonable

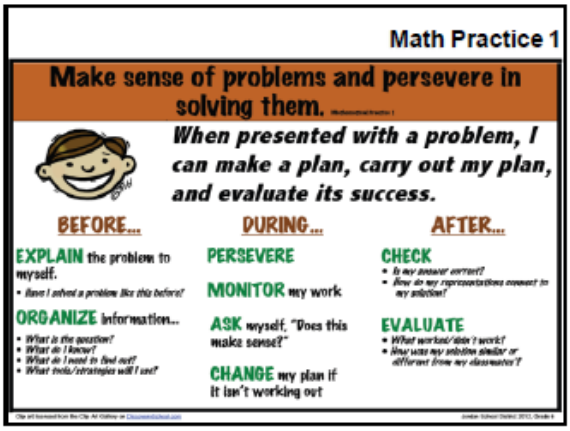
In the Classroom:
- Students work in pairs or groups to design a mathematical model for a given situation
- Groups "act out" a problem scenario and/or use manipulatives to demonstrate it
- Students brainstorm a list of mathematics they have previously learned that are needed to represent and solve this situation

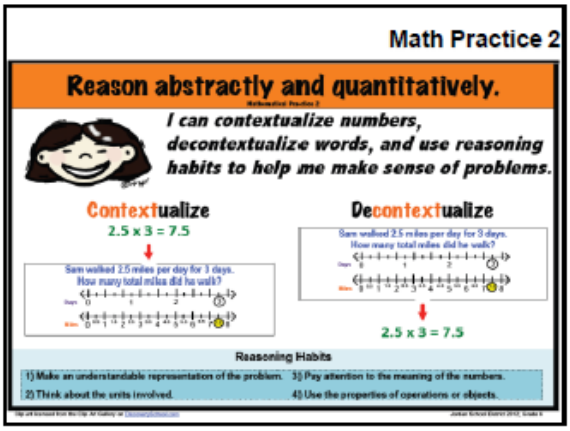




Presentation Slides 81 - 92

The focus of these slides to delve deeper into the Mathematical Practices, providing participants with detailed explanations of practice. The presentation of this session concludes with a collection of Guided Questions associated with the standards. This handout is presented to the teachers. The presenter review each slide in its entirety.





Math Practice 3

Construct viable arguments and critique the reasoning of others.

I can make conjectures and critique the mathematical thinking of others.

I can make, justify (prove), and present arguments by...

- using objects, drawings, diagrams and actions
- using examples and non-examples
- applying context

I can critique the reasoning of others by...

- listening
- asking questions to clarify or improve arguments
- comparing strategies and arguments while identifying flawed logic

Math Practice 4

Model with mathematics.

I can recognize math in everyday life and use math I know to solve problems.

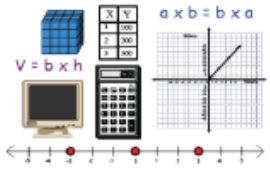
I can...

Math Practice 5

Use appropriate tools strategically.

I can use certain tools to help me explore and deepen my math understanding.

- I know *HOW* and *WHEN* to use math tools.
- I can reason: *"Did the tool I used give me an answer that makes sense?"*



Math Practice 6

Attend to precision.

I can use precision when solving problems and communicating my ideas.

Mathematicians attend to precision by using...

How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally?

$\frac{1}{2}$ lb. ÷ 3 people = $\frac{1}{6}$ lb. of chocolate each

(symbols; units of measure; context)

- math vocabulary with clear definitions
- symbols that have meaning
- context labels
- units of measure
- calculations that are accurate and efficient

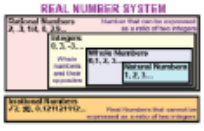
Math Practice 7

Look for and make use of structure.

I can see and understand how numbers and spaces are organized and put together as parts and wholes.

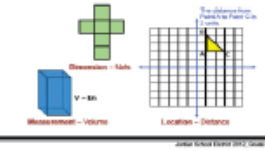
Numbers

For Example:



Spaces

For Example:

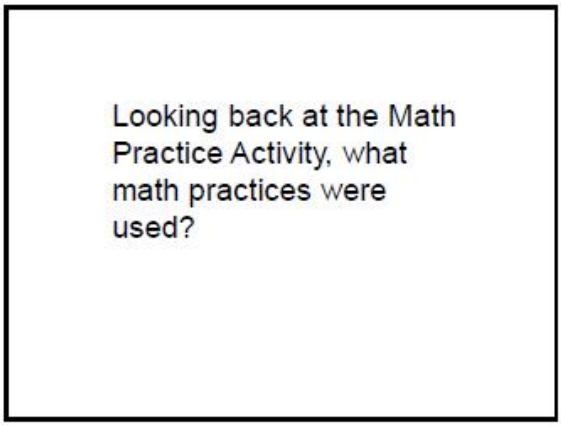


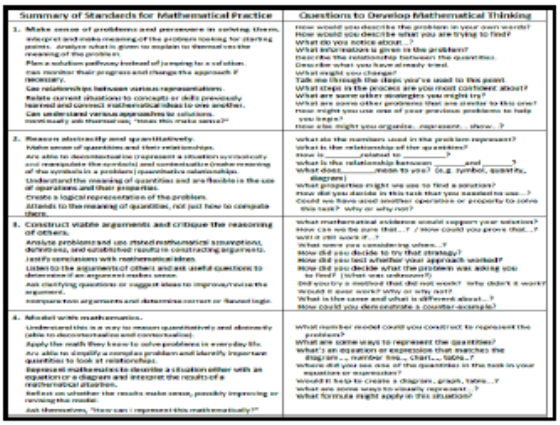
Math Practice 8

Look for and express regularity in repeated reasoning.

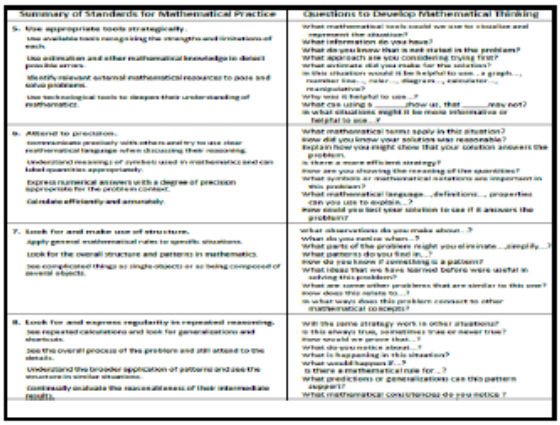
I can notice when calculations are repeated. Then, I can find more general methods and short cuts.

As I work...	EXAMPLE: I have a container of yogurt that is ¾ full. One serving of yogurt is ¼ of the container. How many servings are left in the container? (THINK: How many ¼'s are in ¾'s?)
...I think about what I'm trying to figure out while I pay attention to the details.	I can notice that ¼ is repeated and draw a model to figure out the number of servings left in the container.
...I evaluate if my results are reasonable.	Once I understand division of fractions, I can use a short cut to solve it like this.





Summary of Standards for Mathematical Practice	Questions to Develop Mathematical Thinking
1. Make sense of problems and persevere in solving them. Interpret and make meaning of the problem looking for starting points. Analyze what is given to explain to themselves the meaning of the problem. Plan a solution pathway instead of jumping to a solution. Can monitor their progress and change the approach if necessary. See relationships between various representations. Relate current situations to concepts or skills previously learned and connect mathematical ideas to one another. Can understand various approaches to solutions. Continually ask themselves, "does this make sense?"	How would you describe the problem in your own words? How would you describe what you are trying to find? What do you notice about...? What information is given in the problem? Describe the relationship between the quantities. Describe what you have already tried. What might you change? Talk me through the steps you've used to this point. What step in the process are you most confident about? What are some other strategies you might try? What are some other problems that are similar to this one? How might you use one of your previous problems to help you begin? How else might you organize, represent... show...?
2. Reason abstractly and quantitatively. Make sense of quantities and their relationships. Are able to decontextualize (represent a situation symbolically and manipulate the symbols) and contextualize (make meaning of the symbols in a problem) quantitative relationships. Understand the meaning of quantities and are flexible in the use of operations and their properties. Create a logical representation of the problem. Attends to the meaning of quantities, not just how to compute them.	What do the numbers used in the problem represent? What is the relationship of the quantities? How is _____related to _____? What is the relationship between _____and _____? What does_____mean to you? (e.g. symbol, quantity, diagram) What properties might we use to find a solution? How did you decide in this task that you needed to use...? Could we have used another operation or property to solve this task? Why or why not?
3. Construct viable arguments and critique the reasoning of others. Analyze problems and use stated mathematical assumptions, definitions, and established results in constructing arguments. Justify conclusions with mathematical ideas. Listen to the arguments of others and ask useful questions to determine if an argument makes sense. Ask clarifying questions or suggest ideas to improve/revise the argument. Compare/mark arguments and determine correct or flawed logic.	What mathematical evidence would support your solution? How can we be sure that...? / How could you prove that...? Will it still work if...? What were you considering when...? How did you decide to try that strategy? How did you test whether your approach worked? How did you decide what the problem was asking you to find? (What was unknown?) Did you try a method that did not work? Why didn't it work? Would it ever work? Why or why not? What is the same and what is different about...? How could you demonstrate a counter-example?
4. Model with mathematics. Understand this is a way to reason quantitatively and abstractly (able to decontextualize and contextualize). Apply the math they have to solve problems in everyday life. Are able to simplify a complex problem and identify important quantities to look at relationships. Represent mathematics to describe a situation either with an equation or a diagram and interpret the results of a mathematical situation. Reflect on whether the results make sense, possibly improving or revising the model. Ask themselves, "How can I represent this mathematically?"	What number model could you construct to represent the problem? What are some ways to represent the quantities? What's an equation or expression that matches the diagram..., number line..., chart..., table...? Where did you see one of the quantities in the task in your equation or expression? Would it help to create a diagram, graph, table...? What are some ways to visually represent...? What formula might apply in this situation?

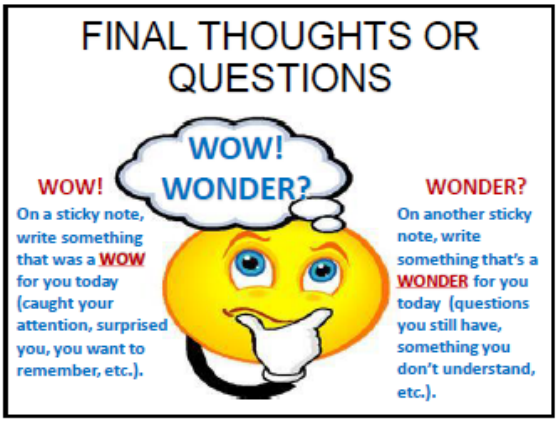


Summary of Standards for Mathematical Practice	Questions to Develop Mathematical Thinking
5. Use appropriate tools strategically. Use available tools recognizing the strengths and limitations of each. Use estimation and other mathematical knowledge to detect possible errors. Identify relevant external mathematical resources to pose and solve problems. Use technological tools to deepen their understanding of mathematics.	What mathematical tools could we use to visualize and represent the situation? What information do you have? What do you know that is not stated in the problem? What approach are you considering trying first? What estimate did you make for the solution? In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative? Why was it helpful to use...? What can using a _____show us, that _____may not? In what situations might it be more informative or helpful to use...?
6. Attend to precision. communicate precisely with others and try to use clear mathematical language when discussing their reasoning. Understand meaning of symbols used in mathematics and can label quantities appropriately. Express numerical answers with a degree of precision appropriate for the problem context. Calculate efficiently and accurately.	What mathematical terms apply in this situation? How did you know your solution was reasonable? Explain how you might show that your solution answers the problem. Is there a more efficient strategy? How are you showing the meaning of the quantities? What symbols or mathematical notations are important in this problem? What mathematical language...,definitions..., properties can you use to explain...? How could you test your solution to see if it answers the problem?
7. Look for and make use of structure. Apply general mathematical rules to specific situations. Look for the overall structure and patterns in mathematics. See complicated things as single objects or as being composed of several objects.	What observations do you make about...? What do you notice when...? What parts of the problem might you eliminate...,simplify...? What patterns do you find in...? How do you know if something is a pattern? What ideas that we have learned before were useful in solving this problem? What are some other problems that are similar to this one? How does this relate to...? In what ways does this problem connect to other mathematical concepts?
8. Look for and express regularity in repeated reasoning. See repeated calculations and look for generalizations and shortcuts. See the overall process of the problem and still attend to the details. Understand the broader application of patterns and see the structure in similar situations. Continually evaluate the reasonableness of their intermediate results.	Will the same strategy work in other situations? Is this always true, sometimes true or never true? How would we prove that...? What do you notice about...? What is happening in this situation? What would happen if...? Is there a mathematical rule for...? What predictions or generalizations can this pattern support? What mathematical consistencies do you notice?

Wrap Up – 2:45 p.m. to 3:00 p.m.

Presentation Slides 93-95

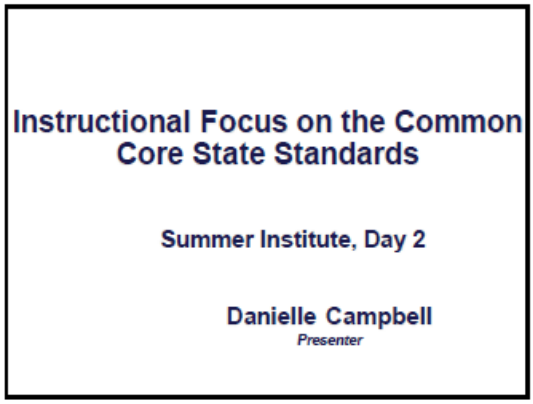
The focus of these slides are to provide participants to share their thoughts with a WOW and Wonder and then conclude with a formal evaluation for Day 1. The evaluation will be provided at the end of Appendix A.



Day 2

Presentation Slide 96

The title page for Day 2 session. Instructional Focus on the Common Core State Standards, Summer Institute, Day 2. Presenter – Danielle Campbell

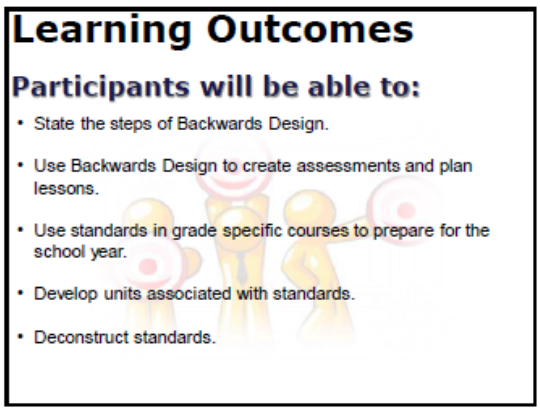


Session 1 – 8:00 a.m. to 10:00 a.m.

Presentation Slides 97 – 98

Learning Outcomes and Agenda for Day 2

The presenter briefly discusses the connection between the learning outcomes and the research questions and then proceed to review the Learning Outcomes for the day, followed by the agenda. The learning outcomes for Day 2 session are associated with Research Question 1, Theme 1: Teacher Preparation (or lack of).



Presentations Slides 99

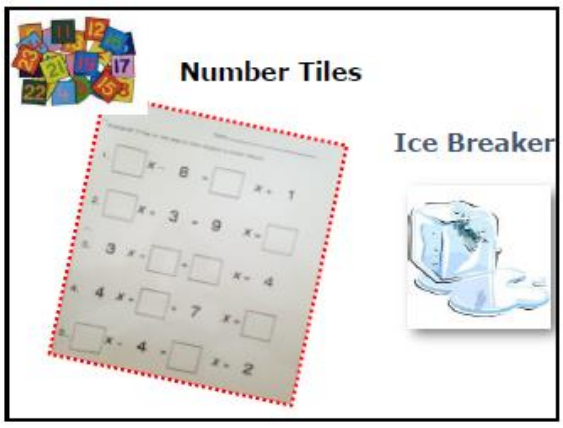
Activity: Number Tiles

The icebreaker for the day is called number tiles. The presenter will review the following objective and directions. Participants will be provided a maximum of no more than 15 minutes to complete 7 cards. At the conclusion of the activity, the presenter will ask participants to think about the standards for mathematical practices and determine which practices best fit the activity. Although all practices will connect to the activity, the presenter is looking for responses such as MP. 1, MP. 3, MP. 4, MP. 6, and MP. 7.

Objective: Math tiles are a hands-on activity that takes students' thinking beyond procedures and rote memorization.

Directions:

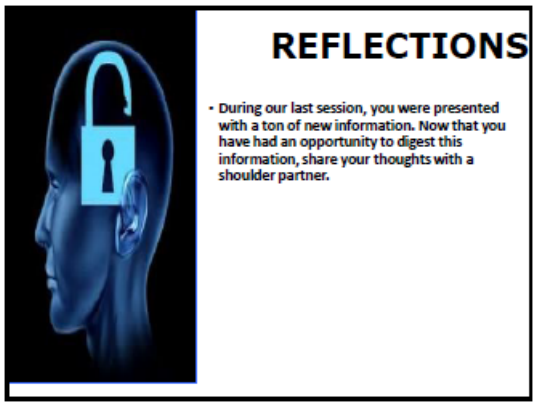
In groups, arrange each number tile (0 – 9) on the various tile cards in order to correctly complete each mathematical task. Once arranged have the leader of the group raise his or her hand so that the presenter may check for correctness.



Presentations Slides 100 – 101

Reflections

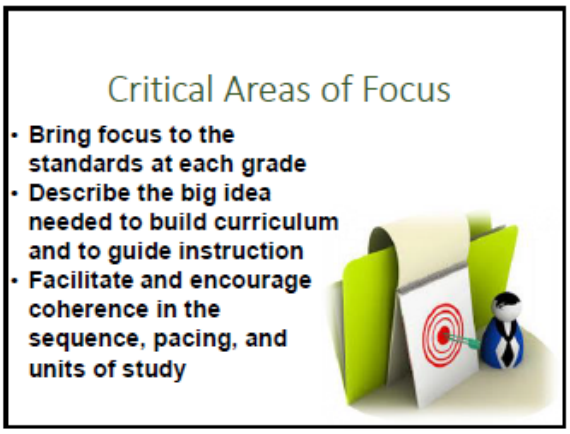
The focus of these slides are to provide the teacher leaders and administrators an opportunity to share out regarding their experiences of implementing the various information discussed during the first session. The presenter will provide an opportunity for participants to reflect on the information learned on Day 1.

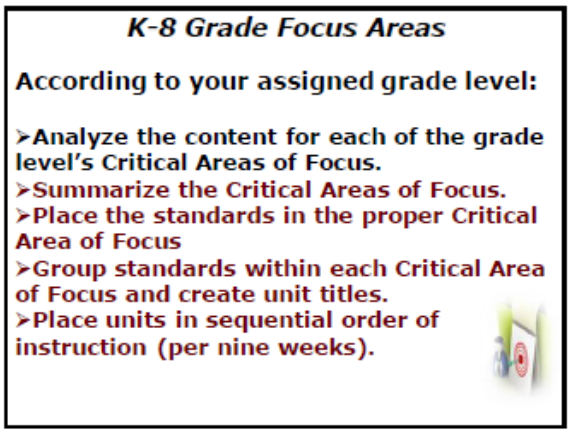


Presentations Slides 102 – 104

Unit Development (Informing Pacing)

The focus of these slides is understanding unit development. Participants will be presented with the critical areas of focus associated with their grade levels. Using the critical areas of focus and grade specific standards, participants will develop units for teaching. The presenter will review the directions for the activity located on slides 103 and 104.





Break – 10:0 a.m. to 10:10 a.m.

The presenter allows the participants to take a ten minute break after slide 104.

Session 2 – 10:10 a.m. to 11:00 a.m.

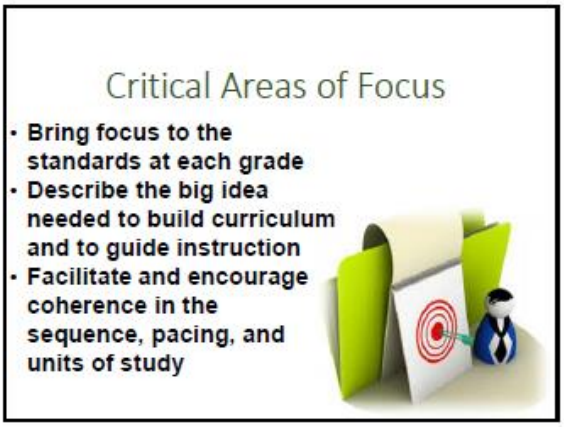
Presentation Slides 105 - 121

Backwards Design

Now that participants have developed their pacing guides for the academic year, the focus of these slides is to discuss the components of Backwards Design. Teacher leaders and administrators learn the three basic steps of Backwards Design:

- Step 1: Identify the Desired Results (standard deconstruction).
- Step 2: Determine Assessment Evidence (create assessment).
- Step 3: Plan Learning Experiences and Instruction.

The presenter and participants will first discuss the outcome of the unit planning. The presenter will inform participants that the next phase is understanding the concept of Understanding by Design. The presenter will present the following slides with no changes. This session concludes with the difference between Traditional Design vs Backwards Design.



K-8 Grade Focus Areas

According to your assigned grade level:

- **Analyze the content for each of the grade level's Critical Areas of Focus.**
- **Summarize the Critical Areas of Focus.**
- **Place the standards in the proper Critical Area of Focus**

Backward Design

·To begin with the end in mind means to start with a clear understanding of your destination. It means you know where you're going…so the steps you take are always in the right direction"

It seems
backward….

Bausace rehtar tahn cnitaerg atnesmssess naer the end of a uint of sduty (or riynleg on tobotxek tset) we dtierneme waht the tnemssessa wlil look lkie as we bigen to paln a uint….

It seems
backward

because rather than creating assessments near the end of a unit of study (or relying on textbook tests) we determine what the assessment will look like as we **begin** to plan a unit…

Basics of Backwards Design

- Step 1: Identify the Desired Results (Standards) (Deconstruct the standards)
- Step 2: Determine Assessment Evidence (Create Assessment)
- Step 3: Plan Learning Experiences and Instruction

Step 1: Identify the Standard (Deconstruct the Standard)

- List the standards you must teach within a unit, module, or chapter, etc.
- Deconstruct the standard(s)
  - Determine the "Big Idea"
- Determine the Essential (HOTS) Questions
- Determine What students will do (VERB)

STEP 1 (CONT.): IDENTIFYING THE DESIRED RESULTS

Establish Goals	Identify big ideas/concepts/understanding	Determine essential questions	Identify what students will be able to…
↓	↓	HOTS ↓	↓
CCSSM standards 7.EE.A.1	There are infinite ways to express a number or expression.	What strategies can be applied to add, subtract, factor, and expand linear expressions?	Identify key skills and knowledge students should know and will acquire. What should students be able to do as a result?

You will be unpacking your standards in your next session

Step 2 – Create Assessments

- Performance Tasks and Projects
- Traditional Evidence
  - Informal Checks/Observations
  - Quizzes and Tests
  - Homework
  - Reflections
  - Self-assessment

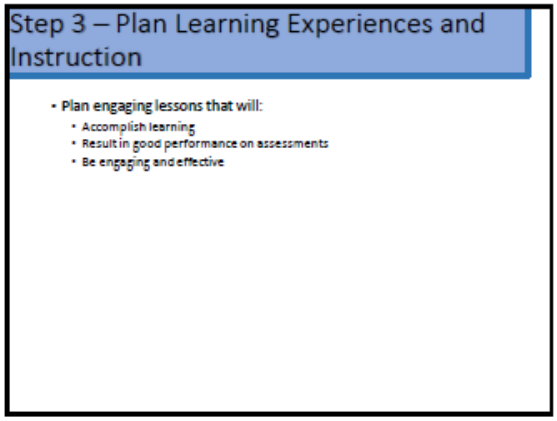
Planning Assessments

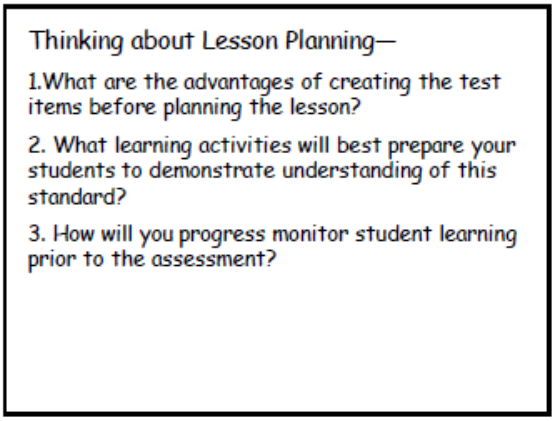
- 1.What kinds of evidence do we need?
- 2.What specific characteristics in student responses, products, or performance should we have?

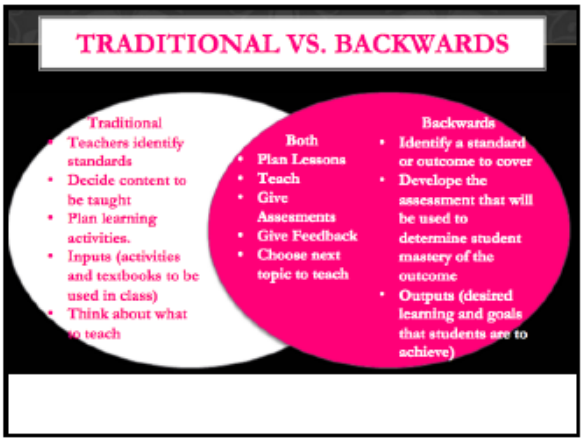
Progress monitoring / data
is used to assess knowledge & skills that contribute to the culminating performances

The assessment or culminating project

provides *evidence* that students are able to use their knowledge *in context*







Lunch – 11:00 a.m. to 12:00 p.m.

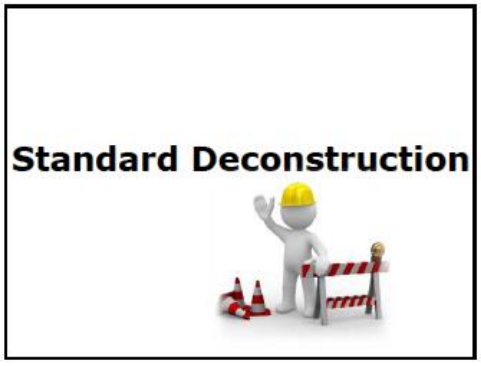
The presenter allows participants to break for lunch, reminding them that lunch is scheduled for 1 hour and that Session 3 will begin promptly at 12:00 p.m.

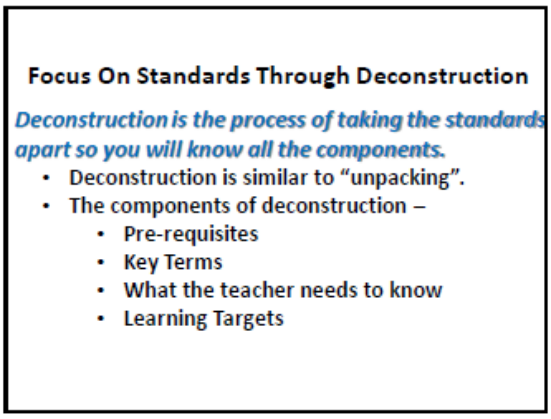
Session 3 – 12:00 p.m. to 1:20 p.m.

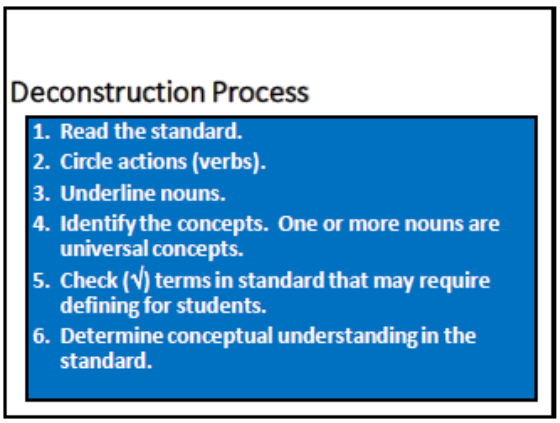
Presentation Slides 122 – 125

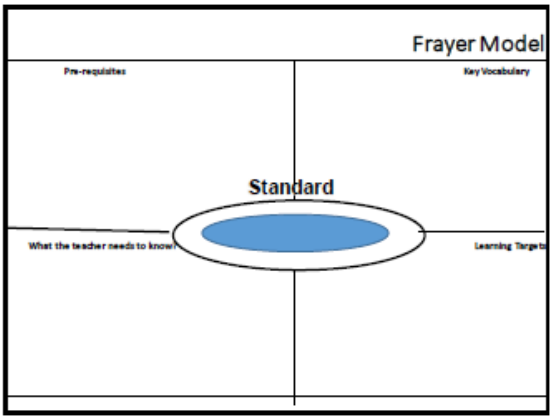
Standard Deconstruction

The focus of these slides is to discuss the components and process of standard deconstruction. All participants will receive ten handouts of the Frayer Model to be used to deconstruct standards. The presenter will explain the deconstruction components and process (slides 123 – 124). Slide 125 will serve as a participant handout.









Presentation Slides 126– 133

The presenter models how to deconstruct various middle and high school level standards with the participants, using the above strategies for deconstruction. Note: These slides contain animations so that presenter can discuss in phases.

Deconstruction: The Standard #1

7.EE.A.1

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Clarification of Terminology
What is meant by.....

Rational coefficients

Coefficients which consist of integers, decimals, and fractions.

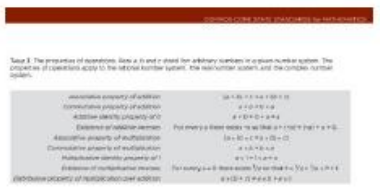
Properties of operations

Associative properties of addition/multiplication
Commutative properties of addition/multiplication
Additive Identity Property of 0
Existence of Additive Inverses
Multiplicative Identity Property of 1
Existence of Multiplicative Inverse
Distributive Property of Multiplication over Addition

Linear expressions

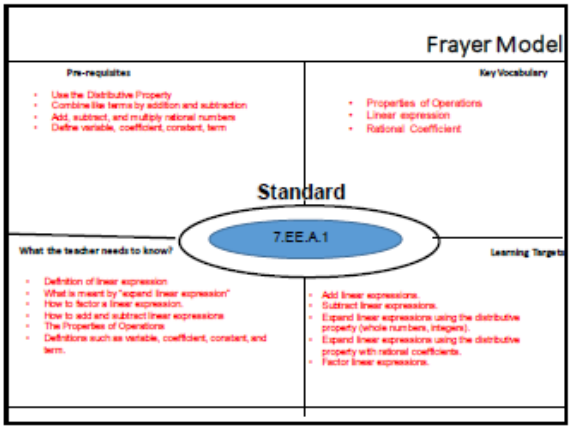
An algebraic expression in degree 1.

Properties of operations



Taken from the Common Core State Standards Glossary, page 90.

Frayer Model



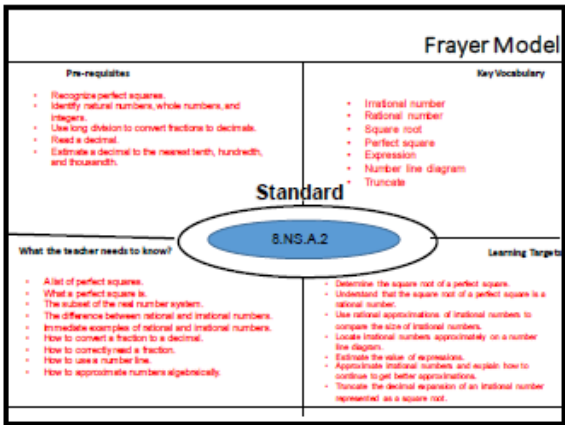
Deconstruction: The Standard #2

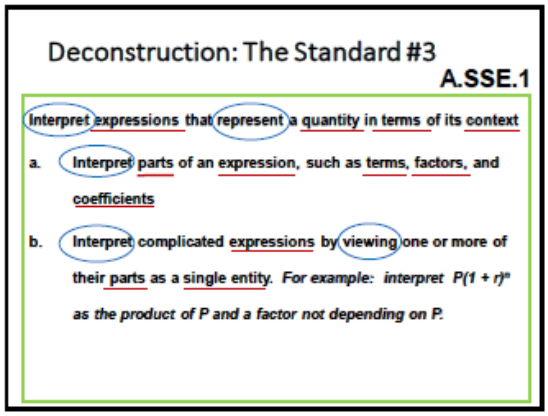
8.NS.A.2

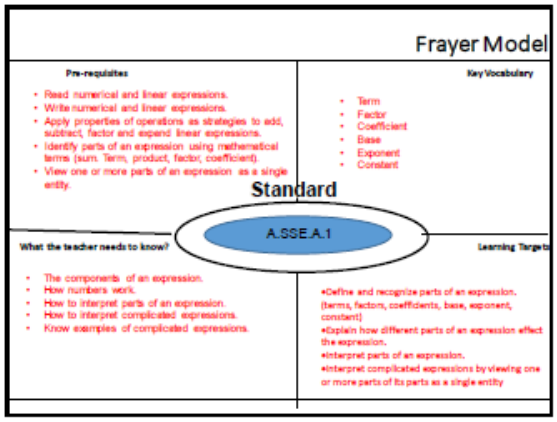
Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

MP. 7 & MP. 8 (MP. 5)

Frayer Model







Break – 1:20 p.m. to 1:30 p.m.

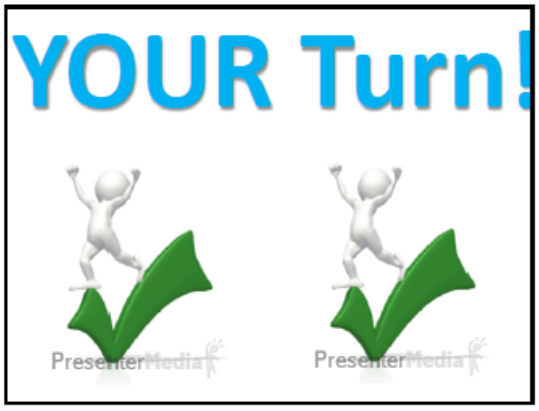
The presenter allows the participants to take a ten minute break after slide 133.

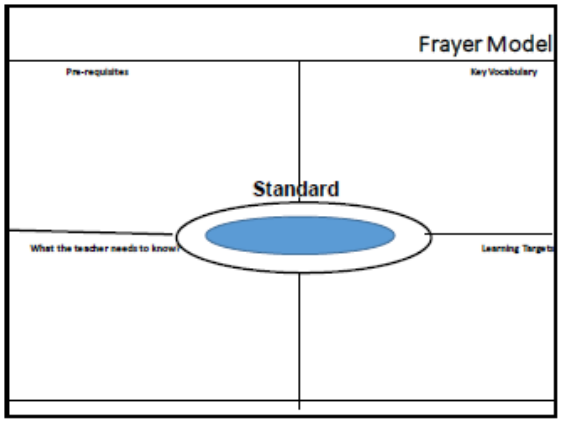
Session 4 – 1:30 p.m. to 2:45 p.m.

Presentation Slides 134 - 135

Standard Deconstruction, continued

Teacher leaders and administrators begin the deconstruction of standards associated with the pacing guides created during Session 1. The goal will be to deconstruct the majority (if not all) of the first term standards as the presenter serves as a facilitator during this process.

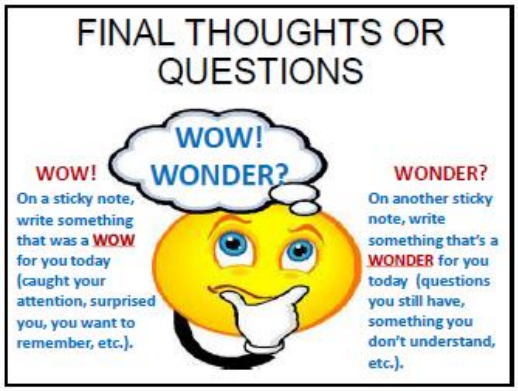




Wrap Up – 2:45 p.m. to 3:00 p.m.

Presentation Slides 136 – 138

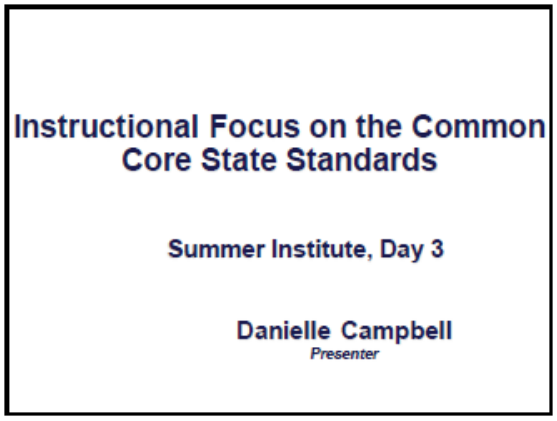
The focus of these slides are to provide participants to share their thoughts with a WOW and Wonder and then conclude with a formal evaluation for Day 2. The evaluation will be provided at the end of Appendix A.



Day 3

Presentation Slide 139

The title page for Day 3 session. Instructional Focus on the Common Core State Standards, Summer Institute, Day 3. Presenter – Danielle Campbell

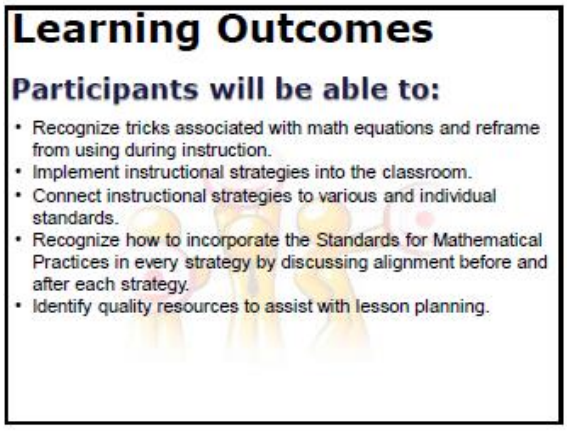


Session 1 – 8:00 a.m. to 10:00 a.m.

Presentation Slides 140 - 141

Learning Outcomes and Agenda for Day 3

The presenter briefly discusses the connection between the learning outcomes and the research questions and then proceed to review the Learning Outcomes for the day, followed by the agenda. The learning outcomes for Day 3 session are associated with Research Question 1, Theme 2: Student Preparation (or lack of) and Theme 3: Resources. The learning outcomes associated with Day 2 are listed below.



Presentations Slides 142-145

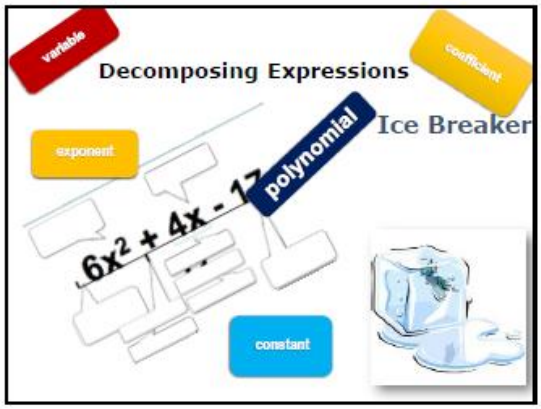
Activity: Decomposing Expressions

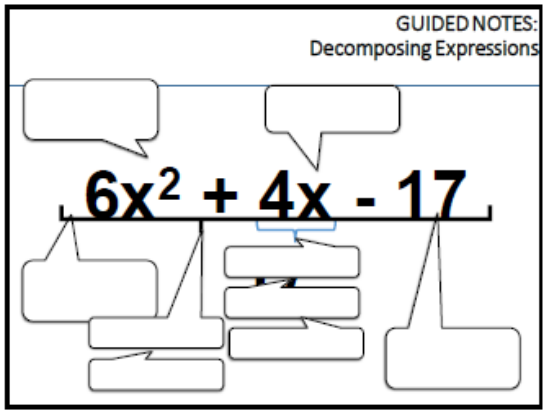
The icebreaker for the day is called Decomposing Expressions. The presenter will review the following objective and directions. Participants will be provided a maximum of no more than 10 minutes to complete task. At the conclusion of the activity, the presenter will ask participants to think about the standards for mathematical practices and determine which practices best fit the activity. Although all practices will connect to the activity, the presenter is looking for responses such as MP. 1, MP. 3, MP. 6, and MP. 7. Slide 143 will serve has the handout.

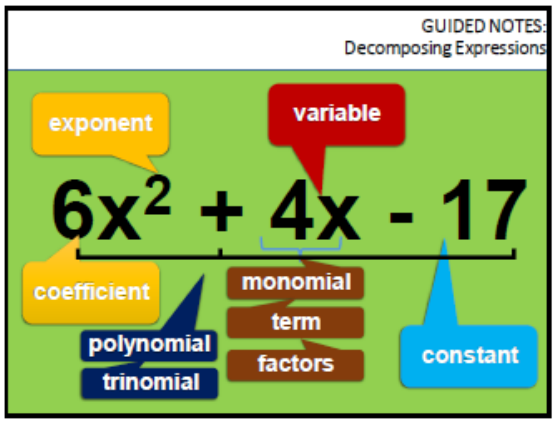
Objective: Decomposing Expressions provide opportunities for participants to practice with number sense. They must practice using sound mathematical terminology to analyze the various ways to read mathematical terms. At the end of the activity, participants will reflect on their behaviors and determine the mathematical practices associated with this activity.

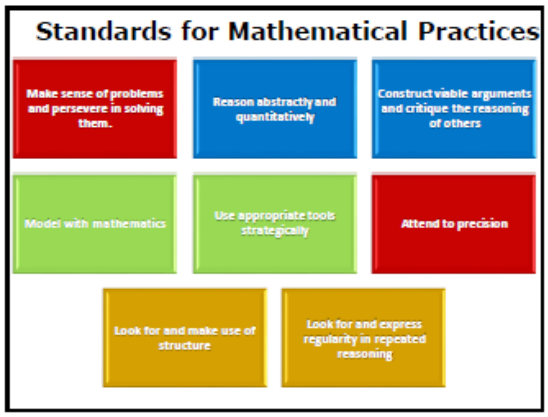
Directions:

- In groups and using the provided handout, correctly name the part of the expression identified by a blank. Note: some parts will have more than one name.





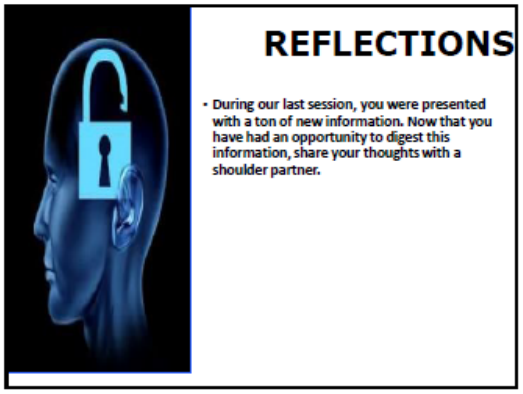




Presentations Slides 146 - 147

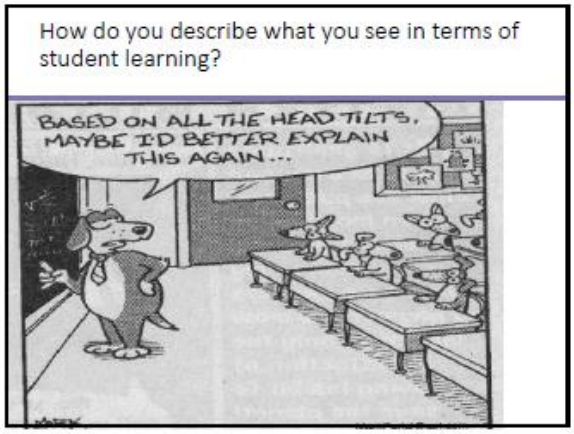
Reflections

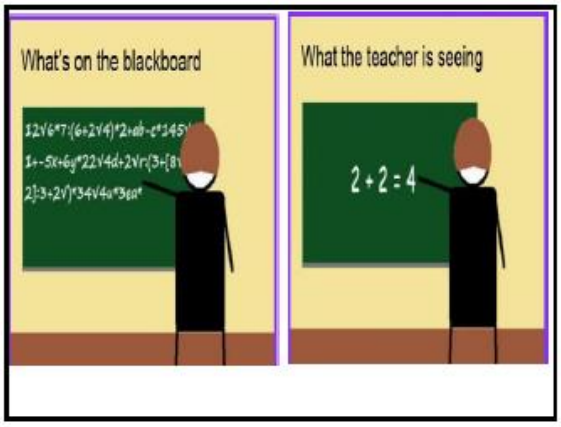
The focus of these slides are to provide the teacher leaders and administrators an opportunity to share out regarding their experiences of implementing the various information discussed during the second session.

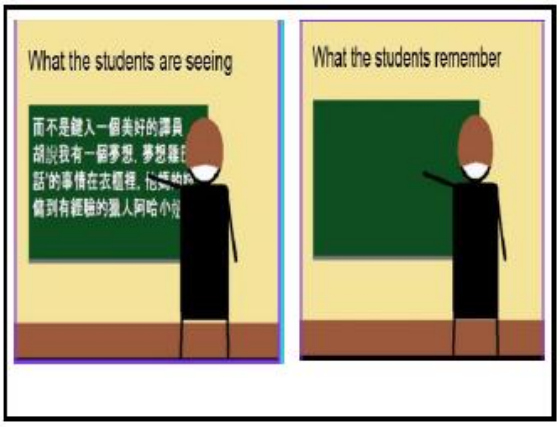


Presentations Slides 147 – 149

The focus of these slides is to use animation to depict how students interpret what teachers are saying. It is an additional reflection point. The presenter will remind participants that not all students interpret mathematics like the teacher.





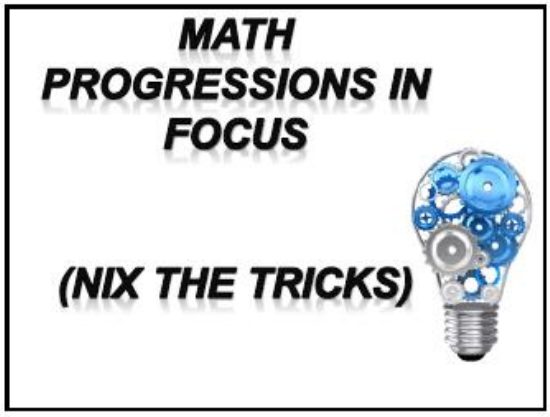


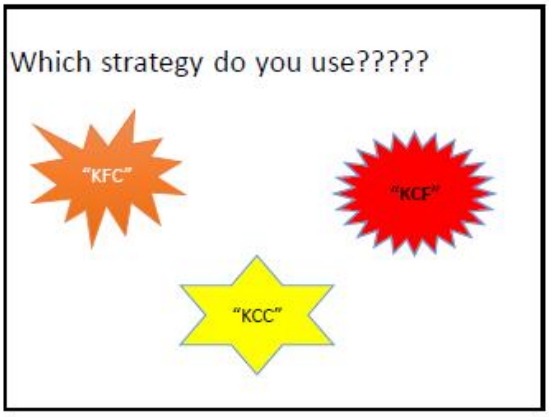
Presentations Slides 151 – 163

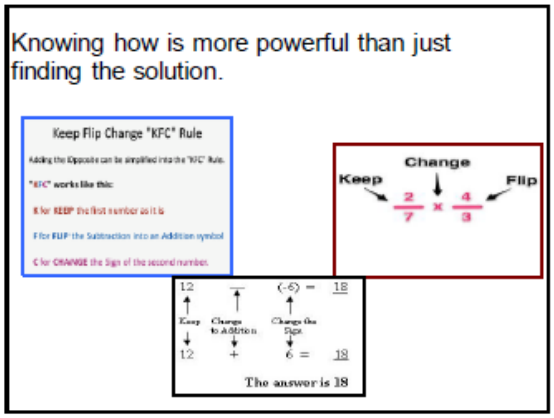
Part of students' conceptual understanding of math is having math sense. The focus of these slides is to discourage teacher leaders from using tricks to teach mathematics and to encourage more suitable strategies. The participants will learn that the tricks inadvertently create more gaps in student learning and walk away with strategies to encourage conceptual teaching of mathematics.

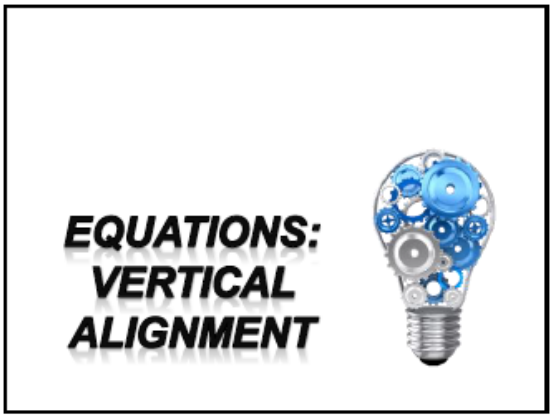
- Trick 1: Expressions: Nix – KFC, KCF, or KCC
- Trick 2: Equations: Nix – Take or Move to the other Side
- Trick 3: Equations: Nix – The word Cancel
- Trick 4: Equations: Nix – Switch the Side and Switch the Sign

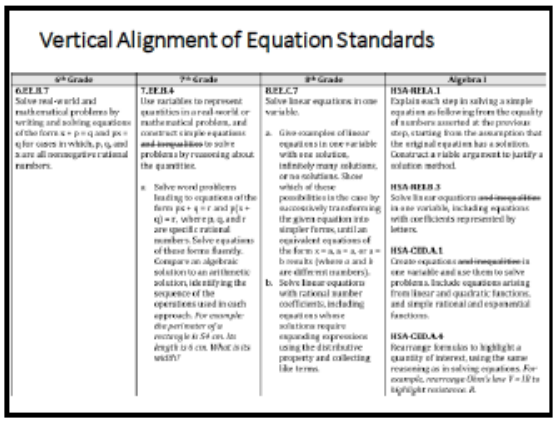
- Tick 5: Expressions: Nix – FOIL











Equations: Nix the Tricks.....

- **Nix: Take or Move to the Other Side**
  - Why? Taking and moving are not algebraic operations. When students think they can move things for any reason, they will neglect to use the opposite operations.
- **Fix:** Use mathematical operations and properties to describe what we are doing, helps students develop more precise mathematical language

Source: Nix the Tricks by Tina Cardone and the MTBoS

Equations: Nix the Tricks.....

- **Nix: Cancel**
  - Why? Cancel is a vague term that hides the actual mathematical operations being used, so students do not know when or why to use it. To many students, cancel is digested as "cross-out stuff" by magic, so they see no problem with crossing out parts of an expression or across addition.
- **Fix:** Talk about inverse operations or getting zero (in the case of addition) or one (in the case of multiplication) instead. The **big idea** is to **maintain the equality** by doing the same operation to both quantities.

Source: Nix the Tricks by Tina Cardone and the MTBoS

Cancel: Nix the Tricks.....

$4x - 4(x+2)$

$4x - 4x + 8$

$+4x + 4x$

$8x + 8$

Incorrect: $\frac{4x+2}{2} = \frac{4x+2}{2} = 4x$

Correct: $\frac{4x+2}{2} = \frac{2(2x+1)}{2} = 2x$

Source: Nix the Tricks by Tina Cardone and the MTBoS

FOIL: Nix the Tricks.....

$(2x+3)(x-4)$

First Inside Outside Last

$2x^2 - 8x + 3x - 12$

- **Nix: FOIL**
  - It implies an order. It is a one trick pony, meaning it only works when multiplying two binomials. Students must also understand how to multiply various polynomials.
- **Fix: Distributive Property**
  - Can be taught as soon as distributive property is introduced. Students can start by distributing one binomial to each part of the other binomial. Then distribution is repeated on each monomial being multiplied by a binomial. As students repeat the procedure they will realize that each term in the first polynomial must be multiplied by each term in the second polynomial.

Source: Nix the Tricks by Tina Cardone and the MTBoS

FOIL: Nix the Tricks.....

$$\begin{aligned}23 \cdot 45 &= (20+3)(40+5)\\ &= 20(40+5) + 3(40+5)\\ &= 20 \cdot 40 + 20 \cdot 5 + 3 \cdot 40 + 3 \cdot 5\\ &= 800 + 100 + 120 + 15\end{aligned}$$

	40	5
20	800	100
3	120	15

$$\begin{aligned}(2x+3)(x-4)\\ &= (2x+3)(x) + (2x+3)(-4)\\ &= 2x^2 + 3x - 8x - 12\\ &= 2x^2 - 5x - 12\end{aligned}$$

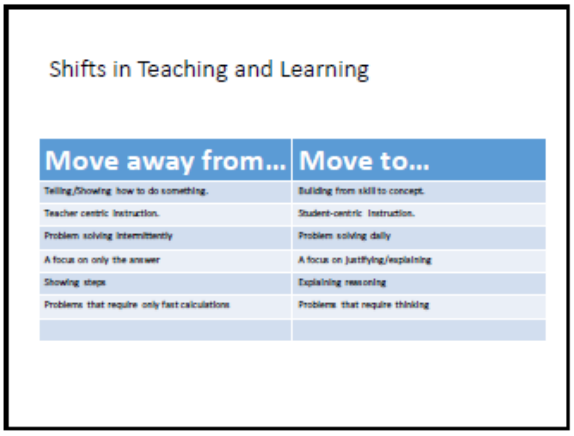
	$2x$	3
x	$2x^2$	$3x$
-4	$-8x$	-12

Source: Nix the Tricks by Tina Cardone and the MTBoS

Equations: Nix the Tricks.....

- **Nix: Switch the Side and Switch the Sign**
  - This strategy hides the actual operation being used. Students who remember the rhyme have no idea what they are doing. This leads to misapplication and inability to generalize appropriately.
- **Fix:** Talk about inverse operations or getting zero (in the case of addition) or one (in the case of multiplication) instead. The **big idea** is to **maintain the equality** by doing the same operation to both quantities.

Source: Nix the Tricks by Tina Cardone and the MTBoS



Break – 10:00 a.m. to 10:10 a.m.

The presenter allows the participants to take a ten minute break after slide 165.

Session 2 – 10:10 a.m. to 11:00 a.m.

Presentation Slides 164 - 170

Instructional Strategies, Part 1

The focus of these slides is to address instructional strategies that can be taught using any of the CCSSM strategies. Participants learn the difference between Cooperative Groups and Collaborative Groups and learn the similarities between a Carousel and Poster Session. The presenter completes a discussion with participants while explaining types of instructional activities. This begins part 1 of instructional strategies that can be utilized in a classroom.

- Expert Groups
- Carousel
- Cooperative Groups
- Collaborative Groups
- Poster Sessions

INSTRUCTIONAL STRATEGIES, PART 1

EXPERT GROUPS
CAROUSEL
COOPERATIVE GROUPS
COLLABORATIVE GROUPS
POSTER SESSIONS

Expert Groups

How does it look?

- Randomly number off
- Move to new group with specific job/task
- Become an expert on your task
- Return to your group to share

Advantages

- Everyone has to share and talk
- Forces students to come prepared
- Forces accountability
- Different perspectives from multiple groups
- Timed 7 – 8 minutes

Source: Dr. B. Dougherty

Carousel

How does it look?

- Assign a group task
- Describe on chart paper
- Hang chart paper around the room
- Students rotate and comment on sticky notes (initially their comments)
- Return to original group to revise/share
- Share out

Advantages

- Critiques others work
- Gains insight in sharing ideas
- Fast paced
- Forces students to prepare

Source: Dr. B. Dougherty

Poster Session

How does it look?

- Each student is assigned a task (outside of class, i.e. great review for homework)
- Provide guidelines for preparing posters
- Rotate posters to all groups, with groups responding to the content, using posted notes and initials
- Return Posters and Revise
- Report out.

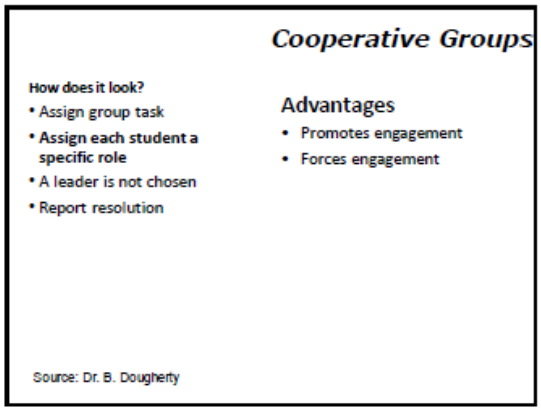
Advantages

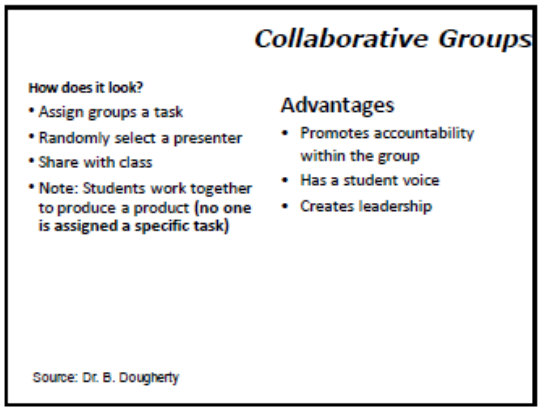
- Critiques others work
- Gains insight in sharing ideas
- Fast paced
- Forces students to prepare

Source: Dr. B. Dougherty

- **IS THERE A DIFFERENCE BETWEEN COOPERATIVE GROUPS AND COLLABORATIVE GROUPS?????**
- **If so, what is the difference?**

Cooperative Groups: each student has a specific part of the task (students are assigned a specific role)
Collaborative Groups: Students work together to produce a product (no one is assigned a specific role)





Lunch – 11:00 a.m. to 12:00 p.m.

The presenter allows participants to break for lunch, reminding them that lunch is scheduled for 1 hour and that Session 3 will begin promptly at 12:00 p.m.

Session 3 – 12:00 p.m. to 1:20 p.m.

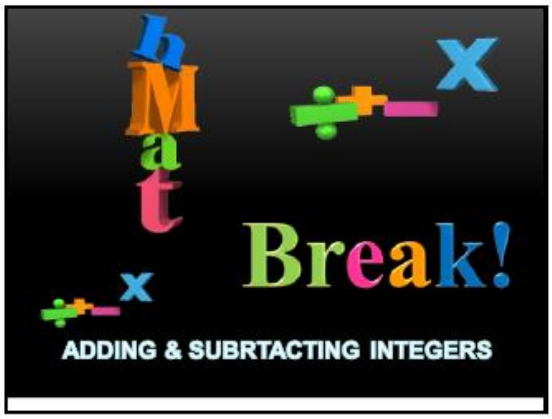
Presentation Slides 171 - 199

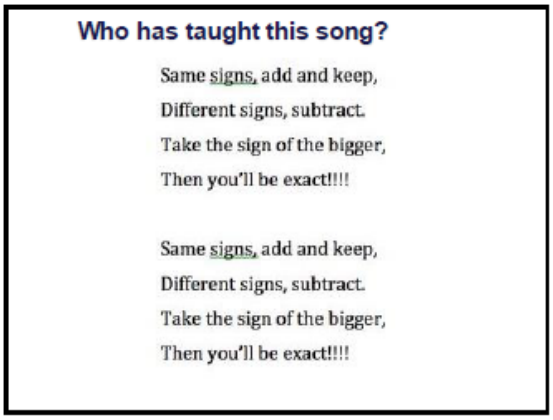
Instructional Strategies, Part 2

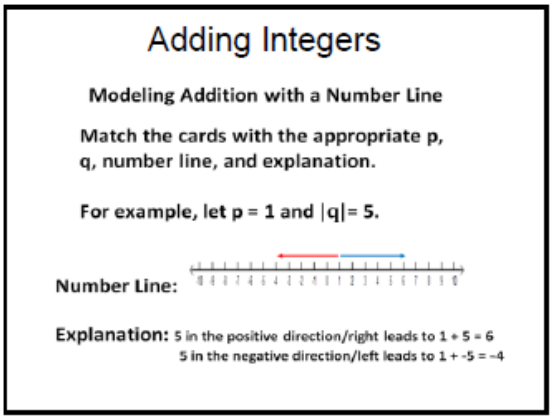
The focus of these slides is to provide teacher leaders and administrators with direct hands-on opportunities to teach various grade level standards. The session is part 2 of Instructional Strategies. Participants would now be broken into grade level content areas. The choices of activities are listed below. Some activities are grade level specific while others have coherence across grade levels. The presenter will serve as a facilitator as participants work as a team to complete the chosen activity.

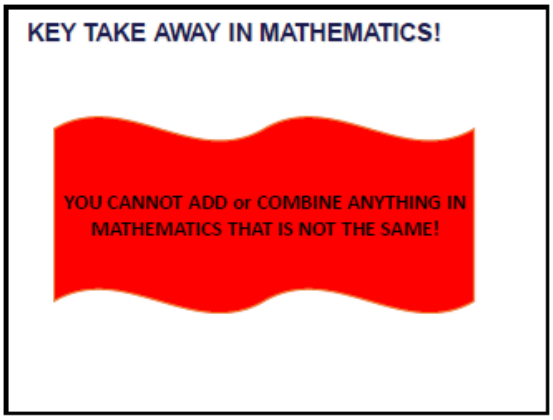
- Adding and subtracting integers (Grade 7)
- Equivalent Expression (Number Web) (Across grade levels)
- Roll a Function (Algebra)
- The Swap Meet (Grade 8 and Algebra)

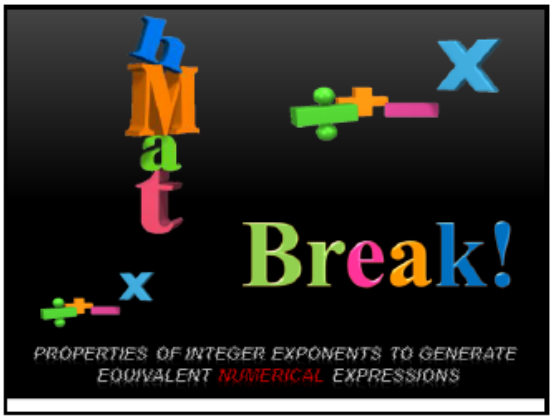
- Algebra Tiles (Across grade levels)
- Surface Area and Nets (Grade 7)
- Wrapping a Gift (Grade 7)
- Seeing Structure (Algebra)



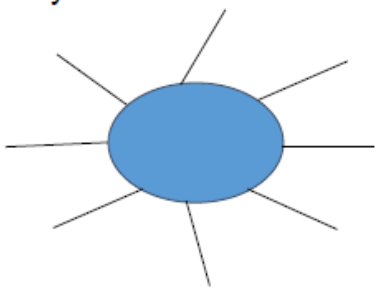






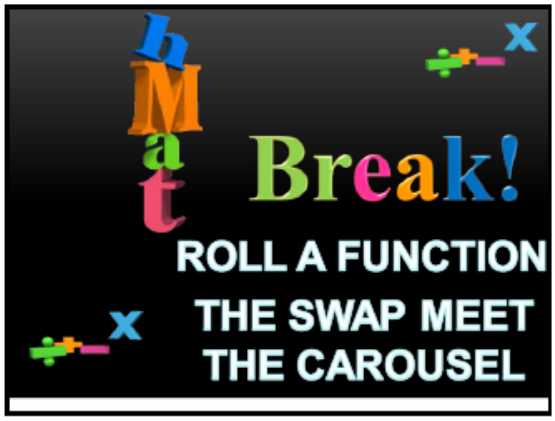


Activity: Number Web



Number Web Expressions

- Group 1: $-2.5(1 - 2n) - 1.5n$
- Group 2: $(x + 15) + (x + 5) + (x + 15) + (x + 5)$
- Group 3: $3^{-8}/3^{-4}$



ROLL A FUNCTION

- Two dice are rolled.
- Find the sum of the dice and graph the transformed parent function based on the criteria below.

Sum	Criteria for Transformation
2	Multiply the linear parent function by -1
3	Shift left: the cubic parent function by the smaller addend
4	Shift right: the cubic parent function by the smaller addend
5	Shift up: the absolute value function by the larger addend.
6	Shift down: the absolute value function by the larger addend.
7	Multiply the quadratic parent function by the smaller addend.
8	Divide the quadratic parent function by the smaller addend
9	Multiply the exponential parent function by the inverse of the larger addend
10	Divide the exponential parent function by the inverse of the larger addend
11	Horizontally shift the quadratic parent function by the smaller addend and vertically shift by the larger addend
12	Create your own transformation

THE SWAP MEET

- Items Provided:
  - Real-world scenario
  - A function
  - A graph of a function

REAL-WORLD SCENARIO - Determine the type of function represented by the real-world scenario.

FUNCTION – Sketch a graph of the function.

GRAPH – Create an equation that could represent the graph.

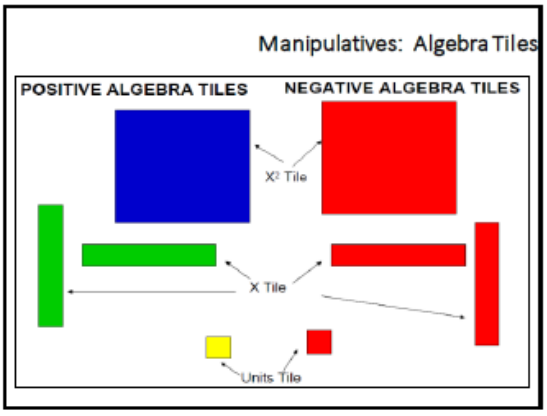
SWAP AND MEET – Search around the room until you find the REAL-WORLD SCENARIO, FUNCTION, or GRAPH that are matches.

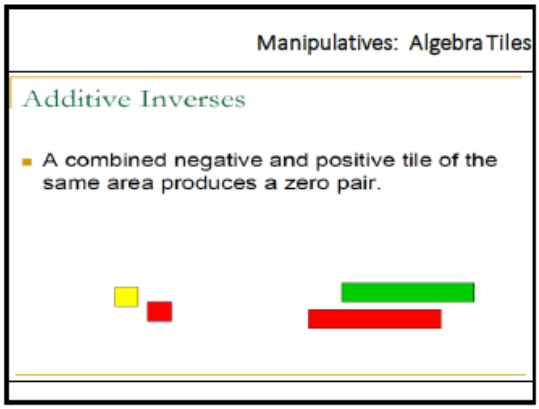
Discuss your findings.

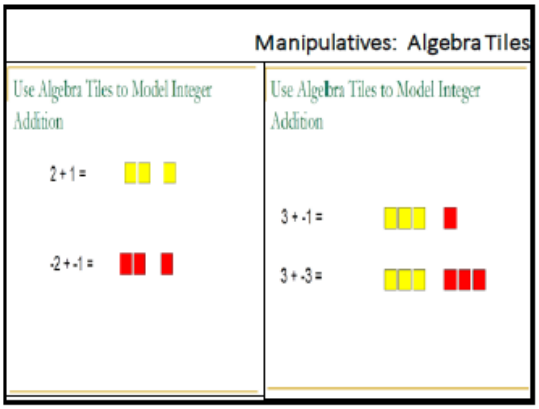
CAROUSEL WITH ANGRY BIRDS

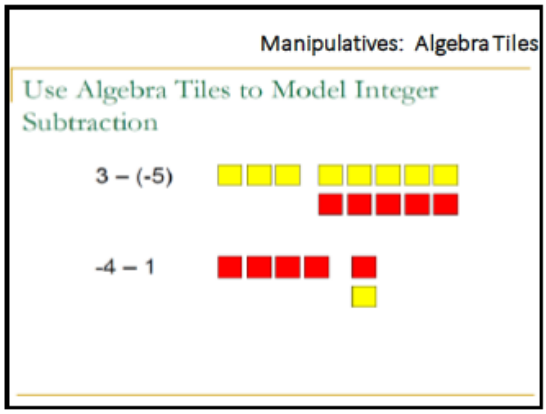
1. Answer the question listed on your table.
2. Move when directed.
3. Review the previous group's answer. Correct if necessary. Place your group's number next to the corrections made.
4. Repeat Steps 1-3 until all rotations are completed.
5. Present your findings.

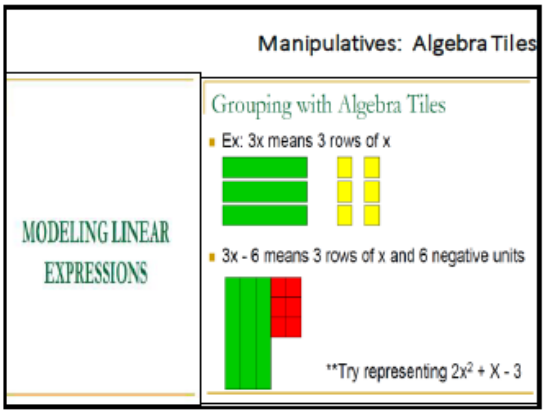

Break!
Using Manipulatives
ALGEBRA
TILES

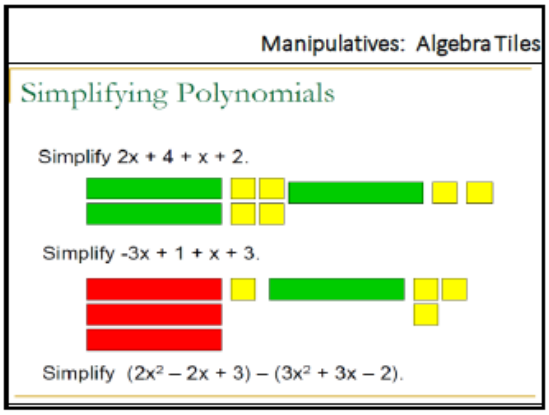

Manipulatives: Algebra Tiles
POSITIVE ALGEBRA TILES
NEGATIVE ALGEBRA TILES
X² Tile
X Tile
Units Tile

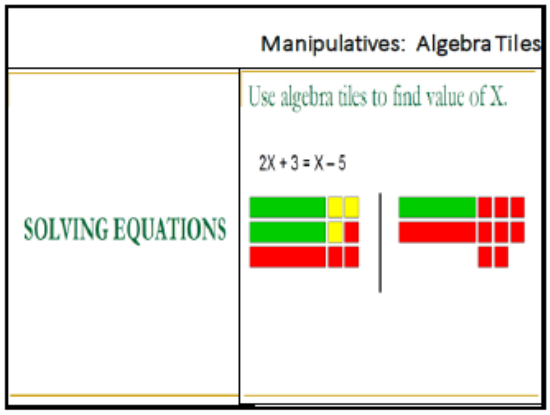

Manipulatives: Algebra Tiles
Additive Inverses
A combined negative and positive tile of the same area produces a zero pair.

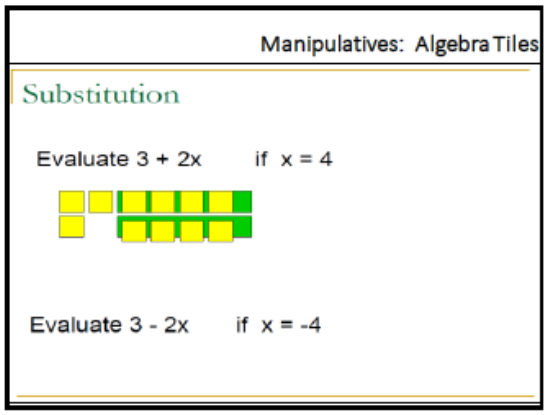

Manipulatives: Algebra Tiles
Use Algebra Tiles to Model Integer Addition
2 + 1 =
-2 + -1 =
Use Algebra Tiles to Model Integer Addition
3 + -1 =
3 + -3 =

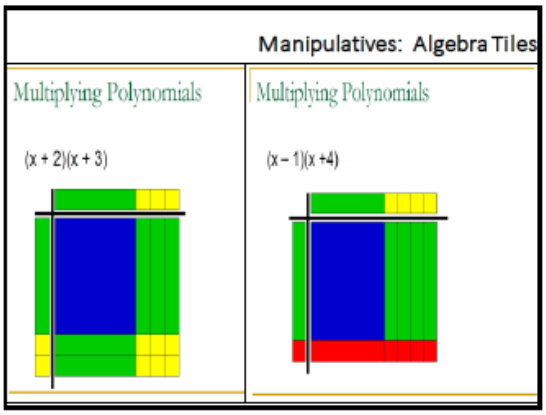

Manipulatives: Algebra Tiles
Use Algebra Tiles to Model Integer Subtraction
3 – (-5)
-4 – 1

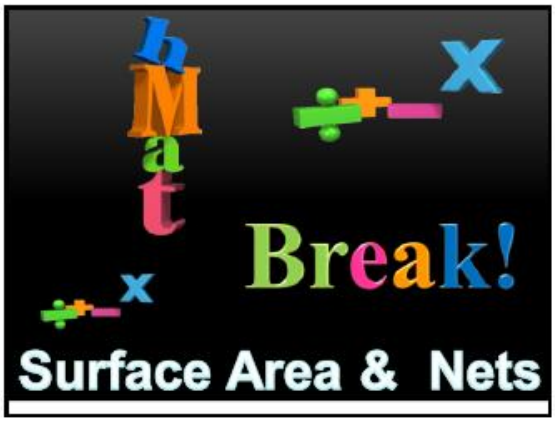

Manipulatives: Algebra Tiles
MODELING LINEAR EXPRESSIONS
Grouping with Algebra Tiles
Ex: 3x means 3 rows of x
3x - 6 means 3 rows of x and 6 negative units
**Try representing 2x² + X - 3

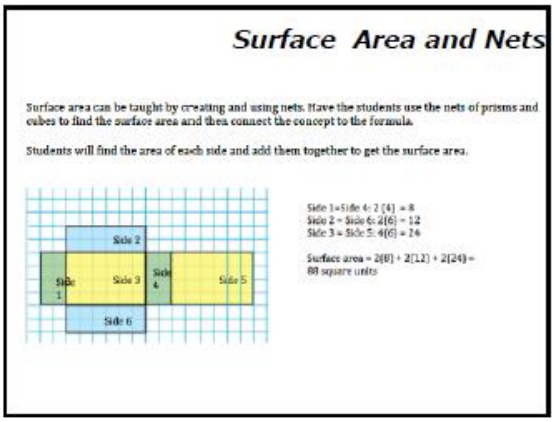

Manipulatives: Algebra Tiles
Simplifying Polynomials
Simplify 2x + 4 + x + 2.
Simplify -3x + 1 + x + 3.
Simplify (2x² – 2x + 3) – (3x² + 3x – 2).

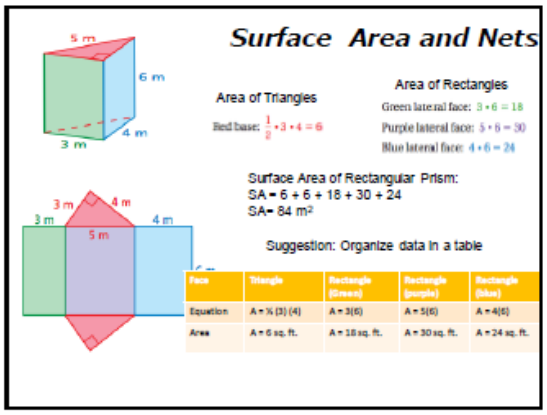

Manipulatives: Algebra Tiles
SOLVING EQUATIONS
Use algebra tiles to find value of X.
2X + 3 = X – 5

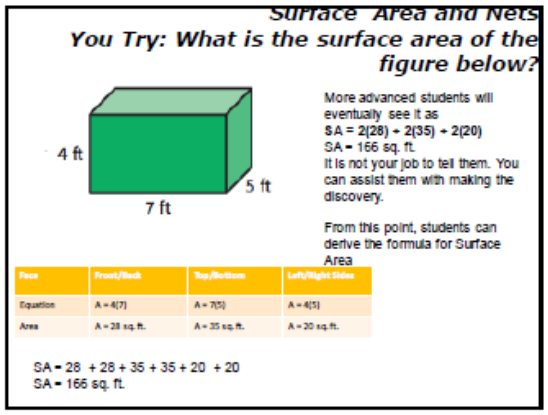

Manipulatives: Algebra Tiles
Substitution
Evaluate 3 + 2x if x = 4
Evaluate 3 - 2x if x = -4

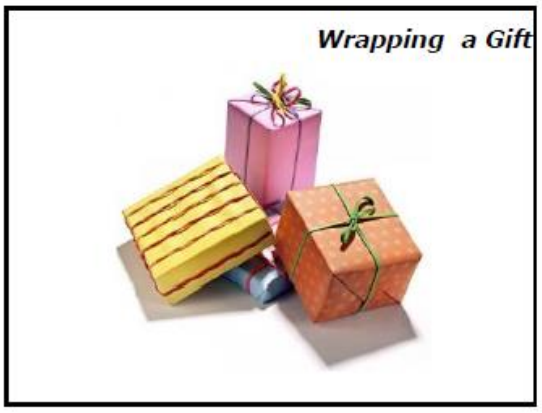

Manipulatives: Algebra Tiles
Multiplying Polynomials
(x + 2)(x + 3)
Multiplying Polynomials
(x – 1)(x +4)

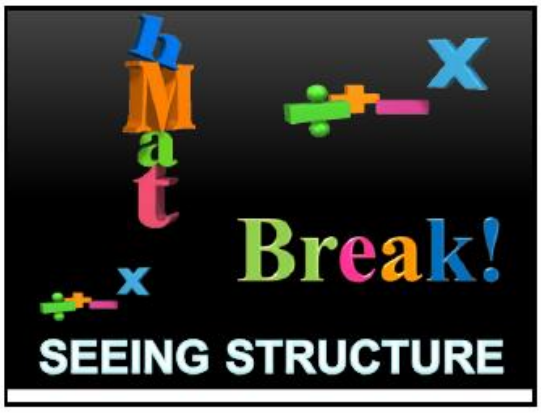

Break!
Surface Area & Nets

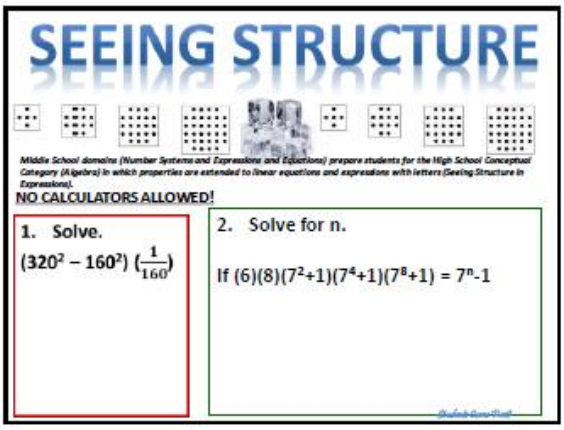

Surface Area and Nets
Surface area can be taught by creating and using nets. Have the students use the nets of prisms and cubes to find the surface area and then connect the concept to the formula.
Students will find the area of each side and add them together to get the surface area.
Side 1 = Side 4: 2 (4) = 8
Side 2 = Side 6: 2(6) = 12
Side 3 = Side 5: 4(6) = 24
Surface area = 2(8) + 2(12) + 2(24) =
88 square units











Break – 1:20 p.m. to 1:30 p.m.

The presenter allows the participants to take a ten minute break after slide 199.

Session 4 – 1:30 p.m. to 2:45 p.m.

Session 4 begins part 3 of Instructional Strategies. The presenter will begin by having participants complete an appointment clock. These strategies can be applied to any grade level; therefore, participants will complete portions of this session using their appointment clocks. The presenter will notice an appointment denoted on the slides in which the activity warrant the clock.

Presentation Slide 200

Appointment Agenda Activity

As the participants transition into the final session of the day, they will complete the Appointment Agenda Activity. The presenter will explain the following directions.

Activity:

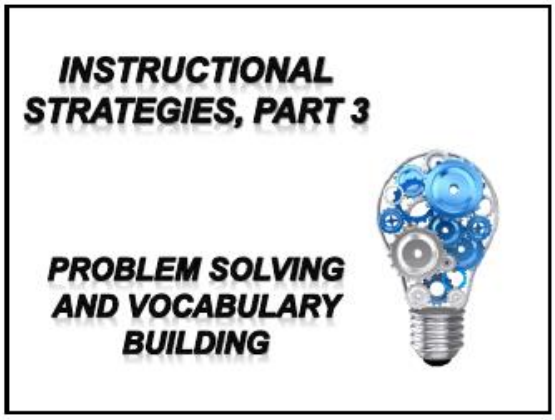
- Participants will take their clock and fill it with 4 appointments, one appointment for each designated hour. Participants will use these appointments throughout the last session to complete activities.

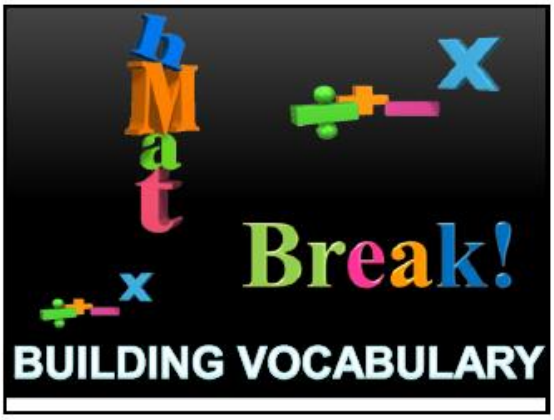
Presentation Slides 201 – 225

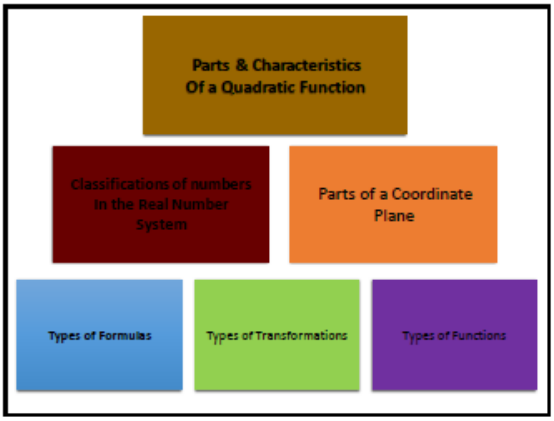
Instructional Strategies, Part 3

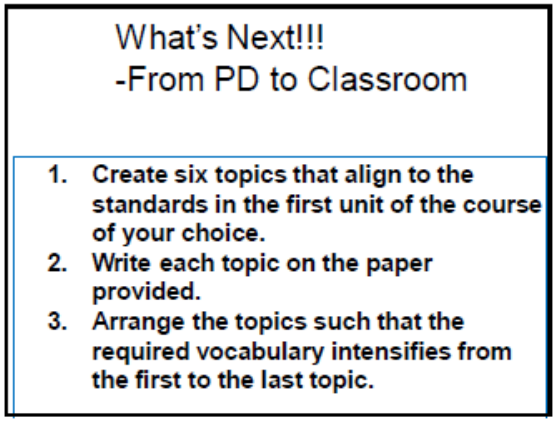
The focus of these slides is to provide teacher leaders and administrators with direct hands-on opportunities to teach various grade level standards. Participants would now be broken into grade level content areas. The focus of these strategies is associated with problem solving and vocabulary building. The activities are listed below.

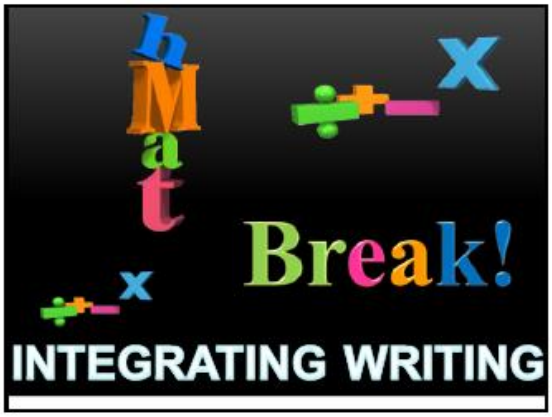
- Vocabulary – The $100,000 Pyramid Vocabulary Edition
- Integrating Writing – the Diamante
- Integrating Writing - RAFT
- Vocabulary – Own the Word
- Integrating Writing – The GIST
- Problem Solving – Pinch Cards

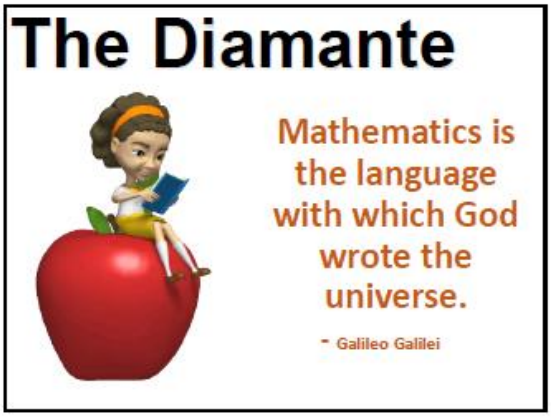


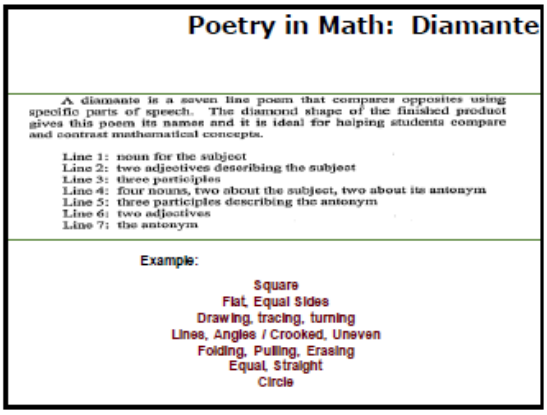


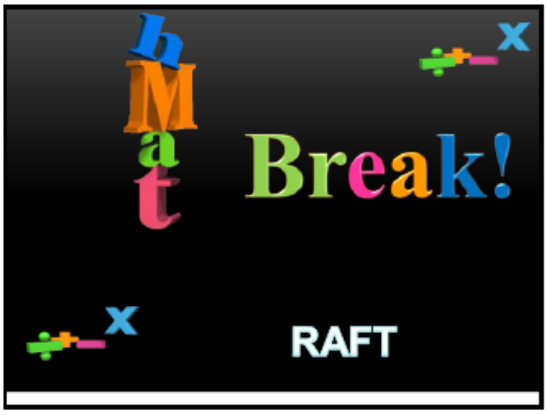

Parts & Characteristics Of a Quadratic Function
Classifications of numbers in the Real Number System
Parts of a Coordinate Plane
Types of Formulas
Types of Transformations
Types of Functions


What's Next!!!
-From PD to Classroom
1. Create six topics that align to the standards in the first unit of the course of your choice.
2. Write each topic on the paper provided.
3. Arrange the topics such that the required vocabulary intensifies from the first to the last topic.


hMat
Break!
INTEGRATING WRITING


The Diamante
Mathematics is the language with which God wrote the universe.
- Galileo Galilei


Poetry in Math: Diamante
A diamante is a seven line poem that compares opposites using specific parts of speech. The diamond shape of the finished product gives this poem its names and it is ideal for helping students compare and contrast mathematical concepts.
Line 1: noun for the subject
Line 2: two adjectives describing the subject
Line 3: three participles
Line 4: four nouns, two about the subject, two about its antonym
Line 5: three participles describing the antonym
Line 6: two adjectives
Line 7: the antonym
Example:
Square
Flat, Equal Sides
Drawing, tracing, turning
Lines, Angles / Crooked, Uneven
Folding, Pulling, Erasing
Equal, Straight
Circle


hMat
Break!
RAFT

Building Vocabulary: RAFT

- **RAFT**
  - **R**ole of the Writer: Who are you as the writer?
    ---- Slope
  - **A**udience: To whom are you writing?
    --- Rate of Change
  - **F**ormat: In what format are you writing?
    --- LETTER
  - **T**opic: What are you writing about?
    --- Similarities of Slope and Rate of Change

RAFT Example

Role: Slope
Audience: Rate of Change
Format: Letter
Topic: Similarities of Slope and Rate of Change

Dear Rate of Change,

You have received my mail on several occasions. I heard that this upsets you. However, I understand the reasons for the mistake; we have so much in common. We both use the same equations

$$m = \frac{rise}{run} = \frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x} = \frac{y_2 - y_1}{x_2 - x_1}.$$

I have also heard that you get discouraged because the students do not remember you but always talk about me. It is not my fault that the teacher spends so much time with me. Why don't we talk to her to see if she would be willing to incorporate more application problems into her lesson? After all, I am just numbers, and you are real life. So cheer up because we are one of a kind.

Your friend,

RAFT Example

RAFT Example

Role: **Variable**

Audience: **Equation**

Format: Love Letter

Topic: **Roles of variables**

Dear Equation,

I know you are wondering who I am. Quit looking for your x and wondering y she is not coming back. She couldn't handle your backwardways, but trust me baby, I'm here to stay. Multiplied together we become complete. When the operations are performed correctly, we are the truth. You just never know which side of me you are going to see, the a, the b, or the c, but I am all that you need.

Love,

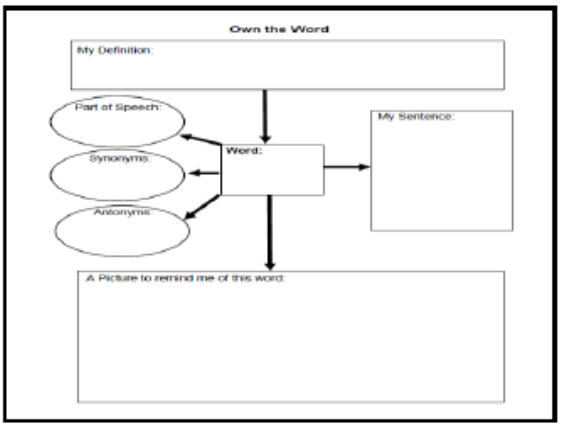
Ms. Variable

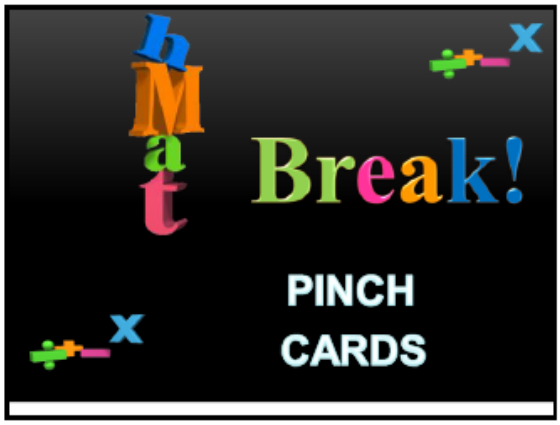
3:00 APPOINTMENT

Create a R.A.F.T. example.

RAFT ACTIVITY ON FRACTIONS

Role	Audience	Format	Topic
Fraction	Whole Number	Petitions	To be considered Part of the Family
Improper Fraction	Mixed Numbers	Reconciliation Letter	Were More Alike than Different
A Simplified Fraction	A Non-Simplified Fraction	Public Service Announcement	A Case for Simplicity
Greatest Common Factor	Common Factor	Nursery Rhyme	I'm the Greatest!
Equivalent Fractions	Non Equivalent	Personal Ad	How to Find Your Soul Mate
Least Common Factor	Multiple Sets of Numbers	Recipe	The Smaller the Better
Like Denominators in an Additional Problem	Unlike Denominators in an Addition Problem	Application form	To Become A Like Denominator
A Mixed Number that Needs to be Renamed to Subtract	5th Grade Math Students	Riddle	What's My New Name
Like Denominators in a Subtraction Problem	Unlike Denominators in a Subtraction Problem	Story Board	How to Become a Like Denominator
Fraction	Baker	Directions	To Double the Recipe
Estimated Sum	Fractions/Mixed Numbers	Advice Column	To Become Well Rounded





Problem Solving and Operations
Pinch Cards

- Each person take four index cards and a marker.
- On each card draw an operation.
- As the presenter shows various word problems, your job is to read the word problem and decide which pinch card (operation(s)) would be used to solve the problems. Note: for multi-step problems, pinch all cards that applies.

+ − × ÷

Sample Problems

1. There were 3 white dogs and 4 brown dogs. How many dogs were there?

2. Jenny had 10 pennies in her pocket? One fell out.
How many pennies were left in her pocket?

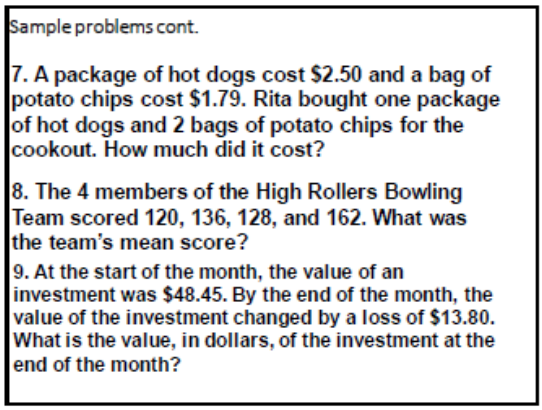
3. Colleen loves playing basketball. Her team had played four games so far this year. She scores 11 points in the first game, 14 points in the second game, 16 points in the third game, and 12 points in the fourth game. How many points has she scored so far this season?

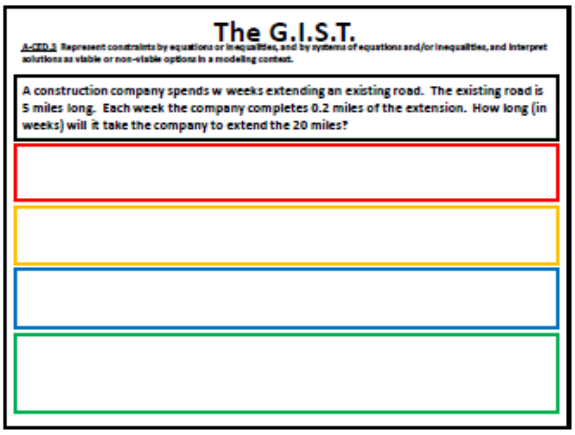
Sample problems cont.

4. There were 6 soccer teams in the league and 12 players on each team. How many players were in the league?

5. Katie's mom baked 24 cookies. Katie and her 5 friends shared them. Each person got the same number of cookies. How many cookies did each person get?

6. Manny ate ½ of the pizza, and Jilly ate 1/3. How much of the pizza did they eat?

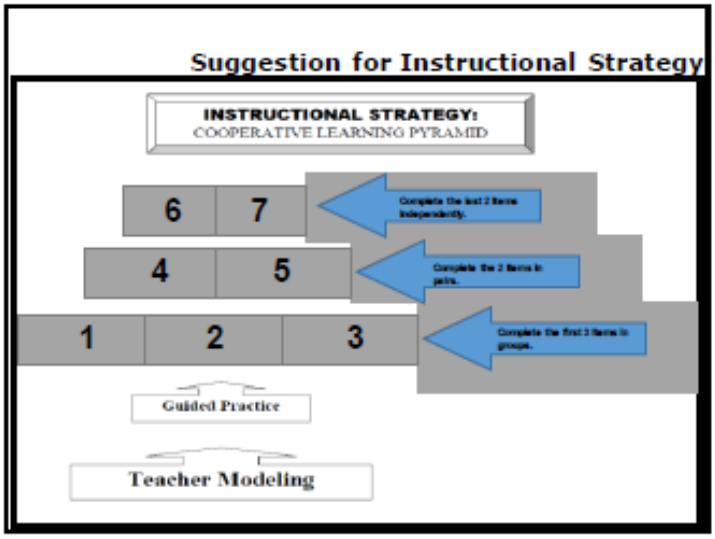




Presentation Slides 226

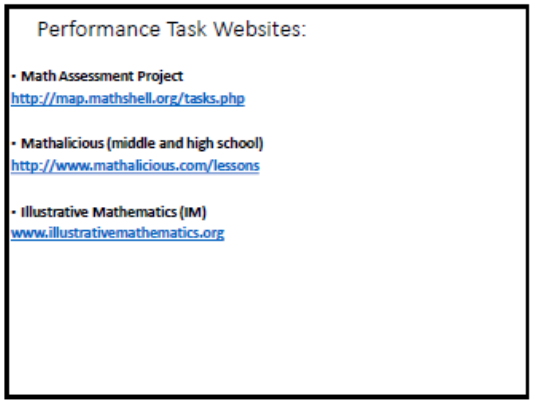
The focus of this slide is to discuss the final instructional strategy of the day. The strategy is called the Cooperative Learning Pyramid. Participants will be provided a copy of a handout similar to the slide below. The presenter will explain how to implement the pyramid. The lesson begins with teacher modeling and then guided practice. At the beginning of independent practices, the students work in a group of four to complete three problems. Once the group has successfully completed those problems, the group is then divided into two groups of two. They must now complete the next two independent practice problems. At the successful conclusion of those two problems, the partners are

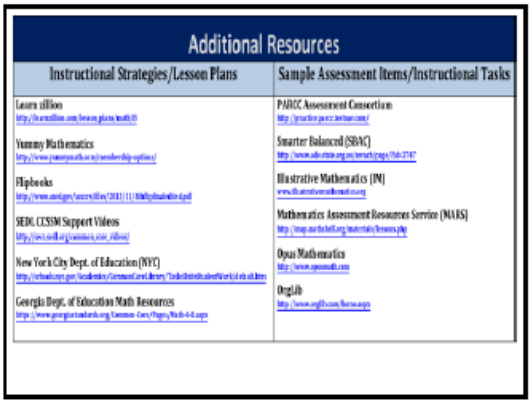
now broken up. The final phase of the pyramid is students must complete the last two problems individually.



Presentation Slides 227 – 228

The focus of these slides is to provide teacher leaders and administrators with a list of resources that could be utilized as they begin their new journey on implementing the standards.

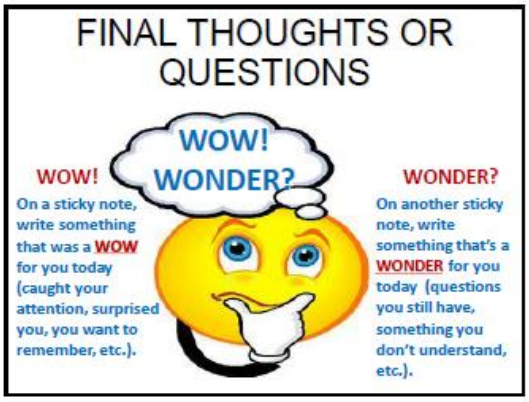




Wrap Up – 2:45 p.m. to 3:00 p.m.

Presentation Slides 229 – 231

The focus of these slides are to provide participants to share their thoughts with a WOW and Wonder and then conclude with a formal evaluation for Day 2. The evaluation will be provided at the end of Appendix A.



Professional Development Evaluation Form

School/Location _____ Date_____
Title of Session: _____

Evaluation Statements		1 Strongly Agree	2 Agree	3 Neither	4 Disagree	5 Strongly Disagree
1	The information presented is of value to me.					
2	Session content was logically organized.					
3	The presenter was/were enthusiastic and positive.					
4	The presenter was/were knowledgeable of the subject matter.					
5	The presenter answered questions appropriately.					
6	The information presented will improve my overall job performance.					
Evaluation Questions:						
7	How do you feel about the amount of participation?	**Just Right**		**Wanted More**	**Wanted Less**	
8	What specific information was of greatest value to you?					
9	How will this training benefit you and your school?					
10	What future trainings or follow-up activities would help you implement what you have learned today?					
11	(Circle your selection) How would you rate the overall program design of this professional development session?	**5** Excellent	**4** Good	**3** Average	**2** Below Average	**1** Failure

Comments:

_____
_____
_____
_____
_____
_____

Materials for 3 – Day Summer Professional Development

- Chart paper
- Markers
- Presenter Role Cards
- Four Number Game Number Tiles
- Instructional Shifts Pre-assessment cards
- Playing cards divided into two groups of 26 cards each
- Mathematical practices pre-assessment cards
- Mathematical Practices Guided Questions handout
- Number tile handouts and number tiles
- Frayer Model handout for standard deconstruction
- Decomposing Expressions handout
- Appointment clock handout
- Algebra tiles
- Index cards
- Graph paper and dice
- Adding Integers matching cards
- Wrapping paper and various empty boxes
- Own the Word handout
- Cooperative learning pyramid handout
- Resource sheet handout
- Copy of presentation as notes for each day

- Evaluation

Appendix B: Open-ended Survey Questions

Demographics:

1. What grade level(s) do you teach?
2. How many years of teaching experience do you have?
3. How many years have you taught at this school?
4. Name all math courses taught during your teaching career.

Research Question 1 Alignment:

5. What are some resources that would better help you successfully implement the CCSSM/MS CCR standards in your classroom?
6. What are some possible barriers with teaching the CCSSM/MS CCR standards?
7. How has your school prepared you to implement the CCSSM/MS CCR standards? District? State?
8. Ely's theory of change states 8 conditions of change that must be present in order to effectively initiate change. Which conditions of change do you believe are necessary to ensure a successful transition to implementing the CCSSM/MS CCR? (Select all that applies)

☐ Dissatisfaction with the status quo ☐ Participation

☐ Existence of knowledge and skills ☐ Commitment

☐ Availability of Resources ☐ Leadership

☐ Rewards or incentives exists ☐ Availability of time

Research Question 2 Alignment:

9. Can you list several solutions that you think will better help you reduce those barriers to successfully implement the standards?
10. What are some suggestions to make you more prepared to teach the CCSSM.MS CCR standards?

Appendix C: Interview Questions

Research Question 1 Alignment

1. What are some concerns you have with implementing the CCSSM/MS CCR standards? Explain.
2. What are some challenges you face with teaching the CCSSM/MS CCR standards? Explain.
3. Compared to the Mississippi Mathematical Framework, do you think the CCSSM/MS CCR standards represent a bigger or smaller challenge with regards to implementation? Explain.
4. What are some positive aspects and strengths with teaching the CCSSM/MS CCR standards? What are some negative aspects and barriers with teaching the CCSSM/MS CCR standards?
5. Has teaching the CCSSM/MS CCR standards affected your day-to-day instructional practices and lesson plan preparation? Explain.
6. During your survey, you had an opportunity to review Ely's change conditions. Please elaborate on why you selected those conditions. Do you believe any of the conditions take more precedent over others? Explain.

Research Question 2 Alignment:

7. What would you say is a realistic timeframe for successfully implementing the CCSSM/MS CCR standards in your classroom? Explain.
8. What are some ways to overcome barriers with teaching the CCSSM/MS CCR standards?