SECOND GRADE TEACHERS’ PARTICIPATION WITH A NEW MATHEMATICS TEXT

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Dedication

I dedicate this dissertation research to my dissertation advisor and chair, Dr. Janine Remillard, who stuck by me for as long as it took for me to cultivate and develop my own ideas. I am indebted to her for providing all the right kinds of support at all the right times.

To the T/E Math Specialists, without whom this dissertation could not have been completed and who have done more to educate me about elementary mathematics than they could ever know.

To the eight teachers who willingly participated with me down the path of implementing a new curriculum in grade 2, and who cheerfully and ably, despite any misgivings of their own, read, evaluated, adapted and created a curriculum that makes the best use of our resource, while keeping our culture and students first.

To my husband, who remains my biggest cheerleader, and hey, we’re still married, after all this!
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ABSTRACT

SECOND GRADE TEACHERS’ PARTICIPATION WITH A NEW MATHEMATICS TEXT

Nancy Adams
Janine Remillard

Since the Standards movement of the late 1980’s, we have grown in our understanding of the role of the teacher in interpreting content for students (NCTM, 2014). Yet, we know little about how teachers participate with curriculum materials to design instruction, as much of the process is both individual and invisible and is influenced by multiple individual, curricular, and cultural factors. Participation with curriculum materials can be viewed as a collaboration between teacher and curriculum tool (Remillard, 2005) in order to make meaning through the active use of the written resource.

This dissertation describes how eight second-grade teachers in a suburban Philadelphia school district participated with a new elementary mathematics curriculum resource during the first year of implementation. By gathering information through surveys and individual interviews, this study revealed how individual and curriculum features influenced these teachers as they designed instruction. Through recording and analyzing a series of professional team meetings involving the study participants, this study also illuminated ways in which participation in a professional learning group might influence teachers’ practice.

Taken together, this study linked the individual teacher’s curriculum use practices and the nature of a particular curriculum with their participation in a professional learning
team to reveal insights into how the three interacted to influence teachers’ participation with curriculum materials. Results of the study suggest that orientation toward curriculum contributed to a teachers’ participatory style while participation in a professional learning group mediated the individual teacher’s personal characteristics and their participation with math curriculum materials. This enabled teachers to participate with like others to adapt and adopt curriculum materials for the benefit of their lesson design. Through the teams, thorough pilot participators became more confident while intermittent and narrow participators saw the possibilities of the new curriculum.
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CHAPTER 1: INTRODUCTION

The curriculum as delivered by the textbook resource matters in elementary mathematics education because, in many elementary schools in the U.S., it is the primary vehicle for lesson planning and design (Stein, Remillard, & Smith, 2007). Interest in and attention to teachers’ use of curricular resources emerged as a result of the 1991 Professional Standards For Teaching Mathematics These standards were intended to support the Curriculum and Evaluation Standards For School Mathematics of 1989 by “promoting a vision of mathematics teaching, evaluating mathematics teaching, the professional development of mathematics teachers and responsibilities for professional development and support, all of which would contribute to the improvement of mathematics education” (NCTM, 1991, p. vii.). Both sets of standards were built with a constructivist and sociocultural vision of teaching and learning in mind and promoted curriculum and pedagogy that emphasized mathematical reasoning, communication, problem solving and connections as integral for all students. The Professional Standards for Teaching Mathematics is built upon the assumption that “Teachers are key figures in changing the ways in which mathematics is taught and learned in schools” (1991). A codicil to this is that in order to make these kinds of changes, teachers need long term support and adequate resources.

In the decade after the publishing of the Standards, the National Science Foundation supported the development of new curricular materials, which spoke
with and through teachers (Remillard, 2000) by providing pedagogical guidance for teachers. Researchers like Remillard (2000, 2012), Remillard & Bryans (2004), Senk & Thompson (2003), Stein, Henningsen, & Silver (2000), and others have studied these new materials and found that they have curriculum and pedagogy that supports the vision and goals laid out by the authors of the Standards. Today, effective use of these educative materials is visible in pockets but has not achieved wide reach despite strong evidence that use of these materials has the potential to both change teachers’ practice positively effect student achievement (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996; Hiebert & Grouws, 2007). Understanding the evolution of these mathematics curriculum materials and examining the body of research around their use is relevant because of the recent publication and adoption by many states of the Common Core Standards.

Researchers will need to continue the conversation about whether curriculum materials aligned to the new Common Core have educative potential and can be used to help implement change on a broad scale.

In this study I sought to understand how second grade teachers in a suburban public school district participate with both a new textbook series and with each other in collaborative monthly planning sessions. As I discuss in more detail below, I use the term participate to mean the way in which teachers actively collaborate with the written resource, what they actually do when making decisions about moving from the written document to their intended plan for instruction. I was interested in three questions associated with second grade teachers’ adoption of a new elementary math series.
1. How do second grade teachers participate with a new textbook resource to plan and carry out instruction?
   a. How is their participation different with a new resource than with a more familiar one?
   b. What process do they use for participating with the components of the resource?

2. What personal and curricular characteristics influence teachers’ participation with a new curricular resource?
   a. How do teachers’ beliefs and knowledge, agency and identity, and orientation toward curriculum matter for curriculum use?
   b. How do the form and educative features of the Math in Focus curriculum matter for curriculum use?

3. How do teachers’ participate with the resource and with each other when working in a professional learning group? How does it matter for curriculum use?

The participants in this study were all second grade teachers in the same suburban Philadelphia school district. The mathematics curriculum resource used in my study was the second grade Math in Focus: Singapore Math (2013), published by Marshall Cavendish and adapted and distributed in the United States by Houghton Mifflin Harcourt.
Theoretical Framework

Two major theoretical perspectives, sociocultural views on agent-tool interactions and perspectives on communities of practice, informed my research. The theoretical underpinnings of my first two research questions resided in Vygotsky’s theories about the sociocultural nature of knowing (1978) where tools both shape human interaction and are shaped by human action. Sociocultural theorists like Wertsch (1998) discussed the notion of learning as mediated action using cultural tools, while Cole (1998) described the use of artifacts to construct understanding. Physical tools like writing implements and symbolic tools like language mediate a teacher’s practice. As characterized by Remillard (2005) and Brown (2009), the curriculum resource is a tool that provides a means to organize instruction to support for student learning that results in growth. Because of their nature and composition, curriculum resources have the capacity to influence what might be accomplished when using them.

Guiding my research on individual teacher’s participation with written curriculum was Remillard’s (2005) conception of curriculum use as participating with curriculum materials to design instruction. In this theoretical stance, participation is viewed as a collaboration between teacher and text with an aim of engaging in meaning making through active use of the written resource. This perspective of teachers as participating with curriculum materials focuses research questions on how teachers engage and use curriculum resources and what teacher and curricular factors influence the relationship between the two. According to Miriam Ben-Peretz (1990), teachers play a critical role in developing a textbook’s potential. By reading and using written curriculum materials,
teachers continually interpret and give voice to content in ways they believe resonate with their students. Remillard (2012) extends this understanding to unfamiliar resources when she refers to “modes of engagement” in speaking to how a teacher engages, infuses meaning and makes sense of a text. Depending upon a teacher’s view of how the written curriculum should be used, she may use the materials to support previously chosen activities, to guide instruction, or as a primary tool (2006). How teachers make decisions when designing lessons makes teachers more than just implementers of the written curriculum; they are actually curriculum creators and developers (Remillard, 2005).

The research on communities of practice is a second body of work that informs this study and provides background for my third research question concerning how teachers participate with curriculum and with each other as members of a team or professional learning community. Barbara Rogoff (1994) advocates for communities of learners as the cultural linkage through which an individual both transforms and is transformed by the community. Professional learning communities are an example of what Cochran-Smith and Lytle (1999) consider knowledge of practice, based on the idea of the transformation of teaching gained through the process of intentional participation with others who hold similar roles and expertise. Learning through community is achieved through a process of problem-finding, problem-solving and building on the contributions of others. Vescio, Ross and Adams (2007) describe five essential characteristics of professional learning communities (PLC’s): a) knowledge is situated in the lived experiences of teachers, b) focus on student learning is clear and consistent, c) extensive and continuous dialog occurs about curriculum, instruction and student growth, d) focus on teacher
collaboration and e) making teaching practice public. In their review of literature on the impact of PLC’s on teaching practices and student learning, Vescio et al suggest that “well-developed PLC’s have a positive impact on both teaching practice and student achievement” (p. 80).

**Conceptual Framework: Curriculum Use as Participation**

My conceptual framework describes and defines the major constructs of my study—the process by which teachers participated with curriculum materials as individuals and as part of a professional learning group. It also provides definitions for critical components of this construct. In developing the framework, I examined the factors influencing teachers in the design phase of participation. Participation with curriculum refers to the mutual or reciprocal action the teacher takes when reading and interpreting a written resource. I explored how individual teachers participate with *Math in Focus* as a new curricular tool, asking questions such as, “when they are preparing a chapter or lesson, where do teachers begin, which pieces of the teacher guide and other resources do they read and how do they use them”. I wondered what issues would emerge for teachers as they used the new resource and how they would resolve concerns.

Remillard (2005) conceptualizes the teacher - curriculum relationship as flowing through multiple dimensions including the teacher, the curriculum, the relationship between the two, and the resulting intended and enacted curriculum. She notes that within and between several of these dimensions, external processes act upon and transform the written curriculum (Figure 1.1).
I drew on the framework above to develop the conceptual framework for this study, narrowing the focus to individual teacher factors and components of the written resource that were most relevant to my study and supported by my theoretical framework and review of the literature. My conceptual framework placed the teacher at the focal point and considered the following factors in the participatory relationship. These include:

a) Teacher
   i) Beliefs and knowledge,
   ii) Orientations toward curriculum
   iii) Professional identity

b) Written Resource
   i) Mathematics
   ii) Pedagogy
   iii) Form
   iv) Educative Features (a specialized form of address)
In addition to these teacher-text interactions, I drew on Stein et al (2007) to frame teacher professional communities as a transformational influence on teachers’ participation with curriculum resources.

**Figure 1.2.** Explanations for Transformations Between Written and Intended Curriculum (Stein et al, 2007).

Figure 1.3 on page 9 below provides a visual conceptualization of the framework I used to study influences on teachers’ participation with written mathematics curriculum materials when implementing those materials for the first time. In the sections following, I define and describe each of the constructs I am studying.
Examining Second Grade Teachers’ First Year of Participation

With Math In Focus

**Figure 1.3.** Influences on Teachers’ First Year Participation with Math in Focus

Individual teachers come to a resource with agency & identity, beliefs & knowledge and an orientation toward curriculum use. A written curriculum resource contains a particular type of mathematics, pedagogy and forms of address that include pedagogical guidance in the form of educative features. A community of teachers can collaborate to influence the intended curriculum and each other’s beliefs, identity and orientation. Independently or in community, teachers participate with the text and with each other creating curricular change over time.

**The Individual Teacher**

The individual teacher approaches written curriculum materials with a set of beliefs and knowledge, professional identity and agency and an already established orientation toward curriculum materials. Alba Thompson (1992) defined teacher *beliefs* as understandings about the world that can be held with varying degrees of conviction and that do not require consensus with others. Further, she distinguished knowledge as
different from beliefs in that knowledge, at least temporarily, satisfies a true condition. Remillard and Bryan (2004) introduced and defined the construct of orientation toward curriculum as: “A set of perspectives and dispositions about mathematics teaching, learning and curriculum that together influence how a teacher engages and interacts with a particular set of curriculum materials (p. 346). Professional identity is how teachers define themselves to themselves and to others (Lasky, 2005). Professional identify is evolving and communally sustained. Considering agency as an important subset of identify, I used the definition forwarded by Bourdieu (1977) and Tharp & Gallimore (1991); it is the belief that human beings have the capacity to influence their lives and environment while also being shaped by social and individual factors.

**Professional Learning Group**

Teacher participation with curriculum materials is also influenced by membership in a professional community. My framework used the definition from Judith Sowder (2007), that of a community of teachers who share a specialized knowledge base that includes both content and pedagogical knowledge about how students think. My framework extended the features of a Professional Learning Group (PLG) and builds on the work of Drake and Sherin (2004) to include participation with written curriculum as a tool for organizing student learning. The construct of a PLG relies upon collaborative efforts that result in risk taking and the sharing of ideas with a focus on student learning through the intended curriculum. In Vescio et al (2007) review of 11 research articles, I found that all of them supported the notion that PLG’s can lead to changes in pedagogy, defined here as teaching practices specific to mathematics. Using a PLG to help teachers
implement a new curriculum can empower teachers to make choices about different pedagogical ideas.

**The Curriculum Resource**

A third influence on teacher participation with written curriculum materials is the nature of those materials. Collopy (2003) defined the nature of a curriculum resource as the particular view of mathematical knowledge and pedagogy that written resource forwards. Additionally, when viewed through the lens of teacher participation, the way in which a curriculum resource speaks to and through teachers (Remillard, 2005) is also inherent in its nature. I conceived of the written resource in four distinct areas: forms of address, educative features, mathematical underpinnings and pedagogical strategies. Remillard (2012) introduced the concept of *modes of address* to refer to the written curriculum’s positioning of itself around power, gender, race and interests. More specifically, *forms* of address are “what teachers actually see, examine and interact with when participating with a written resource” (Remillard, 2012, p. 108). According to Remillard, the make-up and organization, visual appearance, communication of content, medium and genre will all mediate how teachers engage with a particular curriculum resource. A specialized voice form of address, the *educative features* of a written resource can help teachers enact and maintain the rigor of the tasks in the resource (Ball & Cohen, 1996; Collopy, 2003; Davis & Krajcik, 2005). By educative, these authors mean that the written resource can help teachers by providing information about authors’ intentions, what to expect from students in response to the tasks, and the mathematics and practices of the discipline. By mathematical underpinnings and pedagogical strategies, I
refer to the content and philosophy of the included mathematics and the pedagogical strategies for teaching children certain mathematical concepts, computational skills, problem-solving skills and applications of mathematics in daily life.

**Scholarly and Practical Significance**

Since the NCTM *Standards* of 1989, we have grown in our understanding of the role of the teacher in interpreting content for students. Yet, we know little about how teachers participate with curriculum resources, as much of the teacher planning process is both individual and invisible. This dissertation study attempted to make visible second grade teachers’ thinking as they interacted with a new series during its first year of implementation. This study’s focus on teacher participation contributes to the research on teacher learning by:

1. Adding to the body of knowledge about how teachers use new curriculum materials in lesson design.

2. Verifying the findings of previous research on the influence of curriculum materials on teachers’ thinking about students and about mathematics teaching and learning.

3. Uncovering some of the challenges teachers experience in practice as they engage with a new curriculum tool.

4. Identifying ways in which a professional learning community can contribute to more thoughtful use of a new mathematics resource.

This study will contribute to the body of work on teachers’ use of curriculum materials in several ways. First, there is little research on the nature of new elementary
math series based on the Singapore approach and this study took a close look at two chapters in the second grade *Math in Focus: Singapore Math* series. Second, this dissertation recorded and reported on the ways in which a teacher professional community can contribute to curriculum design and development, of which there is little previous research. Third, by examining a small group of teachers at a particular time and location, my study illustrated the power and influence of the local culture in interpreting, designing and enacting a new mathematics curriculum.

**Organization of this Dissertation**

This dissertation sought to understand teachers’ participation with a new math curriculum resource by examining three critical influences on their curriculum use: the personal characteristics of the teacher, the form and features of the curriculum resource, and the social discourse that occurs in a community of practice. In Chapter 2, I reviewed the relevant literature and note how this study might contribute to and extend the existing body of knowledge. In Chapter 3, I explained my research design and methodology for gathering the data that informs my analysis. Drawing on two specific chapters in the second grade MiF teacher’s guide, in Chapter 4, I analyzed the nature of the written resource and present findings concerning the challenges identified in this analysis. In Chapter 5, I introduced the study participants and the personal and curricular characteristics that influenced their curricular work and in Chapter 6, I illustrated practices and learning that occurred in the professional learning communities created to assist teachers in implementing the new resource. Finally, in Chapter 7, I triangulated
findings that illuminate teacher participation with *Math in Focus* as influenced by the teachers themselves, the curriculum resource, and the professional community.
CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this review is to introduce constructs, concepts and research designs that informed this study, survey bodies of literature that informed this study and revisit the research questions. The study drew upon and extended research around teachers’ curriculum use in elementary grade mathematics. In her examination of two fourth grade teacher’s use of a reform mathematics text, Remillard (2000) spoke to the notion that textbooks are not actors. Because teachers act as mediators of content, the characteristics they bring to the table influence the way the written curriculum is interpreted for learners. In order to write curriculum that influences learning it is essential that we know how teachers participate with it.

In this Chapter, I describe what we know about the participatory nature of teachers’ use of curriculum and factors that influence how teachers participate with curriculum. This dissertation looked closely at the space between the written and intended curriculum, as this space is often where teachers participate most closely with the curriculum materials. Within that space, I conceived of teacher participation as the intersection of three components: characteristics of the individual teacher, nature of the written resource, and collaboration with other professionals. Within each of these sections, I defined the constructs I used in this study and elaborated on the studies that helped develop my conceptual framework.

By surveying the relevant and important literature in each of the three locations of participation, I hoped to guide the reader towards a deeper understanding of how this study both corresponds with and adds to the current research around teacher participation.
I first examined the literature around teachers’ beliefs and knowledge, identity and self-direction and orientation towards curriculum, defined the related constructs and described the literature as it relates to teacher curriculum use. This is followed by a development of the constructs and literature that surrounds the nature of written curriculum materials. Similarly, I examined the constructs and literature that surround teacher professional community, identifying and describing several studies where teachers worked in PLC’s to participate with new curriculum materials.

**Individual Teacher Factors**

The majority of research on teachers’ use of curriculum materials focused on the individual teacher and seeks to determine factors that influence teacher’s use. These factors include teacher beliefs and knowledge, teachers’ orientations toward curriculum, and teachers’ professional identity (Stein et al, 2007).

**Teacher Beliefs and Knowledge**

Teachers’ beliefs and knowledge about teaching and learning mathematics influence the ways in which they participate with mathematics curriculum materials. Alba Thompson (1992) operationalized teacher beliefs as understandings about the world that can be held with varying degrees of conviction and without the need for consensus. She differentiated knowledge from beliefs as satisfying a true condition that is, at least temporally, valid across a group. Teachers that hold beliefs with more complex conceptualizations of what it means to know and be able to do elementary mathematics might use materials differently than those with a less ambitious view (Kilpatrick, 2001). Teachers with similar knowledge packages might teach quite differently depending upon...
their belief systems about learning and teaching mathematics and researchers have found that instructional practice, which includes curriculum use, is influenced by individual teachers’ knowledge and beliefs (Philipp, 2007; Wilkins, 2008).

**Beliefs.** Collopy (2003) conducted a study designed to investigate two upper elementary school teachers’ changes in beliefs related to teaching and learning mathematics using a reform oriented curriculum. The two study participants were experienced teachers, both volunteered to try the new curriculum and both had previously used the same curriculum. Collopy observed mathematics lessons and interviewed the teachers both formally and informally. After collecting detailed data about their beliefs and practices, she concluded that, despite their surface similarities, the two teachers differed significantly in how they participated with the curriculum materials. She concluded that this was related to tightly held teacher beliefs about mathematics learning. Remillard and Bryans (2004) studied eight elementary teachers over two years to gain a greater understanding of the relationship between the use of standards-based curricula and teacher learning. Through the use of monthly study group meetings, observations and interviews, they concluded that teachers' orientations toward using curriculum resources had a greater influence on the way a curriculum was used rather than whether teachers were philosophically aligned with the resource. The construct of *orientation toward curriculum* was established in this study.

**Knowledge.** Shulman (1986) distinguished three characterizations of teacher knowledge: subject matter knowledge, pedagogical content knowledge (PCK) and curricular knowledge. While subject matter knowledge is knowledge of the discipline's
content, pedagogical knowledge is characterized as the set of skills and strategies that teachers use to enable others to understand the content. The third category of teacher knowledge is curricular knowledge and addresses how well a teacher knows and understands the resources she is using. Ball (1993) defined Mathematical Knowledge for Teaching (MKT) as a particular combination of Shulman’s work that attempted to carefully measure and conceptually map the knowledge needed for the teaching of mathematics. Hill and Charalambous (2012) studied the interaction between MKT and curriculum materials by observing two teachers with very different MKT as they enacted the same lesson. Comparing the two lessons suggests that MKT appears to contribute to the mathematical richness of the lesson relating positively to teachers’ use of representations, precision in language and the teachers’ ability to move the lesson along. They found that teachers with higher levels of MKT teachers not only more fully used but also improved their curriculum materials.

Hill, Ball and Schilling (2008) performed a large-scale study of elementary teachers in California to unpack PCK and develop measures of teachers' combined knowledge of content and students. They wrote test items designed to measure teachers' knowledge of common student errors, students' understanding of content, content learning trajectories and common student computational strategies. Several hundred teachers completed these test items and 57 of them also participated in interviews. Although this was an ambitious study, the authors concluded that although it appears that teachers do hold knowledge of content and of students, the measurement of that knowledge is challenging, as the domain is not yet well defined.
Sherin & Drake (2004) studied 10 elementary-school teachers who were using a reform-based curriculum for the first time. Their study introduced a curriculum strategy framework as a way to characterize teachers’ interactions with curriculum materials. The framework focuses on three key interpretive activities: reading, evaluating, and adapting curriculum materials by measuring how a teacher engages with each of these activities before, during, and after instruction. One of their findings was that the quality of a teacher’s curriculum adaptations was a function of their own understanding of the content they were expected to teach. Teachers, they conclude, need both a productive orientation toward the curriculum and a high level of mathematical knowledge for teaching to positively influence instructional quality through curricular adaptations.

**Teachers’ Orientation toward Curriculum**

A second characteristic that influences teachers’ participation with a mathematics curriculum resource is their orientation toward mathematics curriculum materials. In their 2004 study, Remillard and Bryans extended the research on beliefs and knowledge and introduced the construct of orientation toward curriculum. They defined this construct as:

A set of perspectives and dispositions about mathematics teaching, learning and curriculum that together influence how a teacher engages and interacts with a particular set of curriculum materials and consequently the curriculum enacted in the classroom and the subsequent opportunities for student and teacher learning (p.346).

Through interviews, observations and monthly meetings, these researchers studied the way a reform curriculum supported the learning of eight elementary teachers in the same
school during the first year and a half of use. They found that teachers use curriculum materials based on their orientation no matter how they identify with the mathematical vision of the materials. Their study defined three categories of curriculum participation based upon how teachers were oriented to the materials: intermittent and narrow, adopting and adapting and thorough piloting. Those whose use was intermittent and narrow used the materials sparingly, relying primarily on their own teaching routines and materials. Those who had an adapting and adopting orientation used the materials but adapted them to their already existing strategies and routines. Thorough piloters used all parts of the curriculum. Remillard and Bryans concluded that orientation toward curriculum rather than beliefs about mathematics teaching and learning were more significant in how teachers used the written curriculum to plan instruction.

According to Remillard (1996, 1999, 2000, 2005), teachers are curriculum creators and developers and are inclined to use new written resources consistent with their interactions with previously used resources. In her 1996 study, she examined two elementary teachers’ use of a new mathematics curriculum that had been adopted by their school district. Using qualitative methods including classroom observations and before and after interviews, Remillard drew on her descriptive characterizations of the teachers to explain their textbook interactions. They found that the two teachers read very different parts of the text and for different purposes. Remillard identified three different types of reading a mathematics text: reading for worksheets, reading for the script and reading for big ideas. Sherin and Drake (2004) extended this work in their analysis of ten elementary school teachers using a reform-based curriculum. They studied ways that
teachers read curriculum materials for overviews or details, evaluated them in terms of students, teachers and others and adapted or created, replaced or omitted those materials depending upon what they see as important.

Drake and Sherin (2009) continued to examine teachers’ participation with math curriculum and conjectured that as teachers participate with curriculum materials over time, a vision of the goals and strategies associated with a set of materials is developed, helping teachers know what to expect as they move through lessons. This suggests that teachers’ participation with curriculum materials is dynamic and changeable. Drake and Sherin defined the construct of *curriculum trust* as a set of teacher beliefs and practices that over time reflect an understanding that the curriculum materials will work to support student learning. McDuffie and Mather, in their 2009 study of two seventh grade mathematics teachers’ implementation of a new curriculum, defined the construct of *curricular reasoning* as a specific form of pedagogical reasoning that teachers employ while working with curriculum materials to plan, implement and reflect on instruction. They examined four primary instructional activities that engage teachers in this type of reasoning: a) analyzing curriculum materials by thinking about the learners, b) doing tasks together as learners, c) mapping learning trajectories and d) revising plans based on working with students during instruction. Consistent with Drake and Sherin (2009), Stein (2007) and Tarr, Reys, Reys and Chavez (2006), teachers in McDuffie and Mather’s study often transformed curriculum materials by adding or omitting activities.
**Teachers’ Professional Identity and Self-Direction**

**Identity.** Teachers’ participation with curriculum materials is also shaped by their professional identity. Beijaard, Meijer, & Verloop (2004) reviewed 22 studies to further extend and define teacher professional identity. Their findings emphasized the temporal and dynamic nature of identity and how it changes over time through relevant others, events and experiences. Beijaard et al identified four contexts of the identity construct that furthered our understandings of teacher professional identity: a) it is ongoing, b) it relates to both person and context and is not entirely unique to the individual, c) it consists of sub identities, which more or less harmonize but could conflict in cases of educational change and d) one subcategory is teacher agency or self-direction, where learning individually as well as collaboratively takes place through the activity of the learner. Teacher professional identity is how teachers define themselves to themselves and to others, thus it is both personal and social (Lasky, 2005). It is a construct of professional self that evolves over career stages (Ball & Goodson, 1985; Sikes, Measor & Woods, 1985). For Clandenin & Connolly (1996), a teacher’s professional identity is their story to live by, which is communally sustained as teachers support one another through confirmation of their beliefs, values, and actions and as they share significant, endorsable stories about each other.

In terms of professional identity’s impact on curriculum use, Silver, Ghousseini, Charalambous, & Mills (2009), hypothesized that teachers might struggle with a curriculum resource if their professional identity did not include a role as an active mediator of the interactions between students and content or when they had a limited
repertoire of instructional strategies to use in facilitating students’ engagement with the content. On the other hand, providing a new curricular tool can provide teachers with the agency to access rich and different mathematical tasks that carry some of the instructional load (2009). Their study, BIFOCAL, involved 12 teachers from five middle schools who were using a reform curriculum. After one year of study involving participants' interviews, professional development sessions, and post-session reflections, the BIFOCAL study team analyzed the data using open coding. They identified and categorized themes and reviewed data sources to establish their assertions.

Building on their 2004 study, Drake and Sherin (2006) looked closely at the adaptations teachers made before, during and after instruction, finding that teachers’ approaches were internally consistent yet widely varied among different teachers across the first year of curriculum use. Their study extracted a sample of two teachers from a larger cohort of 20 involved in a more longitudinal study of a reform curriculum. The two teachers shared a similar career stage, 7-10 years, because the authors believed that teachers at this stage of experience are most likely to change their practice in response to reform. Through narrative inquiry that included before and after interviews and curriculum specific professional development sessions, Drake and Sherin developed a model of curriculum use for each of the two teachers and identified the curricular adaptations teachers made during instruction. They concluded that much about teachers’ curriculum use could be understood through the lens of their identities as mathematics teachers and learners.
**Self-direction/Agency.** Considering self-direction, often called agency, as an important subset of identity, it can be defined as a belief that human beings have the ability to influence their lives and environment while also being shaped by social and individual factors (Bourdieu, 1977; Tharp and Gallimore, 1991). Core features of human agency were further delineated by Bandura (1997) as consisting of “intentionality, forethought, self-reactiveness, and self-reflectiveness. Further, Bandura extended the work on individual human agency to include social and collective agency, where it is accepted that the greatest efficacy and productivity occur when an individual is positively oriented toward the context in which they find themselves. Teacher agency is then shaped by the structural and cultural features of the school society and culture and plays out in the way policy or curricular decisions are adapted, adopted or ignored (Lasky, 2005). In this way, teacher self-direction plays a role in how a teacher engages and interacts with a new curricular tool.

Teacher self-direction is strongly influenced by *instructional reality*, defined by McClain, Zhao, Visnovska and Bowen (2009) as teachers’ perceptions of demands and supports in their local context. In their work with grades 5-8 across three school districts using reform curriculum materials, McClain et al (2009) found that this reality, including the students involved, played a significant part in how written materials were used by teachers. In schools where teachers were viewed as professionals, curriculum materials were used by teachers to design curriculum. McClain et al (2009) defined *teacher agency* as having “authority over both the mathematics that is taught and the sequencing and presentation of that content” (2009, p. 63). They found that the more the institutional
reality required fidelity to a textbook or other curricular resource the more teachers were
de-professionalized. Their findings indicated that in settings where the teacher is the
instructional authority in the classroom, teachers are highly professionalized and are able
to use a textbook resource as a tool to design curriculum.

The Written Resource

According to my framework, the nature of the curricular resource also shapes
teachers’ interaction and engagement. The nature of the resource refers to the particular
view of mathematical knowledge and pedagogy that a written resource forwards
(Collopy, 2003), as well as the way in which it speaks to and through teachers
(Remillard, 2005). Studies around the written curriculum resource generally fall into two
types. The first considers features of a curriculum resource likely to matter for teachers
and possibly influence their use. The second focuses on how teachers participate with
particular features of a curriculum resource. There is not a good deal of research that
explores how written materials influence teachers’ participation with the materials; the
relevant studies are explored below.

Features of Written Curriculum Materials Likely to Matter for Teachers

The presentation of a text influences the way teachers use the content. Teachers
respond to not only to the content of a text, but also to its other forms of address,
including *structure, look, voice, medium* and *genre* (Remillard, 2012). The visual aspects
of a text is the referent for look; in the United States this typically means pages are in
color with pictures of happy children and highlighted vocabulary. Voice describes how
the authors communicate with teachers, whether it is to or through (2005). Speaking to
teachers might include explaining mathematical content while speaking through teachers is more directive and includes telling teachers what to teach and in what order.

Pedagogical guidance is considered part of the voice of a text. The medium, according to Remillard, may be either text-based or electronic while the genre defines curriculum guides within a larger classification of written curriculum materials. “Forms of address act as powerful mediators of teachers’ engagement with a particular curriculum resource” (2012, p. 114).

Curriculum materials can contribute to effective instruction if they are carefully created to assist the teacher with the enactment of mathematical tasks (Ball & Cohen, 1996). They can, for example, include helpful material on student thinking, connect the current lesson with previous and future lessons across the grade spans, and provide background material to assist the teacher in planning. The written curriculum, believe Ball & Cohen (1996), must be designed with the enacted curriculum in view, and used as a tool by the teacher to facilitate teacher and student interaction with mathematical content. In his work on the teacher-tool relationship, Brown (2009) frames teachers’ use of curriculum materials as one of multiple design activities that teachers use to attain their instructional goals. In Brown’s theoretical frame, texts are static representations of abstract concepts and activities that can be crafted to trigger particular instructional activities.

The 1989 Standards guided the development of curricula funded by the National Science Foundation. Commonly called Standards-based or reform curriculum materials, they differed markedly from traditional materials (Senk and Thompson, 2003). The
teacher resources that accompanied Standards-based curricula were often intended to promote teacher learning in addition to student learning and have come to be called educative curriculum materials (Davis and Krajcik, 2005). Stein and Kim (2009) compared the educative features of two standards-based curricula and found that teachers are better able to enact and maintain high-level tasks when the curriculum resource provides explanations of mathematical purpose and potential student responses.

**Teacher’s Work with Written Resources**

Texts can also help teachers learn how to anticipate what learners may think or do in response to certain activities and can explain why certain tasks or activities are included (Ball & Cohen, 1996; Hill & Charalambous, 2012; Remillard, 2000). In their work with two seventh grade math teachers using Connected Mathematics, Hill & Charalambous (2012) found that curriculum materials can contribute to instructional quality by providing novel tasks that laid the groundwork for students’ deep problem-solving experiences. In this study, the Connected Mathematics curriculum resource prevented a low-MKT teacher from making a mathematical error, suggesting that supportive materials might assist teachers with a lower level of mathematical knowledge for teaching in maintaining adequate instruction. They write, “more supportive materials appear to help teachers use representations more effectively to give meaning to mathematical symbols and operations, to provide explanations that build, at least partly, on key mathematical ideas and unfolding a sequence of small, logical steps, and to use language and notation more precisely. Curriculum materials, including carefully selected and sequenced examples can also support lesson coherence and directionality (p.569).”

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Stein and Kaufman (2010) studied 48 teachers in two different school districts as they implemented two standards-based curricula: Everyday Math and Investigations. They collected data through classroom observations, interviews and surveys. One of their finding was that one of the written resources provided more support for teachers in terms of the big ideas and concepts of the curriculum. Teachers using this curriculum maintained a higher level of cognitive demand and paid more attention to student thinking and reasoning than those teachers using the other curriculum.

**Teacher Professional Community**

Working in teacher professional communities can influence teachers’ participation with a curricular resource by engaging participants in sustained and focused collaborative work. By professional community I refer to a community of teachers who share a specialized knowledge base that includes content and pedagogical knowledge about how students think (Sowder, 2007) and meets the conditions established by Veschio et al (2007) in my theoretical framework. Only a small number of studies exist that examine the relationship between participation in professional communities and curriculum use, but there is extensive research on the type of learning that professional communities provide teachers. In the following paragraphs, I describe studies that reveal how teachers have come together in intentional ways to explore their teaching practices and their subject content, narrowing the focus of the reviewed studies to finally describe the work of a PLC in participating with curriculum materials.

Wineburg and Grossman (1998) studied a group of 22 English and history teachers from an urban high school who came together two times per month to read texts and talk
about teaching and learning. The authors viewed this professional community as having two roles: a) the improvement of their teaching practice and b) the continued learning of their subject matter. Initial analyses of the first 18 months showed, for experienced teachers, both a deprivatization of teaching and an increased feeling of professionalism among the participants.

The QUASAR (Quantitative Understanding: Amplifying Student Achievement and Reasoning) project studied by Stein, Silver and Smith (1998) involved middle school teachers from economically disadvantaged neighborhoods. Six site-based professional development programs were created so that math teachers and their research partners could work together to develop and implement innovative curricula and instructional practices. The authors analyzed data from these groups over six years and concluded that PLC’s were central to fostering teacher change and increased student learning. By comparing the different site-based groups, they could determine that where strong community work groups evolved, teachers increased their use of challenging tasks and more often expected students to explain their thinking. The study group also measured student learning and found that students grew in their ability to problem solve and to communicate about the math they were learning.

Cognitively Guided Instruction (Franke & Kazemi, 2001), a program developed to help teachers learn to examine student thinking, created communities of practice where teachers met to examine student work. Teachers involved in these communities of practice brought examples of student work to share with others in their work group. Franke and Kazemi studied the work groups for four years and found that, over time,
teachers saw themselves as a community of learners with a shared goal of improving the learning and teaching of mathematics. Their analysis revealed that participants’ instructional practices had changes along with their ability to elaborate on the details of children's mathematics reasoning and problem-solving strategies.

McDuffie and Mather (2009) extended the work of Sherin and Drake (2005) on curricular reasoning by examining teachers’ participation with curriculum materials in a small professional development group. They were interested in learning how teachers used curricular reasoning in their lesson planning and how collaborative, curriculum-based professional development supported teachers’ use of this reasoning. Using field notes, interviews, video recordings, emails, curriculum materials and student work, the authors found that, similar to Sherin and Drake, the teachers transformed curriculum materials by adding and omitting materials. Unlike Drake and Sherin, however, the two teachers in this study omitted fewer pieces of the lesson studied and made adaptations and additions more connected to students and standards than Drake and Sherin reported. The authors concluded that working with colleagues in a professional community empowered the teachers to work with the curriculum as a complete framework including approaches and strategies for teaching and learning. They also suggest that participation in this learning community enhanced the development of their curricular reasoning and vision. Curriculum study through teacher professional communities meets multiple criteria for successful professional development.
Summary

The research examined in this chapter represents an overview of the five bodies of literature on teachers’ participation with a new curriculum resource in the space between the written and intended curriculum. These include teachers’ beliefs and knowledge, teachers’ orientation toward curriculum, teachers’ professional identity, teachers’ membership and participation in a professional learning community and the nature of the written curriculum. This study attempts to add to the body of knowledge about how teachers participate with new curriculum materials and to verify the findings of previous research on the influence of factors that help determine ways in which teachers interact with these materials over the first year of use.

The body of literature on teacher beliefs and knowledge suggests that even if teachers share a similar knowledge base, different belief systems will likely result in different instructional practices, including ways in which they participate with curriculum materials. The construct of orientation toward curriculum materials pulls together practices and dispositions that influence a teachers’ participation with curriculum. Research suggests that despite a teacher’s alignment with a particular curriculum’s philosophy, their orientation will determine how they interact with these materials. This construct has been used to explore how teachers read curriculum materials and what they read them for, along with how teachers evaluate and adapt materials for instruction.

Scholars have provided evidence that a teacher’s professional identity is dynamic and based upon context factors. It represents a story that teachers tell themselves and each other. Teacher agency is seen as a subset of identity and speaks to teachers’ self-
directed activities in moving from the written to the intended curriculum. The written resource forwards a particular view of mathematics and pedagogy and often consists of educative features designed to be helpful to teachers. Scholars have also examined the structural features of a text as well as the forms of address. Evidence from these studies suggests that these features also influence teachers’ participation with curriculum. There is a large body of research around teacher learning in professional communities and what constitutes effective professional development. Evidence suggests that working collaboratively with others can empower teachers’ participation with new curriculum materials if the collaboration is ongoing and content focused.

By conducting this study, I hoped to learn how individual teachers’ participation with Math in Focus was influenced by their personal characteristics. My analysis also sought to reveal ways in which the nature of Math in Focus influenced teachers’ responses to the materials. Finally, this study sought to understand the influence of planned professional collaboration in working and designing lessons with a new curriculum resource.
CHAPTER 3: METHODS

The aim of this study was to understand how second grade teachers participated with a new textbook resource to plan and carry out instruction. In my investigation of eight second-grade teachers during their first year of participation with a new curriculum resource, I sought to verify and build on previous research that focused on the teacher-tool relationship. My study design was developed to address three different research questions. First, I wanted to learn how teachers’ participation with a new resource compared with their participation with a previous resource and what processes they used to participate with the different components of the new resource. Second, I wanted to gather information about personal and curricular characteristics that might influence teachers’ participation with the new resource. Finally, because the study participants engaged in monthly team meetings to work with the curriculum and each other, I wanted to examine how this type of professional development might influence teachers’ curriculum use. I conceived of the study with the teacher as the central focus of the design, influenced by the written resource, individual teacher factors, and participation in a learning community.

Study Design

To understand how teachers participate with new curriculum materials, I designed a study that looked at second grade teachers’ planning and design processes as they implemented a new math series. I focused particularly on their use of the new teacher resources that accompanied the series and factors that might influence their choices. My study consisted of four major components: 1) developing profiles of individual teachers
with respect to their beliefs about teaching and learning and agency and identity, 2) characterizing teachers’ orientation toward curriculum, 3) analyzing the nature of the curriculum resource and 4) examining teacher learning within a professional community. Each is further explicated in the chapters that follow.

**Data Collection**

I developed an online questionnaire, which I used to collect information from individual study participants on beliefs about teaching and learning, agency & identity, and orientation toward curriculum. Data from the questionnaire was used to create a profile of each study participant and to make connections where possible between their beliefs, agency and identity and orientation toward curriculum and their participation with Math in Focus. I conducted two individual interviews with each teacher; one occurring from November through January 2013-2014 and one occurring in May and June 2014. Through the two interviews, I attempted to capture information about teachers’ orientation toward math curriculum materials, how they participated with *Math in Focus (MiF)* during the first year of use, and what they like, disliked and found challenging. I analyzed the *Math in Focus, Grade 2 Teacher Resource*, done in order to capture challenges of the curriculum and teacher supports provided by the curriculum. This was done using both the online site provided by the publisher and the 2013 copyright of the Teacher Resource Guide, Grade 2A and 2B. Finally, I recorded and collected artifacts from all 12 of the team meetings, six from each team, in order to examine closely the opportunities afforded by the use of a professional learning
community for curriculum implementation. Table 3.1 below is a data map that associates each of the research questions with the sources of data.

Table 3.1

Research Data Map

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Questionnaire</th>
<th>Interviews</th>
<th>Team Meetings</th>
<th>MiF Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do second grade teachers participate with new math curriculum materials during the first year of implementation?</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2. How do teachers’ personal factors influence their curriculum use?</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. How does the nature of the curriculum impact teachers’ curriculum use?</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. How does participation in a professional study group influence teachers’ participation with new math curriculum material?</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Research Site and Participant Selection

My research was conducted in a suburban school district in the eastern United States, approximately 15 miles from a major metropolitan city. The District serves more than 6,000 students in five elementary schools (K-4), two middle schools (5-8) and one high school (9-12). It has benefited from a strong reputation over time and enjoys extensive parent involvement at all levels. At the time of this study, there were between four and five second grade classrooms in each of the five elementary schools and the classroom teacher was responsible for teaching reading, writing, math, social studies and
science. Two teachers from each of the second grade teams at the five elementary schools were selected by their Principals to participate in the MiF implementation team. Because this District has two levels of mathematics in grade 2, five of the teachers selected were teaching an on-level second grade math class and five of them were teaching an above-level second grade math class. All ten of these teachers were the original study participants, however, one above-level teacher did not respond to multiple requests for interviews and one on-level teacher did not complete the survey or the second interview, so they were eliminated from the analysis, even though they continued to participate in the team meetings. Each elementary school had one math specialist, who was responsible for supporting both struggling and accelerating students as well as supporting teachers in the classroom. Although performance on standardized measures was similar across the five schools, each elementary school had a distinct culture, established through history and influenced by the teachers and principals in each of the buildings.

**Study Participants.** Complete information about the eight study participants is included in Chapter 5. All were all inservice teachers with more than five years of experience in the elementary classroom. All but one were female. Several had been in the school district for more than 20 years. All the participants were state certified in elementary education and all had worked with the previous math written resource. Each of the eight teachers received professional development on MiF from both the publisher and the math specialist during the year prior to implementation.
Data Collection and Analysis

Data was developed and collected over the course of the 2013-2014 school year on a timetable that merged the needs of the school district with the requirements of the curriculum implementation. Table 3.2 outlines the timeline for data collection. This is followed by a detailed description of each data collection method.

Table 3.2
Timeline for Data Collection

<table>
<thead>
<tr>
<th>2013-2014 School Year</th>
<th>Teacher/School Schedule</th>
<th>Teacher Interviews</th>
<th>MiF Team Meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>All second grade teachers participate in inservice time for planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>Classroom use of MiF begins</td>
<td>Requests for teacher participation</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>IRB Forms signed and collected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td></td>
<td>#1</td>
<td>Team Meeting #1</td>
</tr>
<tr>
<td>December</td>
<td></td>
<td>#1</td>
<td>Team Meeting #2</td>
</tr>
<tr>
<td>January</td>
<td></td>
<td>#1</td>
<td>Team Meeting #3</td>
</tr>
<tr>
<td>February</td>
<td>Report Card Prep Parent Conferences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td></td>
<td>Team Meeting #4</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td>Team Meeting #5</td>
</tr>
<tr>
<td>May</td>
<td>Online Questionnaire Distributed</td>
<td>#2</td>
<td>Team Meeting #6</td>
</tr>
<tr>
<td>June</td>
<td>School year ends</td>
<td>#2</td>
<td>Data Collection complete</td>
</tr>
</tbody>
</table>
Questionnaire

The study questionnaire was constructed of 20 items designed to reveal teachers’ knowledge and ideas about teaching and learning mathematics. The purpose of the questionnaire was to gather information about individual teacher factors that might influence their participation with curriculum materials. These included teacher beliefs and knowledge and teacher identity and self-direction/agency. The questionnaire was administered online through Survey Monkey. Participants answered each question on a four-point Likert scale from Strongly Disagree to Strongly Agree. Each survey question was coded as positive or negative for one of the characteristics measured in the questionnaire and the results recorded in a matrix used to help develop an individual profile of each study participant. All study participants completed the questionnaire along with five additional team participants who were not study participants. A replica of the questionnaire is contained in Appendix A.

Development. I developed the questionnaire by combining two different but related survey instruments: Kennedy, Ball and McDiarmid’s Study Package for Examining and Tracking Changes in Teachers’ Knowledge (NCRTL, 1993) and the card sort task of Deborah Ball’s unpublished dissertation: Knowledge and reasoning in mathematical pedagogy: Examining what prospective teachers bring to teacher education. (1988). Ball’s card sort task asked teachers to respond to statements concerning their knowledge and ideas about a) mathematics [K], b) teaching mathematics [T], c) learning mathematics [L], d) learners [P] and e) themselves [S]. Kennedy, Ball & McDiarmid
parsed similar questions into additional subcategories. There was a good deal of overlap between the survey and card sort items.

The NCRTL study seemed to further define and clarify Ball’s original conceptualization of teachers’ ideas and understandings about mathematics, teaching and learning, the role of the teacher, and the role of the learner. I summarize my organization of the four belief categories identified by the two studies, the questions that relate to each and the grouping scheme I used in Table 3.3 below, while Table 3.4 maps each question in numerical order and shows the relationship between the two survey instruments.

Table 3.3
Questionnaire Grouping Scheme

<table>
<thead>
<tr>
<th>Belief Category</th>
<th>Relevant Questions</th>
<th>Grouping Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Grade Students as Learners</td>
<td>2, 3, 6, 7, 8, 9, 10, 11, 20</td>
<td>+ Additive or Constructing Knowledge/ + Social or Independent</td>
</tr>
<tr>
<td>(Learning)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second Grade Students as Learners</td>
<td>1, 12, 14</td>
<td>+ Value of Ability</td>
</tr>
<tr>
<td>(Ability)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Views of Themselves as</td>
<td>11, 13, 17, 18, 19</td>
<td>+ Transmission or Facilitative Teaching/ + Feeling of Confidence</td>
</tr>
<tr>
<td>Instructors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Views of Mathematics</td>
<td>4, 5, 6, 7, 9, 10, 15, 16</td>
<td>+ Way of Thinking or Rules and Procedures or Body of Knowledge</td>
</tr>
</tbody>
</table>

Table 3.4
Conceptual Map of Dimensions of Teacher Beliefs and Knowledge about Teaching and Learning

<table>
<thead>
<tr>
<th>Question #</th>
<th>Ball</th>
<th>Kennedy, Ball &amp; McDiarmid</th>
<th>Subcategory</th>
<th>Response Coding (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P</td>
<td>L</td>
<td>Ability</td>
<td>Anyone can achieve (+)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T/L</td>
<td>How learning occurs</td>
<td></td>
</tr>
<tr>
<td>2*</td>
<td>T</td>
<td>T/L</td>
<td>Social dimensions</td>
<td>Interaction with others (+)</td>
</tr>
<tr>
<td>3*</td>
<td>L</td>
<td>T/L</td>
<td>What to do to learn</td>
<td>Repetition (+)</td>
</tr>
<tr>
<td>Question #</td>
<td>Ball</td>
<td>Kennedy, Ball &amp; McDiarmid</td>
<td>Subcategory</td>
<td>Response Coding (+/-)</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>---------------------------</td>
<td>-------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>4</td>
<td>K</td>
<td>K</td>
<td>Ideas about mathematics</td>
<td>Way of thinking (+)</td>
</tr>
<tr>
<td>5*</td>
<td>K</td>
<td>K</td>
<td>Ideas about mathematics</td>
<td>Rules and procedures (-)</td>
</tr>
<tr>
<td>6</td>
<td>L</td>
<td>T/L</td>
<td>Social dimensions</td>
<td>Interactions with others (-)</td>
</tr>
<tr>
<td>7</td>
<td>L</td>
<td>T/L</td>
<td>What to do to learn Ideas about math</td>
<td>Memorize (+) Rules and procedures (+)</td>
</tr>
<tr>
<td>8</td>
<td>L</td>
<td>T/L</td>
<td>How learning occurs</td>
<td>Constructing knowledge (+)</td>
</tr>
<tr>
<td>9*</td>
<td>L</td>
<td>T/L</td>
<td>How learning occurs</td>
<td>Additive (+)</td>
</tr>
<tr>
<td>10</td>
<td>K</td>
<td>K</td>
<td>Ideas about mathematics How learning occurs</td>
<td>Way of thinking (+) Constructing knowledge (+)</td>
</tr>
<tr>
<td>11</td>
<td>L</td>
<td>T/L</td>
<td>Teacher role (goal)</td>
<td>Foster inquiry (-)</td>
</tr>
<tr>
<td>12</td>
<td>P</td>
<td>P</td>
<td>“Ability”</td>
<td>Native (+)</td>
</tr>
<tr>
<td>13</td>
<td>T, L</td>
<td>T/L</td>
<td>Teacher role (approach)</td>
<td>Facilitative (+)</td>
</tr>
<tr>
<td>14</td>
<td>P</td>
<td>P</td>
<td>“Ability”</td>
<td>Anyone can achieve (+)</td>
</tr>
<tr>
<td>15</td>
<td>K</td>
<td>K</td>
<td>Ideas about mathematics</td>
<td>Rules and procedures (+)</td>
</tr>
<tr>
<td>16</td>
<td>S</td>
<td>K</td>
<td>Ideas about mathematics</td>
<td>Body of knowledge (-)</td>
</tr>
<tr>
<td>17</td>
<td>S</td>
<td>K</td>
<td>Personal attitudes</td>
<td>Confidence (+)</td>
</tr>
<tr>
<td>18</td>
<td>T, L, K</td>
<td>T/L</td>
<td>Teacher role (approach) How learning occurs</td>
<td>Directive (+) Developmental (+)</td>
</tr>
<tr>
<td>19</td>
<td>T, L, K</td>
<td>T/L</td>
<td>Teacher role (goal)</td>
<td>Teach subject matter (+)</td>
</tr>
<tr>
<td>20</td>
<td>P, L</td>
<td>T/L</td>
<td>How learning occurs Ability</td>
<td>Constructing knowledge (+) Sources of success (+)</td>
</tr>
</tbody>
</table>

**Legend:**
- Idea about Math = K
- Ideas about Teaching and Learning Math = T/L
- Ideas about Learners = P
- Ideas about Self = S

**Analysis of the Questionnaire.** After all study participants had completed the questionnaire, I organized the results in multiple ways. I first developed the belief
categories described in Table 3.3, based upon the works of Ball, and Kennedy, Ball & McDiarmid as in Table 3.4. I was then able to associate each participant’s results and begin to categorize them in certain ways. The questionnaire accounted for the categorization of teachers’ beliefs about mathematics, their views about students, and their view of themselves as teachers. Table 3.5 below summarizes how I used the questionnaire to sort the teachers into groups.

Table 3.5

Teacher Belief Analysis

<table>
<thead>
<tr>
<th>Belief</th>
<th>Categorization</th>
<th>Relevant Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>View of Mathematics</td>
<td>Rules and procedures</td>
<td>4 (+), 10 (+)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Way of Thinking</td>
<td>5 (-), 7(+), 15 (+)</td>
<td></td>
</tr>
<tr>
<td>Body of Knowledge</td>
<td>16 (-)</td>
<td></td>
</tr>
<tr>
<td>View of Students as</td>
<td>Social</td>
<td>2 (+), 6 (-)</td>
</tr>
<tr>
<td>Learners</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Independent</td>
<td>2 (-), 6 (+)</td>
</tr>
<tr>
<td>View of Self</td>
<td>Facilitate</td>
<td>13(+), 11(-)</td>
</tr>
<tr>
<td></td>
<td>Transmit</td>
<td>18 (+), 19 (+)</td>
</tr>
</tbody>
</table>

+ = Agreed or strongly agreed with statement
- = Disagreed or strongly disagreed with statement

Interviews

Each study participant completed two interviews, one in the fall of the study year and one in the late spring, early summer of the same school year. The interviews were semi-structured, audio recorded, and lasted from 20 – 50 minutes.

Development. For each of the two interviews, I created an interview guide, based upon my conception of teacher identity, agency, and orientation toward curriculum materials. My conception of teacher identity was based upon commonly held definitions

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of teacher identity as a story to live by, typically communally sustained through
significant endorsable stories that they tell others and that they tell themselves (Clandenin
& Connolly, 1996; Sfard & Prusak, 2004; Skinner & Cain, 1998). I used the two
interviews of each participant to gather evidence about the intrinsic and extrinsic value
each teacher found in their work, their commitment to lifelong learning and their
confidence in their pedagogy and mathematical content knowledge. To draw inferences
about teacher agency I relied on the definition of agency posed by Biesta & Tedder
(2006) and Bandura (2001) as the capacity for intentional, autonomous action on behalf
of what matters to them. I again used the two interviews to look for evidence of teacher
empowerment about curriculum and instruction as it related to the Math in Focus

 curriculum

The two individual teacher interviews were also used to capture teachers’
orientation toward math curriculum materials using the lens of Remillard & Bryans
(2004). In it they suggest that teachers have a stance toward curriculum materials that
influences how they participate with curriculum materials to design instruction. I also
generated questions about teachers’ participation with MiF and their view of its structure.
A copy of each of the guides can be found in Appendix B.

 Interview 1. Interview #1 was conducted in the late fall and early winter, in the
first several month of implementation. After gathering background information about the
individual teacher, I used Interview #1 to examine teachers’ feelings about the series they
used previously: Scott Foresman/Addison Wesley Mathematics. Then we talked together
about MiF Chapter 4 and teachers described their participation with the text. Questions
examined what pieces of the curriculum attracted them, occupied their attention and sustained their involvement in the curriculum. Other questions considered how teachers acted upon the content of MIF. Both were evaluated by analyzing teachers’ open-ended responses as they and the interviewer paged through the teacher resource guide for Chapter 4: Using Bar Models: Addition and Subtraction.

**Interview 2.** Interview 2 was conducted during the spring of the first year of implementation of MIF. The same teachers were interviewed individually. The second interview gathered information about their experiences as a member of the MIF implementation team and their evaluation of how the process went in their classroom and school. We also walked together through Chapter 16: Using Bar Models: Multiplication and Division. Similar to Interview #1, Interview #2 was also open-ended and, although I steered teachers to answer the interview questions, they also had the opportunity to provide feedback about whatever was on their minds regarding MiF and its implementation.

**Analysis of the Interviews.** Using the online program, *Dedoose*, I coded each interview transcript for themes that connected my research questions to my review of the literature. Seven primary themes emerged and 416 excerpts were coded with the coding scheme summarized in Table 3.7 on p. 46. I used these interview excerpts to construct the individual teacher profiles in Chapter 5 and to analyze how teachers’ participated with the MiF curriculum in Chapter 7. Table 3.6 (p. 43) connects the seven themes associated with the interview data to the research from my literature review.
Table 3.6

Interview Themes

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Interview Theme</th>
<th>Research Base</th>
</tr>
</thead>
</table>

Teacher identity was determined through individual interviews 1 & 2, along with Prompt 17 on the Questionnaire: “I usually feel confident about my ability in mathematics”. I operationalized teacher identity by coding interview responses for the following: Value, Commitment, and Self-Efficacy. I defined value as either intrinsic or mission-driven. Intrinsic value was measured by a stated interest in either the subject of
mathematics or in teaching as expressed by statements about helping students learn, interacting with students or enjoying the subject matter. Mission-driven value was associated with goal-oriented statements reflecting an interest in increasing math literacy or making a difference in students’ lives. Interview statements like “helping kids improve and getting to know them” (AD, I2) were coded for value.

To analyze teacher agency I focused on agency as self-efficacy. I defined teachers’ self-efficacy as judgment of their capacity to be successful both in explaining mathematical concepts and in their knowledge and ability in mathematics. Self-efficacy as either confident or compliant/worried was measured primarily through Interviews 1 & 2 with questions about how teachers used Math in Focus as a resource. Statements like, “I feel comfortable talking about the material” (BA, I1) and “I’m normally pretty good at thinking about ways to help that child” (BA, I2) were considered evidence of a confident view of self. Other statements like, “Just looking at the Smart Board and asking, what am I doing here” (DD, I1) and “It used to be when I gave a test and they did well you thought, ‘Oh I did a great job’. Now its like, ‘well, that’s gone’” (VS, I1) were coded as a worried or compliant view. Teachers’ curriculum orientations were also determined through individual interviews 1 & 2. Interview transcripts were coded for how study participants viewed the curriculum resource as a tool for lesson design and instruction and whether or not they were philosophically aligned to the MiF pedagogy as forwarded in the teacher resources.

In Interview 2, teachers were asked specifically about the role of new curriculum materials within their second grade math class. Using the research of Remillard &
Bryans (2004), Remillard (2005), and Sherin & Drake (2004), teachers were coded as having one of three stances: interpreter, student or follower. Teachers as interpreters tended to ask what the curriculum had in it for them to use to enact the lessons. Interpreters liked to recall the District curriculum and use the MiF resource to enact similar lessons utilizing some of their own past pedagogy and material. Teachers as students tended to ask how they could best learn what the author intended the curricular materials to do. They preferred to study the MiF curriculum closely in order to learn what the authors intended and how it should be enacted. They tended to want to enact lessons using the resource. Teachers as followers wondered what the author wanted them to do and tended to follow the script more closely than the other two groups. They were interested in following the book for both instruction and pedagogy, at least until they knew it well enough to create their own materials.

Table 3.7
Dedoose Codes and their Description

<table>
<thead>
<tr>
<th>CODE TITLE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Participation</td>
<td>Emotional involvement with and commitment to the resource - why they interact with it; Mutual or reciprocal action the teacher takes when reading and interpreting the resource.</td>
</tr>
<tr>
<td>a. Parts</td>
<td>Where do they begin, which pieces of the teacher guide and other resources do they read and why.</td>
</tr>
<tr>
<td>b. Issues</td>
<td>What issues emerge for teachers as they use the new resource? How do they resolve differences between their thinking and the text's positioning?</td>
</tr>
<tr>
<td>c. Over Time</td>
<td>How do teachers respond over time? What do they like and dislike? What do they predict that they will do differently the second year?</td>
</tr>
<tr>
<td>Type</td>
<td>Question</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>d. Adapting</td>
<td>How do teachers adapt MiF? Do they omit some portions of lessons? Do they change the written lesson design? Do they change the written tasks</td>
</tr>
<tr>
<td>e. Evaluating</td>
<td>How do the teachers evaluate MiF before instruction? Does it make sense? Does the teacher believe that it will be effective in achieving student learning?</td>
</tr>
<tr>
<td>f. Reading</td>
<td>What do teachers read and what do they read it for?</td>
</tr>
<tr>
<td>g. Over Time</td>
<td>From beginning of year until end, are there discernible changes in their interaction with MiF?</td>
</tr>
<tr>
<td>h. Intermittent and Narrow</td>
<td>Uses materials sparingly, relying primarily on their own teaching routines and materials.</td>
</tr>
<tr>
<td>i. Adapting and Adopting</td>
<td>Uses the materials but adapts them to their already existing strategies and routines</td>
</tr>
<tr>
<td>j. Thorough Piloters</td>
<td>Thoroughly used all parts of the curriculum</td>
</tr>
<tr>
<td>2. Orientation</td>
<td>Orientation toward curriculum</td>
</tr>
<tr>
<td>a. Plan</td>
<td>How teachers use to plan</td>
</tr>
<tr>
<td>b. Student Needs</td>
<td>How teachers balance curricular demands with student needs</td>
</tr>
<tr>
<td>c. Bar Models</td>
<td></td>
</tr>
<tr>
<td>d. Fidelity</td>
<td>How bound to the resource do teachers feel?</td>
</tr>
<tr>
<td>e. SFAW vs. MiF</td>
<td></td>
</tr>
<tr>
<td>3. Structure of Resource</td>
<td>Visual aspects of a text</td>
</tr>
<tr>
<td>a. Look</td>
<td>How do the authors communicate with teachers?</td>
</tr>
<tr>
<td>b. Voice</td>
<td>Directive, tells teachers what to teach and in what order</td>
</tr>
<tr>
<td>c. Speaking Through</td>
<td>Explaining mathematical content to teachers</td>
</tr>
<tr>
<td>d. Speaking To</td>
<td>Sequenced examples</td>
</tr>
<tr>
<td>e. Support</td>
<td>Explanations of mathematical content</td>
</tr>
<tr>
<td>f. Student Thinking</td>
<td>Student thinking is explained in the resource</td>
</tr>
<tr>
<td>g. Connections</td>
<td>Connects previously learned material with current content and explains future content</td>
</tr>
<tr>
<td>4. Teacher Knowledge</td>
<td>Subject matter knowledge</td>
</tr>
<tr>
<td>a. Fundamental Mathematics</td>
<td>Pedagogical content knowledge</td>
</tr>
<tr>
<td>b. Student Thinking</td>
<td>Curricular knowledge</td>
</tr>
<tr>
<td>5. Beliefs</td>
<td>Understandings about the world that can be held with varying degrees of conviction</td>
</tr>
<tr>
<td>6. Assessments</td>
<td>MiF Assessments were challenging and many conversations were needed to sort out how to handle them with students and parents.</td>
</tr>
<tr>
<td>a. Scoring</td>
<td></td>
</tr>
<tr>
<td>b. Modifying</td>
<td></td>
</tr>
</tbody>
</table>
### Team Meetings

Two teams of five second grade teachers, representing each of the five elementary schools, and divided by above and on-level classes, met six times over the course of the year to discuss the implementation of MiF in Grade 2.

**Development.** In order to provide teacher support for the implementation of MiF, the school district in this study created two professional teams, one for the teachers of above-level learners and one for the teachers of on-level second grade learners. For both teams, the purpose of meeting together was to successfully

| 7. **Identity (continued)** |  
|-----------------------------|-------------------|
| a. Value - intrinsic        | Stated interest in helping student learn, interacting with students or enjoying the subject matter |
| b. Value - attainment       | Goal of increasing math literacy Making a difference in student lives |
| c. Commitment               | Lifelong learning to become a better teacher |
| d. Self-efficacy            | Judgment of one's capability to be successful Confident about ability to explain concepts Confident about content knowledge |
| e. Emotions                 | Construction of emotions through transactions with students |

| 8. **Agency**               |  
|-----------------------------|---------------------|
| a. Director                 | View of self as director of instruction |
| b. Mediator                 | View of self as interpreter of resource and its content |
| c. Designer                 | View of self as designer of curriculum Empowered to make decisions about curriculum |
| d. Support of 9, 9.         | Do teachers feel supported by the District in terms of professional learning as it relates to implementing Math In Focus - information, materials |

| 9. **Culture/Context**      |  
|-----------------------------|---------------------|

| c. Challenge                |  
|-----------------------------|---------------------|

- Story to live by
- Communal sustained Stories teachers tell each other and themselves

| 8. **Agency**               |  
|-----------------------------|---------------------|

- View of self as director of instruction
- View of self as interpreter of resource and its content
- View of self as designer of curriculum
- Empowered to make decisions about curriculum
- Do teachers feel supported by the District in terms of professional learning as it relates to implementing Math In Focus - information, materials
design instruction and pedagogy using the MiF resource. Members of the teams were asked to participate in monthly meetings to discuss concerns, pacing and content, take information back to their buildings and work together to implement Math In Focus. Eight of the ten second-grade teacher participants also participated in two individual interviews and took part in the online questionnaire as part of this study. The math specialist from each building also participated in the team meetings in order to provide support for the team representatives.

Each meeting lasted approximately two hours and participants were charged with both representing their building during the meeting and returning to their building to share what they learned. Because the meetings were loosely organized and team driven, recordings of the team meetings were coded for recurring and significant themes initiated by any of the team members. Recordings of the team meetings were examined for illustrative, recurring and significant themes that resulted in discussions and/or changes in practice. Chapter 6 provides explicit details on the agendas, common themes and illustrative conversations of the team meetings.

**Analysis of the team meetings.** Each of the 12 team meetings were approximately two hours long. To analyze them I first tabulated the themes from the meeting agendas to see how often and which topics resurfaced over the course of year and across the two teams. Because the meetings were loosely organized and team driven, I also coded recordings of the team meetings for recurring and significant themes initiated by any of the team members. I then examined the content of the conversations for conversation flow, direction and results. First, who initiated the
conversation, a teacher or the facilitator, and second, who subsequently steered the conversation: a teacher, the facilitator or a math specialist. Finally, in which direction did the conversation evolve and what adaptations or products emerged as byproducts of the conversations.

To further analyze the processes of the professional teams and how their work might impact teachers’ curriculum use, I selected particular conversations using the following criteria: a) occurring in multiple agendas, b) having participation by multiple team members, and c) resulting in work and/or a work product. To describe the team’s participation, I again used Drake & Sherin’s (2009) model for how teachers read, evaluate and adapt curriculum resources. Following the vignettes, I used the work of Davis and Krajcik (2005) to assess the products created or substituted by the teams during the adaptation phase in order to determine whether they added educative and/or structural features to the existing text.

Nature of the Written Curriculum

In response to the development of first the Common Core Standards and then the Pennsylvania Core Standards, school districts like the one in this study felt the need to make substantive changes to the mathematics curriculum reflective of these new Standards. MiF is an adaptation of the successful Singapore math curriculum, *My Pals Are Here*. Student texts and teacher resources have been changed to be culturally sensitive to the population in the United States.

**Development.** The District adopted the 2013 copyright of *Math in Focus: Singapore Math*. Kindergarten and first grade teachers implemented the resource in the
year prior to this study so the majority of the students had experience with the curriculum prior to entering second grade. The MiF curriculum resource contains multiple components in addition to the student texts. There is a teacher guide to directly accompany the student text as well as resources for assessments, extra practice, enrichment and reteaching. Manipulative kits are recommended for each grade level and can be purchased from the publisher. Teachers have access to both online and hard copies of all the materials. Because teachers tend to participate with the teacher resource to design their lessons, using parts of the guide for analysis was most appropriate to learning more about the nature of the MiF curriculum.

**Analysis of the MiF Curriculum.** I collected data from the teacher resource guide and from the online materials provided by the publisher in an effort to identify potential challenges created by the use of MiF and to see what supports the series provided for the teacher. Through the use of the resource itself, I gathered information about structural features of the resource, the mathematics of the series and the pedagogy it forwarded, and then analyzed these components for possible challenges they posed for the study participants. My analysis of potential challenges looked at the MiF Grade 2 Teacher Guide as a whole. My analysis of the teacher supports used the section headers of Chapter 4 and Chapter 16 of the MiF Grade 2 Teacher Guide as a unit of analysis to examine structural supports, voice and educative features of the text. In Chapter 5: The Nature of the Curriculum, I explicate a detailed collection of the descriptive and analytic information gathered through this study. I used this information in Chapter 8 to make inferences about teachers’ participation with the new series.
My Role as Researcher

Although my position within the district studied allowed me unique access to District processes and resources, it also created the potential for biases and distortions in my study. As Math and Science supervisor for the school district studied, I was vested in the outcome of the new series implementation. I led the investigation and adoption of the new series and presented to peers, supervisors and Board members about the choice of Math In Focus. I have approached my relationship with teachers in the District as a helper, but I also observe math teaching regularly and write up formal observations as a result. This, of course, impacts their teacher evaluation.

Efforts to minimize bias

I made concerted efforts to ensure that the teachers felt comfortable sharing their reactions to the new math series. First, to set up the study, I visited each teacher personally and asked him or her to participate. I provided information about the study and told them their participation was optional. Each participant signed an IRB consent form and agreed to participate in the questionnaire, two interviews and the team meetings. The questionnaire, which addressed beliefs about teaching and learning, was delivered online in order to minimize me as a threat. The interview questions about how teachers were using the new curriculum were framed as open-ended in order to give the teachers control over how they walked through the chapters we discussed, reducing my voice in the interview process. The elementary math specialists attended all team meetings as both teacher peers and teacher supports and were tasked with gathering information from teachers in advance of the meetings as well as providing building
support for all second grade teachers to give the teachers in the study a chance for a more anonymous voice. The norms that were developed for the implementation teams were also designed to increase mutual trust.

The most difficult bias to control was that of my strong connection to the District and to the new series. Throughout the course of the study, I made every effort to be aware of and examine my own biases and to acknowledge and confront them when I could. Overall, I believe my role as a person who was there to not only implement a new curriculum resource but also to support teaching and learning was assistive in creating a space where all involved could work as a team.

**Limitations of the study**

There were several limitations to this study. First, it was a small qualitative study that included only eight teachers, all from the same resource rich school district. Most of the findings from this study can be considered when examining similar schools, but cannot be broadly generalized. Although a great deal was learned about each of the eight teachers in the study, data gathered about individual teacher factors was reflective of only a small number of study participants, making it difficult to draw conclusions. Second, my role as researcher was difficult to separate from my role as math supervisor. Data collected in the teacher interviews must be considered in light of the dual roles I played. Third, my research design could have been improved with the addition of a comparison group. For example, if one group of teachers participated in professional team meetings and one group did not, more could have been learned about the potential of professional learning teams. Finally, it would have also been beneficial if the study continued over the
course of a second year to see how participation with the new curriculum changed as teachers became more familiar with the resource.
CHAPTER 4: THE NATURE OF THE WRITTEN RESOURCE

In order to effectively analyze teachers’ participation with the Math in Focus resource, I first sought to understand the way the resource itself might shape participation through its form and features. In this study, the written resource was conceptualized as a tool for teachers that provides a set of mathematical underpinnings and pedagogical strategies through its tasks, forms of address and educative supports. Math in Focus, as a written resource adapted from the Singapore national curriculum, may indeed be different in its mathematics and pedagogy as well as its presentation to teachers and students. Each of these facets of the curriculum may influence teachers’ participation with the resource.

In this chapter, I outline the Singapore national curriculum, the antecedent of Math in Focus, by describing the Singapore Mathematics Framework and the Model Method. The Framework is an umbrella that highlights Singapore mathematics and pedagogy; the Model Method illustrates a particular strategy designed to support students in problem solving. I then describe Math in Focus more specifically by describing the forms of address and organization as well as its mathematics uncovered in an examination of Chapter 4 (2013). Following this descriptive detail, I identify and then analyze the potential challenges associated with MiF and evaluate the teacher supports provided by the resource.

The Singapore Math National Curriculum

*Math in Focus (MiF)* is a U.S textbook series written for grades K-8 and adapted from the most used Singapore national curriculum resource, *My Pals are Here* (Marshall-
Cavendish, 2013). MiF is also published by Marshall Cavendish and distributed in the United States by Houghton Mifflin Harcourt. The Singapore national curriculum is guided by the Singapore Mathematics Framework, which aims to set the direction for mathematics teaching, learning and assessment from elementary to advanced levels (Hong, K.T., Mei, S. Y. & Lim, J., 2009). Developed in 1990 and revised in 2000 and 2003, the Mathematics Framework emphasizes the development of problem-solving skills and identifies five components critical to the development of mathematical problem solving ability: Concepts, Skills, Attitudes, Metacognition and Processes. Figure 4.1 below shows the framework and the centrality of mathematical problem solving to the five components.

Figure 4.1. Singapore Mathematics Framework
The mathematical concepts component of the Framework represents six areas of conceptual knowledge that should be explored in depth and in an interconnected way. The skills component represents areas of procedural expertise in which students should be come competent. Mathematical processes include the types of thinking associated with mathematics including analysis, logic, the use of mathematical language and vocabulary and mathematical sense making. Also included in the processes component is the set of thinking skills and heuristics designed to assist students with problem solving. A fourth component of the Singapore Mathematics Framework is metacognition, the ability of students to think about and regulate their thought processes when solving problems. Finally, the attitudes component refers to affective parts of learning mathematics, including beliefs, interest, confidence and perseverance.

**The Model Method.** Because the model method is a prominent feature of Math in Focus and because it was a new way of thinking for the teachers in this study, it is assistive to understand a bit more about the method itself. Research from Singapore suggests that the use of representations after concrete examples, but prior to the development of abstract algorithms, allows children to access higher-level mathematics before they learn the language of algebraic abstraction, helping young math learners create a bridge from arithmetic to algebra (Author?, 2009). A key component of the Singapore Math Curriculum is the use of diagrams or models to represent information given in a word problem. Known as the Model Method, it was developed in the 1980’s to address primary aged children’s difficulties with real world problems and is commonly taught in Singapore classrooms. The Model Method develops mathematical concepts by
first using concrete models, and then using visual representations, usually pictures or models, and finally connecting these with abstract algorithms or procedures. This is referred to as the Concrete-Pictorial-Abstract (CPA) approach to concept development (HMH, 2013).

In the Model Method, students use rectangular bars to represent known or unknown mathematical quantities and their relationships in a word problem in order to visualize the problem, write the appropriate number sentence, and then solve the problem (2009). Dr. Yeap Ban Har, an experienced educator who works regularly with the Singapore Ministry of Education to plan and develop math curriculum, describes the use of model drawing this way:

Apart from problem comprehension, the model method is also a form of problem representation that helps students gain a deeper understanding of the operations they may use to solve problems. Instead of relying on keywords and superficial features of a word problem, the model method helps students see the relationships between and among the variables in the problem. (p. 4)

Both the Singapore Mathematics Framework and the Model Method for developing problem solving expertise are critical features of the Math in Focus series.

Math in Focus: Singapore Math – an Introduction

Structure, Look and Voice of Math in Focus

Remillard defines the form of address of a curriculum resource as “what teachers actually see, examine, and interact with when using a curriculum resource” (p. 108, 2012. In particular, the structure refers to how the resource is organized and what is contained within it, look to the visual appearance of the resource and voice to how the authors are represented and how they communicate with the teacher. I used these terms to describe
features of the MiF teacher resource in order to provide context for teachers’ participation with MiF. Beginning with grade 1, the Math in Focus series has two student texts (A & B), two student workbooks (A & B) and two teacher resource guides (A & B), as well as accompanying resources commonly found in U.S. published mathematics series, including reteaching extra practice, enrichment and assessment materials. Online materials for student use and teacher support are also available for each grade level. Each grade’s student and teacher texts are organized into topical chapters with 1-7 lessons in each chapter. Each lesson in the student text includes mathematical content in the form of instruction and both guided and independent exercises. In my examination of the table of contents of for MiF grades 1-5, I noted that the first chapter is always a whole number and place value chapter, followed by several chapters that focus on whole number operations and mental math. Chapters on geometry and data analysis typically occur later in the text.

My study focused on the Grade 2 curriculum as found in the MIF Teacher Resource Guide (2013) and its accompanying materials. In this section of the chapter, I first examine the structure, look and voice of the MiF teacher resource as identified by Remillard (2012). Then, of the 19 chapters in the second grade MiF text, I specifically examine Chapter 4 Using Bar Models: Addition and Subtraction and Chapter 16 Using Bar Models: Multiplication and Division. Study participants responded to interview questions on these two chapters on bar models and how to use them with whole number operations. Teachers answered questions about which sections of the guide they used and which were the most useful to them and why.
**Organization of the Teacher Resource.** The Grade 2 MIF teacher resources include two Teacher Guides, one for Book A and one for Book B, soft bound books that contain reteach, enrichment and extra practice materials, assessments, school to home connection notes and a transition guide for teachers. All of these materials are also available on the HMH publisher’s website ThinkCentral (https://www-k6.thinkcentral.com) along with online-only resources, like student interactivities and professional development resources as in Figure 4.2 below.

![Image of teacher resources]

**Figure 4.2.** ThinkCentral Website Sample
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The guide is organized as a traditional spiral bound text with pictures of the student pages and with both explicit and descriptive information for the teacher located below the pictures of the student pages. Answers to Guided Practice and Let’s Practice are in the teacher resource as are worked problems from the student workbook. The pages provide a number of different resources to support the teacher and the guide is similar to other commercially published texts in its look and feel. Each Chapter in the second grade MIF
teacher resource follows a similar organization, although the numbers of lessons varies depending upon the concept. As a specific example, **Chapter 4 – Using Bar Models: Addition and Subtraction** (2013) contains 12 pages of background for the teachers followed by four lessons, a Problem Solving Thinking Cap, a Chapter Wrap-up and an Assessment with a suggested timeline of 10 days. The teacher background material begins with a single-page chapter overview that contains sections called Math Background, Cross Curricular Connections and Skills Trace.

The Math Background describes in several paragraphs what children learned in previous chapters of the grade 2 curriculum and what strategies, skills and concepts they would learn in the upcoming chapter. It also provides a justification for learning and using bar models and suggests possibly spending extra time on this chapter. Cross Curricular Connections provides two activities, one related to reading and one related to art. The reading activity lists a book that might be appropriate to the chapter while the art activity has students rolling clay into different lengths to show the part-part whole bar model concept. The Skills-Trace section describes in one sentence the learning trajectory for the solving addition and subtraction problems by listing what children learned in grades 1, 2 and 3. This page also directs teachers to additional math background, Singapore math pedagogy and parent support videos available at [https://www-k6.thinkcentral.com/ePC/start.do](https://www-k6.thinkcentral.com/ePC/start.do) in Figure 4.3 below.
The second section of the chapter lists differentiation resources by lesson for ELL, struggling learners, on level learners and advanced learners. It provides suggestions for types of activities that might assist these students if they are struggling, challenged by or outstripping the material. This is followed by a listing of the location and page numbers of assessment resources for prior knowledge, ongoing diagnostic and formal evaluation along with remediation options for each unit objective. An example of the differentiation resource page is pictured in Figure 4.4 below.
The section following contains a planning and pacing guide that describes pacing, objectives, vocabulary, resources and materials needed for each lesson as well as the associated Common Core State Standards and Mathematical Practices. Often, the authors suggest that lessons be delivered over more than one day. At the end of the planning guide additional implementation resources are listed as well as a list of digital resources for teachers. The first page of this planning guide is pictured in Figure 4.5 below.
**Figure 4.5.** Chapter 4 Planning Guide, Grade 2.

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Page 92 of Chapter 4 is the first page explicitly correlated to the student text. It has an introductory page, which lists all the lessons and vocabulary in the unit. Student book pages are shown on part of each page, with teacher information to the left and underneath as in the example below (Figure 4.6).
Individual lessons contain lesson objectives, materials, both digital and hard copy resources and a five-minute warm-up. Student book pages are again shown and are accompanied by sections labeled Teach, which describe how to represent problem situations with a concrete model, prompt students for a pictorial model, introduce the new learning, and write the abstract mathematical work to accompany the pictorial model. Ideas for utilizing the guided practice section are
also included. All chapters in the teacher guide are similar in organization, structure and voice.

At the end of each of the chapters, teachers are provided with a blank section, where they can write notes to themselves about the chapter. Teachers are instructed to use the Chapter Wrap-Up in the student text to review using bar models to solve one and two step addition and subtraction problems. A chapter review with answers and a chapter test is provided in the student workbook and shown in the teacher resource.

For the purposes of this study, it is important to identify significant changes in mathematical content between what study participants experienced when using the SFAW text and what they would experience with MiF. I used the Teacher Resource guide and the electronic Think Central website to analyze the mathematics in Chapters 4 and 16, the two Math in Focus second grade chapters that introduce bar modeling, because the model method was new to both the students and the teachers in this study and representative of both the Concrete-Pictorial-Abstract development and the problem solving framework that are integral to a Singapore approach. Below I give a general description of the mathematics in Chapter 4 then more carefully describe how it is developed in each of the four lessons in order to illustrate how the curriculum builds from developing a mathematical concept to applying that concept to solve a problem. Chapter 16, organized similarly, assumes an understanding of using bar models from Chapters 4, 7, 8, and 9, multiplication as equal groups and division as equal shares. In three lessons over four days, Chapter 16 describes bar model use in multiplication and division, then applies these skills to problem solving for measurement and money.
Mathematical Underpinnings and Pedagogical Strategies of Chapter 4

In Chapter 4, students are presented with two types of bar models, a part-whole model and a comparison model. “In the part-whole model, two or more subsets (the parts) make up a set (the whole). Rectangular bars are used to represent the quantities that form the parts. The relative lengths of the bars help students see and understand the relationships between the quantities” (Yeap, B. H., 2010). “In problems involving the comparison model, one quantity is compared to another. In additive comparison, one quantity is a discrete amount more or less than another quantity” (2010).

Teachers learn what prerequisite knowledge is expected from the Skills Trace and Recall Prior Knowledge sections of the guide. In Chapter 4, background knowledge from grade 1 included practice modeling quantities with concrete materials like unifix cubes and 10 trains as a precursor to representing quantities with bar models (Figure 4.7). Children in first grade also learned to use number bonds to support their understanding of addition and subtraction (MiF, Grade 1, p. 28A).

![Figure 4.7. Number Bonds and 10 trains.](image)

Other requisite knowledge, addition and subtractions of numbers up to 1,000 with and without regrouping, is taught in grade 2 chapters 2 & 3. Chapter 4 introduces bar
models as a more abstract representation of the number bonds, 10 trains and unifix cubes used in grade 1. The bar models in Chapter 4 are used primarily to support student understanding of addition and subtraction problems in real-world contexts for both part-whole and comparison problem solving situations (Figure 5.8 and Figure 5.9 below). At this point the text also introduces word problems with two steps and demonstrates the use of bar models to help write addition and subtraction sentences to solve two-step word problems.

![Figure 4.8. Bar Models Part-Whole for addition and subtraction (p. 96)](Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company)

![Figure 4.9. Comparison Model (p. 109)](Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company)
Lesson 1: Part-Part Whole in Addition and Subtraction. Day 1 develops part-whole bar models for addition and subtraction by relating them to a concrete representation, unifix cubes, and then using the more abstract bars to solve real-world problems like this addition example on p. 96. (Figure 4.10)

Figure 4.10. Bar Model Development (p. 96)
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Although this problem does not require regrouping, later addition and subtraction problems in this lesson and subsequent lessons do so. The text guides students to write their answers as equations, then write a sentence, then check their work. Although the worked problem and guided practice contain two-digit addends and two-digit subtrahends with simple regrouping, the independent practice problems are more difficult, containing three digit addends and three digit subtrahends and minuends. All of the problems in this lesson are one-step (one equation) problems.

Lesson 2: Adding On and Taking Away Sets (103-108A). In this lesson, students experience addition as joining sets and subtraction as taking away sets. They are
also exposed to addition and subtraction as inverses of each other by being asked to work backwards to check their work. Students practice the skills of adding and subtracting sets while continuing to work on drawing bar models. Most of the problems continue to be one step, with the exception of this multi-step problem found in the student workbook pages (Figure 4.11).

4. Kayla has 9 puzzles.
   Her mother gives her 8 more puzzles.
   Her uncle buys another 5 puzzles for her.
   How many puzzles does Kayla have now?

\[ 9 + 8 + 5 = 17 + 5 = 22 \]

She has \( \boxed{22} \) puzzles now.

Figure 4.11. Multi-step problem (p. 78)
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Lesson 3: Comparing Two Sets (109-114A). In this lesson, students learn to use a comparison bar model to represent the known and unknown quantities. They continue to work on addition and subtraction with regrouping and recognizing addition and subtraction as inverses of each other.
Lesson 4: Real-World Problems: Two Step Problems (115-123A). Students use what they have learned about bar models to solve two-step addition and subtraction problems (Figure 4.13).

Figure 4.12. Comparing Two Sets (p. 109) Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

Summary. It is evident in these four lessons that Math in Focus carefully develops the use of model drawing as a tool to help students visualize whole number addition and subtraction situations so they can construct relevant number sentences. The CPA
approach is visible in Lesson 1, as generic concrete unifix cubes give way to representative bar models. The part-whole relationship between numbers that can be described by bar models is also taught in Lesson 1. Lessons 2 and 3 develop the idea of sets and the second number relationship that can be described by the model method, additive comparison, where one quantity is compared to another. Finally, in Lesson 4, students are expected to apply what they have learned to construct bar models and develop appropriate numbers sentences to solve problem situations, using either of the two methods. Chapter 16, organized similarly, assumes as background knowledge an understanding of using bar models from Chapters 4, 7, 8, and 9, and multiplication as equal groups and division as equal shares from Chapter 5. In three lessons over four days, Chapter 16 describes bar model use in multiplication and division, then applies these skills to problem solving for measurement and money.

Possible Challenges of the MiF Text

Based on my analysis and my knowledge of the teachers in my district, I conjectured that in addition to the general newness of the MiF series, the form, mathematics, and pedagogy of the Math in Focus curriculum would present challenges to the teachers in this study. Despite the similarity in qualities like look, feel and genre, there were several differences in lesson management, and assessments. MiF has a different approach to presenting certain mathematics topics and an accelerated timeline for presenting certain topics. These potential challenges are summarized in Table 5.1 along with indicators of the particular aspects the teachers are likely to find challenging. I elaborate upon these challenges following.

72
Table 4.1
Possible Challenges of the MiF Curriculum and Teacher Resource (continued on page 74)

<table>
<thead>
<tr>
<th>Form</th>
<th>Why</th>
<th>Mathematics</th>
<th>Why</th>
<th>Pedagogy</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery curriculum</td>
<td><em>SFAW was a spiraling curriculum</em></td>
<td>Model drawing</td>
<td><em>New method of organizing information in word problems</em></td>
<td>CPA approach</td>
<td><em>New method of developing concepts</em></td>
</tr>
<tr>
<td>Lesson management</td>
<td><em>SFAW was organized as one lesson per day</em></td>
<td>Multi-step problems</td>
<td><em>Level of interpretation needed much higher</em></td>
<td>Developmental readiness</td>
<td><em>New expectations for student achievement</em></td>
</tr>
<tr>
<td>Assessment differences</td>
<td><em>Teachers previously created their own assessments</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Newness**

Most simply, the MiF curriculum was new for all the teachers in the study. The previously used math series had been in place for 20+ years and was part of the culture and identity of teachers and schools in the system. Important curriculum features and ways to use the text were passed on to new teachers through more experienced teachers. Transitioning to MiF meant asking teachers to abandon their old materials and adopt new materials, which are structurally different than the previous materials and need more attention and thought to enact. This took teacher time and commitment, requiring teachers to thoroughly examine the new resource to design each unit and lesson. It also
required more explanation for parents and added another level of ambiguity to conversations about student progress. Multiple different materials located both as hard and online products provide a lot of resources, which take time to examine and organize for instruction.

**Form**

Besides being a new text, different for both teachers and parents and subject to the challenges that change brings, three distinct form differences emerged in my study of the curriculum: a) lesson management, b) assessment differences, and c) a tendency toward mastery rather than a spiraling progression through the text.

**Lesson Management.** Twenty-three of the 74 individual lessons in Math in Focus are paced by the authors to last several days. For example, Lessons 1-3 in Chapter 4 are paced out at 2 days and Lesson 4 of Chapter 4 is given only 1 day. The teacher resource does not provide explanations of how the student workbook and differentiation resources are connected to each day’s lesson, making it difficult to identify which parts of the workbook and differentiation resources to use each day. Teachers would need to do the student practice problems to select and be sure of what they were assigning to students for independent practice need to do the student practice problems to select and be sure of what they were assigning to students for independent practice.
Assessment Differences. The assessments in Math in Focus are significantly different than the previously used assessments. MiF assessments, have suggested point totals and time limits, include multiple choice, short answer and extended response questions and use novel problems from time to time. The Chapter 4 assessment is worth 25 points and is to be completed in 30 minutes. This assessment contained 12 questions; five multiple choice, five short answer and two extended response. Each multiple choice and short answer was worth two points. One extended response was worth 2 point and the other three points. Each of the 12 problems was a word problem where children were expected to apply their understanding of addition and subtraction and bar models to solve as in the example below (Figure 4.15)
Rather than ask students to draw the bar model themselves, a procedure which teachers taught, the bar model was drawn for the students in ten of the 12 problems assessment problems. In the text, lesson 4 is on two-step word problems, yet none of the problems on the Chapter 4 assessment require two steps. The form these assessments took in look and genre might easily surprise teachers in this study, used to creating their own assessments.

**Mastery vs. Spiraling Curriculum.** Math in Focus bills itself as a mastery curriculum. Rather than spiral back to previously learned topics as part of independent practice or assessments, MiF provides a Recall Prior Knowledge section at the beginning of each chapter and supplemental resources for assessing children’s prior knowledge and chapter readiness with a Chapter pre-test in the Assessment booklet. In Chapter 4, the recall prior knowledge section includes adding and subtracting with and without
regrouping (taught in Book 2, Chapters 2 and 3), using subtraction to check addition and solving simple addition and subtraction word problems, both learned in grade 1. If students present a need in any of these concepts, the Transition Guide gives suggestions for where to find remediation in the teacher resources (See Figure 4.16).

**Chapter 4**

**Addition and Subtraction of Whole Numbers**

*Grade 2 Pre-Test Questions*

**ITEMS 1–3**

**Objective**

Identify the number that is greater than or less than another number.

**Grade 1 Reteach**

1A Ch 1 Worksheet 2 pp. 9–16

**Grade 1 Extra Practice**

1A Lesson 1.2

See also the Transition Guide

pp. 1–3

**Figure 4.16** Example of transition Guide for Chapter 4. Images from *MATH IN FOCUS*. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

**Pedagogy**

**Concrete-Pictorial-Abstract (CPA) Approach.** Although the abstract algorithms advanced by the MIF curriculum are the same as teachers typically use from commercially developed curricula, MiF develops these algorithms differently. Each new topic is developed through attention to a concrete or hands on experience, where manipulatives are used to explain abstract concepts. This is followed by a pictorial experience; pictures, models and diagrams are used to present examples with solutions.
Finally, abstract algorithms with only numerals, mathematical notation and symbols are used once students have experienced the concept concretely and pictorially (Figure 4.17).

**Figure 4.17. CPA Approach, p. T9.** Images from *MATH IN FOCUS.* Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

In the Grade 2 teachers’ guide, teachers are specifically told to use manipulatives for lessons. Chapters 1-3 on place value and three digit addition and subtraction recommend base 10 blocks and place value charts be used to develop understanding of ones, tens and hundreds before reading and writing numbers in standard, expanded and word form or using the algorithm for addition and subtraction with and without regrouping. Chapter 4 introduces bar models as a pictorial representation for an equation and Chapter 5 introduces multiplication as equal groups and division as equal shares with counters and cubes before using pictures of equal sized groups. This CPA approach is continued throughout each chapter of the Grade 2 text. Teachers in this study have typically used manipulatives on occasion, but to use them on a regular basis, for an extended period of
time, in order to carefully develop conceptual understanding was not something they would expect to be considered good practice.

**Earlier Introduction of Concepts and Procedures.** Compared to a previous curriculum guide, MIF is conceptually advanced for the grade level. Addition and subtraction of three digit numbers and across zeros are topics taught in MiF Grade 2, these were previously taught in grade 3. The depth of the multi-step problems is much more intense than the previous curriculum and multiplication and division in SFAW was not introduced until third grade.

**Mathematics**

**Model Drawing.** The use of model drawing for problem solving is new to the teachers in this study and requires them to rethink the way problem-solving strategies are presented and unpacked for students. The use of bar models appears in the scope and sequence and in Grade 2 chapters as follows (pp. T31-T44). As discussed previously, bar models are used throughout the second grade text. Teachers are expected to know, understand and teach both part-whole and comparison bar models for addition, subtraction, multiplication and division. Teachers need to understand that the length of the rectangular bars should be drawn in proportion to each other, as far as possible. They need to emphasize that the available information in a problem be recorded onto the model and to use question marks to indicate the unknown information. It is also recommended that teachers show students how to use dotted lines in comparison bar models when a model needs to be transformed (Yeap, B. H., 2009).
Multi-Step Problems. Students are expected to be proficient at solving multi-step problems that present in several ways. One way is straightforward as in Figure 4.18.

41. David is 171 centimeters tall.  
    Owen is 12 centimeters shorter than David.  
    Ronald is 8 centimeters taller than Owen.  
    How tall is Ronald?

Figure 4.18. End of year assessment problem, Grade 2. Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

Students need strategies for unpacking the word problem and determining what they are being asked to do. They need to apply the appropriate problem solving strategy. They also need to subtract with regrouping and then add with regrouping.

Proficiency in a second type of multi-step problem is also expected Figure 4.19.

42. Nina is taking her 2 nieces and 2 nephews to a concert.  
    How much must Nina pay for the tickets altogether?

<table>
<thead>
<tr>
<th>Tickets for Concert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
</tr>
<tr>
<td>$5</td>
</tr>
</tbody>
</table>

Figure 4.19. End of year assessment problem, Grade 2. Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

In this problem, students need to notice that there is one adult and four students, as this is not explicitly stated. They then need to multiply or add 3 four times, then add that total to five to get the correct answer.
Analysis of the Supports Provided by the Teacher Resource

As noted in my literature review, the nature of the curricular resource helps shape teachers participation with it. The form of MiF including the look, voice, genre and layout of the teacher text can influence the way teachers engage and interact with the resource (Remillard, 2005). If the resources are educative (Collopy, 2003; David & Krajcik, 2005; Ball & Cohen, 1996; Hill & Charalambous, 2012; Remillard, 2000 & 2011) teachers are better able to enact and maintain the rigor of high-level tasks. Teacher resources can help teachers by providing information about the authors’ intentions and about what to expect from students in response to the tasks provided in the text. The resource can also help teachers learn the mathematics and the practices of the discipline as related to the content of the student text.

Form

Look and Genre. The authors and publishers of Math in Focus appeared to have made attempts to respond to possible criticism about new and possibly foreign materials by creating teacher resources that followed a similar structure and form to traditional American resources. The spiral bound binder, teacher pages that included an inset student page, additional resources like extra practice, reteach and enrichment and a pacing guide, all followed American-made publisher textbooks in structure and form. For teachers in this study, the MiF resources also looked and sounded similar to SFAW, which was the previously used math series.

Also similar to American commercially published elementary math textbooks, Math in Focus teacher support was offered on a publisher supported website that
accompanied the MiF teacher texts. The website provided an array of online resources, some of which were also available to support families. A Home to School Connection newsletter was available to introduce the textbook and to introduce each chapter. Parent videos were also available to help families with particular concept and skills. Each chapter in the Grade 2 teacher resource was set up similarly so that teachers could experience a routine in their planning. Teachers could rely on the fact that each chapter opened with a pretest, a section on recalling prior knowledge, a series of lessons with similar accompanying teacher supports, workbook answers, a chapter wrap-up and an assessment.

Voice. Remillard defines the voice of a curriculum resource as the way the authors communicate with the teacher by either explicitly telling the teacher what to do or describing for the teacher the main ideas of the resource (p. 112, 2012). Chapter 4, Grade 2 was a combination of explicit and descriptive communications from the authors, with most of the descriptive information provided as introductory information. Using a section header as a unit of analysis, I examined Chapter 4 to identify descriptive, explicit and combination teacher scripts. The Chapter Overview tended to explain the math background and was descriptive in nature. Online support videos are also of the descriptive category, as they provided math background for the teacher and parent. Differentiation Resources were more explicit, telling the teacher exactly what to select for each particular type of student and where to look for the information. The Chapter Planning Guide was a combination of both descriptive and explicit scripts, describing the objectives, standards and accompanying mathematical practices as well as explicitly
stating what materials are needed and where to look in the resource materials for additional independent practice or instruction. Most of the teacher material associated with individual lessons was of a more explicit nature, talking through the teacher. The results of my analysis for Chapter 4 are summarized here.

Table 4.2

Descriptive and Explicit Scripts in Chapter 4

<table>
<thead>
<tr>
<th>Descriptive Scripts Only</th>
<th>Explicit Scripts Only</th>
<th>Both Descriptive and Explicit Scripts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quick Check</td>
<td>• Differentiation</td>
<td>• Common Errors</td>
</tr>
<tr>
<td>• Math Background</td>
<td>• Resources</td>
<td>• Math Journal</td>
</tr>
<tr>
<td>• Skills Trace</td>
<td>• Best Practices</td>
<td>• Hands-on Activities</td>
</tr>
<tr>
<td>• Lesson Objectives</td>
<td>• Assessments</td>
<td>• Thinking Caps</td>
</tr>
<tr>
<td>• Let’s Practice</td>
<td>• 5-Minute Warm-ups</td>
<td>• Guided Practice</td>
</tr>
<tr>
<td>• Big Idea</td>
<td>• Practice and Apply</td>
<td>• Planning Guide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Learn</td>
</tr>
</tbody>
</table>

Educative Features

Teacher resources that promote teacher learning in addition to student learning are known as educative (Davis & Krajcik, 2005). These include explanations of the mathematics, purposes of the included mathematics and the presentation of high-level tasks as well as possible student responses. Because problem solving and the model method are mathematical and pedagogical cornerstones of the Singapore approach, I selected the two chapters that introduce the bar model heuristic in MiF Grade 2 to examine and evaluate with respect to the support provided by the text for teacher learning and implementation based on the potential challenges for teachers using this series for the first time. These two chapters, I reasoned, would be most different for the teachers and
provide insights into how teachers engaged and interacted with a new textbook series when the material was unfamiliar.

In order to determine the extent to which the MiF teacher materials are educative, I examined *Book 2A, Chapter 4: Using Bar Models: Addition and Subtraction* and *Book 2B, Chapter 16: Using Bar Models: Multiplication and Division* by modifying Remillard (2011) and Davis & Krajcik (2005) into the coding scheme below.

Table 4.3
Coding scheme for educative features of the MiF teacher resource

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Description of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Anticipating student thinking</td>
<td>Does the section describe what to expect from the students</td>
</tr>
<tr>
<td>M</td>
<td>Learning the math and the practices of the discipline</td>
<td>Does the section assist the teacher in understanding the mathematics and the pedagogy associated with teaching the students</td>
</tr>
<tr>
<td>S</td>
<td>Fostering teacher reflection on practice</td>
<td>Does the section ask the teacher to consider how the lesson unfolded</td>
</tr>
<tr>
<td>W</td>
<td>Making authors' intentions visible</td>
<td>Does the section clarify what the authors are trying to accomplish</td>
</tr>
<tr>
<td>C</td>
<td>Promoting curriculum adaptation</td>
<td>Does the section encourage teachers to adjust the lesson to accommodate student needs</td>
</tr>
</tbody>
</table>

The unit of analysis I used was the header for each section and it was coded for any feature contained in the section. For example, in Figure 4.20 a section called *Common Error* relates what a student might do during independent practice for comparing bar models and then tells the teacher explicitly what to do in that case.
**Common Error** Some children may not understand what the problem is asking for. Write the problem on the board, and then read it aloud. Ask some children to circle the comparison terms **fewer** and **more**.

**Figure 4.20.** Common Error (p. 102) Images from *MATH IN FOCUS*. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

I coded this as A: Anticipating Student Thinking since it describes possible student thinking. I also coded this as M: Learning the Math and the Practices of the Discipline since the paragraph suggests a) writing the problem; b) reading aloud and c) circling vocabulary for comparison like fewer and more. As another example, this Guided Practice section explains what the exercises do for students. It also suggests several strategies for supporting student practice.

**Guided Practice** (page 113)

These exercises provide further practice in comparing sets involving addition or subtraction. Ask children to explain how they chose whether to add or subtract to solve each problem. Encourage children to draw bar models to represent each problem, and then write the addition or subtraction sentence to solve the problem. Remind children to check their answers with their partners by working backward. See Additional Answers, page T65.

**Figure 4.21.** Guided Practice (p. 113) Images from *MATH IN FOCUS*. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

I coded this as W: Making the authors’ intentions visible since it explains the purpose of the exercises. I also coded this section as M: Learning the Math and the Practices of the
Discipline because it provides three pedagogical strategies: a) asking children to explain their choice of addition or subtraction; b) encouraging children to draw bar models to represent each problem before writing an equation and c) reminding children to check their answers.

**Findings.** My analysis of the educative features suggests that as teachers participate with this curriculum in these chapters, they will likely find support for Learning the Mathematics and Practices of the discipline as forwarded by *Math in Focus*. They will also likely be able to learn what the authors’ intend with each part of the student text. The educative supports in these two chapters, however, do not provide much in the way of Anticipating Student Thinking or Fostering Reflection on Practice and even less on Promoting Curriculum Adaptations. The findings for my analysis of educative features are summarized in Table 4.4 below and explicated afterwards.

Table 4.4
Results of educative features analysis

<table>
<thead>
<tr>
<th>MIF Chapter</th>
<th>Total Units Coded</th>
<th>Anticipating Student Thinking</th>
<th>Learning the Math and the Practices of the Discipline</th>
<th>Fostering Teachers’ Reflection on Practice</th>
<th>Making Authors’ Intentions Visible</th>
<th>Promoting Curriculum Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 4</td>
<td>50</td>
<td>5</td>
<td>26</td>
<td>5</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Chapter 16</td>
<td>41</td>
<td>4</td>
<td>12</td>
<td>5</td>
<td>23</td>
<td>5</td>
</tr>
</tbody>
</table>

The majority of educative supports in Chapter 4 were in the areas of learning mathematics and the practices of the discipline (26) and in making the intentions of the
authors’ visible (21) out of 50 coded units. In only a few sections, notably, Quick Check, Common Errors and Struggling/Advanced Learners did the authors provide support for anticipating student responses (5) and only 7 supportive headers included fostering reflective practice or promoting curricular adaptations. I also examined Book 2B, Chapter 16: Using Bar Models: Multiplication and Division to see if there was a similar distribution of educative supports. Making the Author’s Intention Visible was the primary educative support in Chapter (23) followed by Learning Math/Practices of the Discipline (12) out of 41 coded units. Again there was little support for anticipating student responses (4) and supporting autonomy for teachers (10). Perhaps because this chapter is a follow up to the initial bar modeling chapter (4) and because bar models were reviewed in the measurement chapters, the authors felt less of a need to provide information on the mathematics or its practices.

Teachers may tend to feel uncomfortable making adaptations to the curriculum and thinking about the outcomes of the lesson they teach. They may also be surprised by how students might react to some of the materials contained in the lessons and therefore feel disappointed or somewhat betrayed by the curriculum. Because the educative features tend to tell the teacher what to do and why but fail to tell the teacher what might happen and what to do if it does, teachers might have a difficult time trusting the curriculum as they will not have much recourse when things do not go as the resource suggests.
How the Written Resource Matters for Curriculum Use

Overall, my analysis found mathematics, pedagogy, forms of address and educative features that might influence teachers’ participation with the Math in Focus resource. The Model Method and the Conceptual-Pictorial – Abstract approach to concept development are likely to be new to teachers in this study. The emphasis on multi-step word problems and the inclusion of novel problems on the assessments is a different focus than these teachers had previously and management of the new resources may challenge their identity and agency. A shift to a more mastery than spiraling curriculum along with an earlier introduction of some concepts and procedures may challenge teachers’ beliefs about teaching and learning.

The publishers of Math In Focus took great care to create a form of address that looked similar to other American commercially published math texts and I anticipated that the look and feel of the Math In Focus teacher resources would be well-received at first glance by the teachers in this study. The chapters I examined had a combination of explicit and descriptive scripts. MiF speaks both to and through teachers although the chapters reviewed in this study lean more heavily towards speaking through teachers via scripts and guided lessons than speaking to teachers through educative features. The seeming familiar look of the MiF text may have given the teachers in this study an initial feeling of comfort when first participating with the materials. It is possible that they will feel surprised and perhaps somewhat betrayed by some of the differences between MiF and SFAW.
The educative features found in Chapters 4 and 16 tended to be more supportive to teachers in their explanations of the math and accompanying practices and their descriptions of the authors’ intentions than they were in helping teachers anticipate student responses and encouraging them to adapt the material to design their own lessons. I might speculate that the lack of support for anticipating student responses to the new material creates a condition where teachers will struggle to maintain rigorous task quality. Because the text does not appear to easily lend itself to teacher adaptations, these study participants will need to find other avenues to navigate the challenges posed by this curriculum.
CHAPTER 5: INDIVIDUAL TEACHER FACTORS THAT INFLUENCE PARTICIPATION WITH MATH IN FOCUS

My research question: “what personal and curricular characteristics influence teachers’ participation with a new curricular resource” guided the examination of three individual teacher factors: teacher beliefs and knowledge, teacher agency and identity, and teacher orientation toward curriculum materials. In this chapter, I first remind the reader of my overarching conceptual framework and the methods used to analyze the data related to this research question. In Table 5.1, I introduce the teachers. Table 5.2 summarizes my analysis of the individual teacher factors. In the body of this chapter I examine patterns that emerged from the analysis, develop individual profiles of the participating teachers and analyze their responses to the data collection. This is organized by an overarching individual teacher factor, orientation toward curriculum. In closing, I hypothesize how these factors might influence teacher participation with MiF. For more information about the development and analysis of the questionnaire and interviews, please refer back to Chapter 3: Methods.

Conceptualizing and Analyzing Teachers’ Participation with Curriculum Resources

The conceptual framework guiding my research is based on the notion that curriculum use is a participatory process between teacher, text, and the community of teachers in which they work (Remillard, 2005). My research suggests that activities of teacher-text participation are influenced by specific individual teacher factors, the nature of the curriculum resource itself and the context in which it is used. This chapter focuses
on three specific individual teacher factors: beliefs about teaching and learning, professional agency and identity and orientation toward curriculum materials.

**Teacher beliefs about teaching and learning.**

To actualize my conception of teacher beliefs about teaching and learning, each study participant completed a 20-question questionnaire adapted from Ball (1998) and Kennedy, Ball & McDiarmid (1993). As shown in Table 5.1, questionnaire responses were grouped and sorted into four belief categories based upon a combination and modification of the categories developed by Ball, Kennedy & McDiarmid. This resulted in three analyzed areas of interest: teacher beliefs about second grade students as learners, teachers’ view of themselves as instructors, and teachers’ view of mathematics. Questionnaire responses about second grade students as learners, which focused on their ability, were included in the individual teacher profiles, but eliminated from the analysis because, in this group of teachers, there was no discernible difference in their survey answers.

**Table 5.1: Questionnaire Grouping Scheme**

<table>
<thead>
<tr>
<th>Belief Category</th>
<th>Relevant Questions</th>
<th>Grouping Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second Grade Students as Learners (learning)</td>
<td>2, 3, 6, 7, 8, 9, 10, 11, 20</td>
<td>+ Additive or Constructing Knowledge/ + Social or Independent</td>
</tr>
<tr>
<td>Second Grade Students as Learners (Ability)</td>
<td>1, 12, 14</td>
<td>+ Value of Ability</td>
</tr>
<tr>
<td>Teacher Views of Themselves as Instructors</td>
<td>11, 13, 17, 18, 19</td>
<td>+ Transmission or Facilitative Teaching/ + Feeling of Confidence</td>
</tr>
<tr>
<td>Teacher Views of Mathematics</td>
<td>4, 5, 6, 7, 9, 10, 15, 16</td>
<td>+ Way of Thinking or Rules and Procedures or Body of Knowledge</td>
</tr>
</tbody>
</table>
Professional agency and identity

My conception of teacher identity is based upon commonly held definitions of teacher identity as a story to live by, typically communally sustained through significant endorsable stories that teachers tell others and that they tell themselves (Clandenin & Connolly, 1996; Sfard & Prusak, 2004; Skinner & Cain, 1998). I used the two interviews of each participant to gather evidence about the intrinsic and extrinsic value each teacher found in their work, their commitment to lifelong learning and their confidence in their pedagogy and mathematical content knowledge. To draw inferences about teacher agency I relied on the definition of agency posed by Biesta & Tedder (2006) and Bandura (2001) as the capacity for intentional, autonomous action on behalf of what matters to them. I again used the two interviews to look for evidence of teacher empowerment about curriculum and instruction as it related to the Math in Focus curriculum.

Orientation toward curriculum materials

The two individual teacher interviews were also used to capture teachers’ orientation toward math curriculum materials using the lens of Remillard & Bryans (2004). In their 2004 work these authors suggest that teachers have a stance toward curriculum materials, which influences how they participate with curriculum materials to design instruction. As described in the individual teacher profiles, the study participants tended toward three primary stances in their orientation to MiF, that of follower, learner and interpreter. Study participants whose stance was that of follower believed that curriculum materials were to be used as written and that they needed to follow the script
as designed by the textbook. Teachers with a learner stance felt that they needed to study curriculum materials to ensure that they understood what the author was intending. Interpreters believed that curriculum materials were designed as a resource to be used at the teacher’s discretion. In Interview #1, I gathered information about the study participants approach to their past curriculum resource, but because Math in Focus was a new curriculum, my analysis primarily reflects teachers’ approaches to new curriculum resources.

Analysis of the Study Participants

This study originally included 10 teachers, five teaching above level second grade math and five teaching on level second grade math. Eight of the teachers completed all of the study components, while two did not complete the interview process. These two were eliminated from the analysis, leaving four on level and four above level teachers. Seven of the eight participants were women and two of those were Africa American women. Their experience ranged from 4 – 24 years. Two had taught across the K-4 grade span and all but one had taught at least two different elementary grades.

Table 5.2
Teacher Demographics (continued on p. 94)

<table>
<thead>
<tr>
<th>Teacher Name</th>
<th>Years of Experience</th>
<th>Grades Taught</th>
<th>Above or On level for MIF</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali</td>
<td>4</td>
<td>2,3</td>
<td>Above</td>
<td>NES</td>
</tr>
<tr>
<td>Sheila</td>
<td>22</td>
<td>1,2,4</td>
<td>On</td>
<td>VFES</td>
</tr>
<tr>
<td>Denise</td>
<td>19</td>
<td>1,2</td>
<td>On</td>
<td>DES</td>
</tr>
<tr>
<td>Teacher Name</td>
<td>Years of Experience</td>
<td>Grades Taught</td>
<td>Above or On level for MIF</td>
<td>School</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>---------------</td>
<td>--------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Dominic</td>
<td>7</td>
<td>2</td>
<td>On</td>
<td>BES</td>
</tr>
<tr>
<td>Theresa</td>
<td>24</td>
<td>K-3</td>
<td>On</td>
<td>NES</td>
</tr>
<tr>
<td>Laura</td>
<td>13</td>
<td>1,2</td>
<td>Above</td>
<td>BES</td>
</tr>
<tr>
<td>Tara</td>
<td>8</td>
<td>K, 2</td>
<td>Above</td>
<td>HES</td>
</tr>
<tr>
<td>Patti</td>
<td>13</td>
<td>K-3</td>
<td>Above</td>
<td>DES</td>
</tr>
</tbody>
</table>

Summary of Findings.

Table 5.3 on the following page summarizes and categorizes what I learned about the beliefs, identity and agency and orientation of the eight study participants from the questionnaire and two interviews. Subsequent to this table, I examine and articulate discernible patterns that emerged from my analysis of the survey and interview transcripts.
Table 5.3  
Teachers Beliefs about Teaching and Learning, Identity and Agency and Orientation towards Curriculum

<table>
<thead>
<tr>
<th>Beliefs</th>
<th>Identity &amp; Agency</th>
<th>Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>View of Mathematics</td>
<td>View of Students</td>
</tr>
<tr>
<td>Denise</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
</tr>
<tr>
<td>Tara</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
</tr>
<tr>
<td>Sheila</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
</tr>
<tr>
<td>Laura</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
</tr>
<tr>
<td>Patti</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
</tr>
<tr>
<td>Dominic</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
</tr>
<tr>
<td>Theresa</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
</tr>
<tr>
<td>Ali</td>
<td>Body of Knowledge</td>
<td>Learning is a social enterprise</td>
</tr>
</tbody>
</table>
Relationships and Patterns Emerging from Analysis

Although there were many commonalities among teachers’ individual beliefs about teaching and learning, identities/agencies and orientations toward math curriculum materials, no teacher was a cookie cutter imitation of another. This finding reinforced the notion of teaching as a complex human endeavor with an enacted curriculum that is different in each classroom depending upon a multitude of individual and cultural factors. Nonetheless and despite the individuality that shines through this analysis, below I identify common themes discovered in the teacher profiles that seem to associate certain individual characteristics with each other.

Relationships within Beliefs about Mathematics, Student Learning, and Teaching

Table 5.4 describes the results of both the questionnaire on teacher beliefs about mathematics, student learning and teaching.

Table 5.4
Teacher Beliefs About Teaching and Learning

<table>
<thead>
<tr>
<th>Teacher</th>
<th>View of Mathematics</th>
<th>View of Student Learning</th>
<th>View of role of teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominic</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
<td>Facilitate</td>
</tr>
<tr>
<td>Patti</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
<td>Facilitate</td>
</tr>
<tr>
<td>Denise</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
<td>Facilitate</td>
</tr>
<tr>
<td>Theresa</td>
<td>Way of Thinking</td>
<td>Learning is a social enterprise</td>
<td>Transmit</td>
</tr>
<tr>
<td>Ali</td>
<td>Body of Knowledge</td>
<td>Learning is a social enterprise</td>
<td>Facilitate</td>
</tr>
<tr>
<td>Tara</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
<td>Transmit</td>
</tr>
<tr>
<td>Shelia</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
<td>Transmit</td>
</tr>
<tr>
<td>Laura</td>
<td>Rules and Procedures</td>
<td>Learning is best done on your own</td>
<td>Transmit</td>
</tr>
</tbody>
</table>
Pattern 1: Teachers who viewed math as a way of thinking had different views of student learning than teachers who viewed math as a set of rules and procedures. Evaluating the results of teachers’ questionnaire responses indicated that of the second grade teachers in this study, four viewed the subject of mathematics as a way of thinking, one as a body of knowledge and three as a set of rules and procedures. Theresa, Dominic, Denise and Patti were teachers who viewed mathematics as a way of thinking while Ali was a teacher who viewed mathematics as a body of knowledge. These five teachers also saw student learning as a social enterprise. This perspective contrasted with Laura, Tara and Sheila, who viewed mathematics as a set of rules and procedures and who all saw student learning of mathematics as best accomplished on one’s own.

Pattern 2: Teachers who viewed student learning as a social enterprise had different views of themselves as teachers than those who viewed student learning as something best done independently. Dominic, Patti, Denise, and Ali, who all viewed student learning as a social enterprise, saw themselves as facilitators of learning. Theresa was an anomaly in this pattern; although she viewed student learning as occurring best in social groups, she saw her role as that of transmitting the necessary ways of thinking mathematically. Tara and Sheila, who both saw student learning as something best done alone, saw themselves as transmitters of the necessary rules and procedures rather than facilitators of learning. Laura was an anomaly in this case, as she seemed to see learning
as an independent endeavor but saw herself as a facilitator of learning. Another contributing factor for Laura could be her lack of confidence in her mathematics abilities and the fact that she taught an above level class.

**Other belief relationships among the study participants.** Respondents answered similarly for seven of the 20 questions: Q1 and Q14 (Students), Q4, Q7, and Q16 (Mathematics), Q8 (Learning), Q17 (Teaching). Study participants tended to be optimistic about the success of their students. They believed all of their students could learn the math they were teaching. The teachers were confident or very confident in their ability to teach all their second grade students’ math and they saw using math manipulatives as a way to help their second graders access mathematical concepts. Teachers also tended to view discussion and concrete experiences with mathematical concepts as either very important or important parts of the classroom experience.

Most teachers agreed or strongly agreed that children learn math best through repetition (Q3) and that practice was important to mastering mathematical algorithms (Q9). Although teachers felt strongly about practice and repetition, they tended to believe that children should also participate in problem solving and puzzles as part of the learning experience (Q18). Most teachers strongly agreed or agreed that students should not leave the math classroom feeling stuck or confused (Q11). Most teachers viewed social interaction among students as beneficial to mathematics learning (Q2 & Q6). Most also tended to believe that second graders could understand mathematical concepts and that mathematics was a subject where children could develop their own ways of constructing knowledge.
In contrast to the teachers’ agreement described above, their responses were split on the role student generated algorithms should play in 2nd graders learning (Q15). Half of the teachers agreed that students should use an established procedure or algorithm, while half of the teachers felt that student invented procedures were just as effective. Teachers were divided on the value of keeping to the lesson plan so that time is not wasted in the classroom (Q19). More than half of the teachers disagreed with sticking to the lesson plan, indicating the delicate balance that teachers feel between covering the curriculum and ensuring student understanding.

Teachers were also split on the role of the teacher in organizing the work for students (Q13). Some tended to think that the teacher needed to carefully direct the classroom experience for students, while others disagreed with this approach, perhaps feeling that learning is a little messier. Teachers were also divided on the nature of mathematics as a discipline. One-third of the teachers agreed that some problems in mathematics have no answers, while the other two-thirds disagreed.

In contrast to the agreement described above, the teachers were split on the role student generated algorithms should play in second-graders learning. The greatest response variability occurred with Q15: It is better for second graders to use an established procedure than to invent their own ways of doing things. Sheila, Tara, Laura and Ali agreed with this statement while all other respondents disagreed. This question speaks to teachers’ beliefs about mathematics as a set of rules and procedures vs. a way of thinking. Of note, three of the four teachers who agreed with using an established
procedure rather than inventing their own ways of doing things taught an above level blended class during the study year.

**Relationships within Teacher Identity & Agency**

Table 5.5 describes relationships of teacher agency and identity, including value in teaching, commitment to learning, self-efficacy, and capacity for autonomous action.

Table 5.5

**Teacher Identity and Agency**

<table>
<thead>
<tr>
<th>Identity &amp; Agency</th>
<th>Teacher</th>
<th>Value in Teaching</th>
<th>Commitment to Learning</th>
<th>Self-efficacy</th>
<th>Capacity for Autonomous action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominic</td>
<td>Intrinsic</td>
<td>Knowledgeable</td>
<td>Confident</td>
<td>Self-directed</td>
<td></td>
</tr>
<tr>
<td>Theresa</td>
<td>Extrinsic</td>
<td>Knowledgeable</td>
<td>Confident</td>
<td>Self-directed</td>
<td></td>
</tr>
<tr>
<td>Ali</td>
<td>Extrinsic</td>
<td>Knowledgeable</td>
<td>Confident</td>
<td>Rule Follower</td>
<td></td>
</tr>
<tr>
<td>Laura</td>
<td>Intrinsic</td>
<td>Still learning</td>
<td>Compliant</td>
<td>Self-directed</td>
<td></td>
</tr>
<tr>
<td>Patti</td>
<td>Extrinsic</td>
<td>Still learning</td>
<td>Confident</td>
<td>Self-directed</td>
<td></td>
</tr>
<tr>
<td>Denise</td>
<td>Intrinsic</td>
<td>Still learning</td>
<td>Worried</td>
<td>Rule Follower</td>
<td></td>
</tr>
<tr>
<td>Tara</td>
<td>Intrinsic</td>
<td>Still learning</td>
<td>Worried</td>
<td>Rule Follower</td>
<td></td>
</tr>
<tr>
<td>Shelia</td>
<td>Extrinsic</td>
<td>Still learning</td>
<td>Worried</td>
<td>Rule Follower</td>
<td></td>
</tr>
</tbody>
</table>

**Pattern 3:** Teachers whose self-efficacy was that of confident tended to be self-directed in their approach to the new curriculum while those who were less likely to believe in their abilities tended to follow the rules when it came to new curriculum. In my coding of interview statements, Theresa, Dominic, Ali and Patti emerged as teachers whose comments indicated a tendency towards a high degree of self-efficacy and a confident view of their ability to deliver the new content. These teachers tended to be self-directed in their planning, willing to challenge the curriculum and make decisions independently. Denise, Laura, Tara and Sheila were teachers who were less...
likely to feel a high degree of self-efficacy and more worried about their ability to meet the demands of the new math series. They were more likely to be rule followers in their planning, unwilling to challenge the status quo in the curriculum and rely on others for curricular decision-making.

**Relationships in Orientation Toward Curriculum Materials**

Table 5.6 connects a teacher's stance toward curriculum materials with their belief about the role of new curriculum materials and their philosophical alignment with MIF.

**Table 5.6**

Teacher Orientation toward Curriculum Materials

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Stance</th>
<th>Philosophical Alignment w/ MIF</th>
<th>Role of New Curriculum Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominic</td>
<td>Interpreter</td>
<td>yes</td>
<td>Follow District curriculum, take what is needed out of book</td>
</tr>
<tr>
<td>Theresa</td>
<td>Interpreter</td>
<td>no</td>
<td>Follow District curriculum, Use pages for instruction</td>
</tr>
<tr>
<td>Ali</td>
<td>Interpreter</td>
<td>no</td>
<td>Follow District curriculum, Use pages for instruction</td>
</tr>
<tr>
<td>Laura</td>
<td>Learner</td>
<td>yes</td>
<td>Follow District curriculum, Learn what the book has so you can find additional materials to match it</td>
</tr>
<tr>
<td>Patti</td>
<td>Learner</td>
<td>yes</td>
<td>Follow District Curriculum, Study teacher materials</td>
</tr>
<tr>
<td>Denise</td>
<td>Follower</td>
<td>no</td>
<td>Follow book</td>
</tr>
<tr>
<td>Tara</td>
<td>Follower</td>
<td>no</td>
<td>Follow book</td>
</tr>
<tr>
<td>Shelia</td>
<td>Follower</td>
<td>no</td>
<td>Follow book until you know it, then use or create your own materials</td>
</tr>
</tbody>
</table>

**Pattern 4: Teachers who identified their commitment to learning as knowledgeable and their self-efficacy as confident also tended to orient themselves**
as interpreters of math curriculum materials. In my analysis of the two interviews, I learned that Dominic, Theresa and Ali all felt that they knew the subject of second grade math and were confident in their ability to teach their students. These teachers tended to feel oriented towards interpreting the curriculum to meet student needs. They were comfortable with their already existing pedagogy and believed that they were well prepared to teach whatever second grade content MiF presented with little or no study. Teachers who identified their commitment to learning “still learning” the subject of mathematics tended to feel more worried about their ability to teach their students with the new MiF curriculum. They were oriented to the MiF curriculum as either students or followers. Laura and Patti, oriented as students, tended to study the resource to learn more about what the authors intended. Denise, Tara and Sheila, oriented as followers, tended to present the materials as they were in the text and were leery of applying their background and prior knowledge to the new materials.

Pattern 5: Teachers’ orientation toward curriculum materials was associated with their feelings of self-efficacy. Remillard & Bryans (2004) theorized that teachers have a stance toward curriculum materials that influences how they participate with the materials to design instruction. I found that the study participants tended toward three primary stances: interpreter, learner and follower. Of the eight teachers, three tended to have a stance as that of an interpreter – following the District curriculum and taking what they needed out of the text. Two of the eight teachers had a learner stance, they felt that they needed to really study a
text to learn what it has then either find matching materials or use the pages for instruction. Finally, three teachers were followers; they wanted to follow the new book carefully until they knew it well. Teachers’ stances seemed to be associated with their feelings of self-efficacy; the three followers tended to worry the most about doing things correctly, while the interpreters and students had identities that were more confident.

**Orientation Toward Curriculum Materials**

In this portion of Chapter 5 the study participants are grouped by their orientation toward curriculum materials: followers, learners and interpreters. For each participant, I discuss my analysis of the individual teacher factors (summarized in table 5.3).

**The Followers**

**Denise: Reading the Script.** *Right now with this new program, I’m reading the script because I’m not familiar enough to see the big picture. The old series, because I knew it so well, it wasn’t a script. I did it for the big picture and I’m hoping that’s where this will go.* (Int.1) Denise was a second grade teacher with nineteen years of experience in grades one and two. Teaching was her second career and Denise was one of just a few women of color in the District’s elementary schools.

**Identity and agency.** When asked what she liked about teaching, Denise said, “The children, and I mean, every day is a new day, you definitely see the successes they have and you’re part of them having those successes. Where else can you get that?” (Int. 1). Denise worked with an on-level second grade class during our first year of MiF
implementation and represented her school on the Math In Focus team. She self-
identified as a person who did not really want change and worried about having to learn
and use all the new resources that accompanied Math in Focus.

Well, I’m not, you know, wanting change, and I think just the initial
change that, oh my goodness, I’m going to have to start all over again.
Which, you know, of course some of the things I could use, but a lot of the
curriculum things I had invested in…(Int. 1)

Denise presented as a teacher who relied on the curriculum materials for
instruction. In keeping with not wanting change, Denise seemed to feel somewhat
daunted by MiF. “I find the manual overwhelming”, she reports and “I think with the
new program, we’re afraid to step away [from the script]” (Int. 1). Denise was one of the
few teachers who noted a lack of available mathematics explanations in SFAW and
remarked that it had very limited information on many important second grade concepts,
including multiplication, division and regrouping. She felt there was not much support in
the old series but that now there was so much to look at and to read that it was almost too
much support.

In her first interview, Denise tended to lack a strong sense of self-efficacy about
her ability to interpret and explain the new math content. She expressed concern about
the way things were going for the students and had some doubts about the new text’s
order and explanations of content. She reported that she is occasionally teaching straight
from the manual, “just looking at the Smart Board sometimes, saying, what am I trying to
explain here?” (Int. 1) She questioned the value for students in providing different
strategies for learning multiplication, for example, or using bar models to solve problems,
and considered that it might be better just to learn one concept and learn it well. About
bar models, she noted that they, as teachers, modeled their use but that most of her students didn’t seem to be comfortable using bar models as a tool.

Denise measured her success by how her students responded to her in class. She felt that the hardest part of implementing MiF was seeing her students’ faces when they didn’t understand the lesson (Int. 1). By the second interview, Denise seemed to feel a good bit more confident about her ability to successfully use MiF with her students. She explained that she felt supported by the social and collective agency that accompanied teachers’ participation in the team meetings. About the team meetings, Denise reported, “Oh my goodness; couldn’t have done it without it. First of all, feeling that you are not alone. And again, brainstorming and hearing how someone else might do it.” (Int. 1)

Denise had previously collected children’s literature to accompany the SFAW series and she missed using it because she felt students enjoyed hearing stories either before or after a concept. As she reports, "...my small fortune is because I loved, and I had always used these Math Start books, which you know, have everything...they're really very good and very basic" (Int. 1) Denise shared her ideas about literature with the MiF team and they agreed that this would add to the new math curriculum. Supporting Denise’s request to purchase literature to accompany MiF allowed her to share an adaptation about which she felt comfortable and confident. "You've just got to slow it down so they're bringing it all together. And, I think the story might do that" (Int. 1). In Interview 2, Denise shared that she now had the literature to support the lessons, and "I can say they enjoy that part, even if it's after I've already introduced the concept. It's just another way for them to hear it".
Beliefs about teaching and learning. On the TTLM questionnaire, Denise tended to have few strong views about mathematics teaching and learning. In fact, she felt strongly about only three of the survey responses, agreed with eight others and disagreed with nine more. Her more subtle responses might be indicative of her identity as a teacher worried about her ability to teach this new material to all her students, even though she agreed that she “usually felt confident about her ability in mathematics” (Q17).

Denise viewed mathematics as a complex way of thinking that involved problem solving and invention, even at the youngest ages. Her survey responses revealed that she believed students could invent an acceptable solution and that this might be just as good as an established procedure. The survey also revealed that Denise tended toward the belief that learning takes place through the construction of experience for second grade students. Her responses indicated that she valued student interaction, repetition, practice and work with manipulatives Denise tended to see learners as able to problem solve and to understand concepts, even at the second grade level. She valued peer interaction as a good way for students to learn. Denise’s responses indicate that she sees second graders as problem solvers and inventors, who benefit from working with their peers.

Denise generally approached the role of teaching as facilitative and responsive rather than as a transmitter of information. Denise agreed with (Q11) “Students should not leave a math class feeling stuck” and (Q13) “Students learn best if the teacher organizes the work clearly for them”. She also disagreed with the survey statement, “An effective math teacher plans thoroughly and sees to it that she sticks to it, so that time is
not wasted in the classroom” (Q19) and with (Q18) “I make sure all of my students master basic computational skills before going on to problem-solving and puzzles.”

Overall, Denise wanted to present a set of strategies that would help students access the material, while remaining responsive to her students’ needs.

*Orientation toward curriculum.* Denise was oriented toward Math in Focus as a *follower.* She depended upon the resource to guide her through the lessons and did not really veer away from the text unless she had the support of a group. She had a similar stance toward SFAW. Because of her orientation, she followed the old text explicitly and was very used to teaching arithmetic strategies or procedures before developing mathematical concepts. Going outside of what the text recommended seemed to require group consensus. For example, SFAW did not have a lot of word problems or hands on materials and Denise was proud that second grade teachers throughout the District created a problem-solving template that they felt gave the children a model for problem solving, thus adapting the curriculum to meet perceived student needs.

Denise tended to not be philosophically aligned to the positioning of MiF. It’s problem solving focus and development of concepts through a concrete to pictorial to abstract approach often felt at odds with her beliefs about how math learning occurs. Denise worked with the SFAW curriculum for most of her elementary teaching career and felt that she was effective in using it to achieve student learning in mathematics. She particularly liked that it was a spiral curriculum because she felt comfortable moving on even if students had not mastered a concept since the same concept would come around again in the future (Int. 1).
Her stance as a follower had pluses and minuses during the first year of MiF use. On the minus side, there was a wealth of information for teachers included in MiF and using all of it was difficult. Denise, perhaps because she was oriented toward carefully following the teacher guide and therefore using it all, found the new text overwhelming. Even though her questionnaire responses suggested that she saw math as a complex way of thinking, her lack of confidence in her own mathematical understanding kept her from truly developing this view with her students. On the plus side even though she was not aligned philosophically with the new text, her orientation as a follower tended to ensure that she would try out the lessons even if she didn’t think they would work. Another benefit of following the curriculum carefully was her use of the manipulatives that came with the series. Although she sometimes found it challenging to prepare these hands on tools in advance, she acknowledged that students liked them and that she found them helpful to her instruction.

Overall, Denise was a compliant teacher/follower who found success in using the script of the text to both inform and deliver her instruction. As a teacher nearing retirement, she was concerned introducing a new series so late in her career and was sometimes overwhelmed by both the math and the variety of resources. Denise viewed mathematics as a complex way of thinking that involved problem solving and invention, even at the youngest ages. She tended to see learners as able to problem solve and to understand concepts and was intrinsically motivated to facilitate their learning. Denise felt that by following the curriculum carefully, she could present the material in an
orderly and complete way, so students could be confident in their ability to do the math they were asked to do.

**Sheila: Conscientious.** “That’s the whole thing about the first year. You think about your first year of teaching and it’s the same way. You do it the way everyone tells you. The second year you start to loosen up a little bit and in the third year you make it a little bit more yours. That’s how you teach kids. You don’t want to take ownership away from them. Therefore, right now, this is fine. It’s not hurting anyone to do it by the book.” (Int. 1) Sheila was one of only a handful of black women teachers in the five elementary schools and the only one in her elementary school. She was a second grade teacher at VFES with 22 years of experience in first and second grade. She had always taught in the same district, although she moved between two different elementary schools over the years. For the first year of MiF implementation, she taught an on level class, where both the 2A and 2B books were completed. She represented her school’s on-level classes on the MiF team.

**Identity and agency.** Sheila had a great deal of experience teaching first grade (19 years) and had recently been moved to second grade. She tended to present as good humored, independent, confident, and outspoken, but often made comments that belied her desire to follow the guidance of the text and to learn new things. About the team meetings Sheila reported:

We felt like we had to stick with what everyone else was doing but then when we went to the meetings…it was completely different. Like we said we were going to do A, B and C and then we get to the meetings after us following A, B and C and we saw other people did D, E and F. (Int. 2)
During the second interview, Sheila was much more comfortable with the work she and her school team were doing and how she interacted at the MiF team meetings. Her initial surprise that teachers in other buildings adapted pacing and instruction, gave way to an appreciation of learning from those who were doing things differently. She was open about her need to immerse herself in the new series.

I think you definitely need to take that manual home and get yourself into it. It’s kind of like taking a class. Not that you’re sinking but there are days when you’re like, you turn your back to the children and you’re like, “oh dear God!” (Int. 1)

Sheila’s story to live by included seeing herself as a creator of materials that she could use in the classroom to support her instruction. She appreciated the ability to work interpret curriculum and design instruction as she wished. It was challenging to try to be a thorough piloter. Sheila believed that using a script took away from her ability to teach and believed that it was important to understand the big ideas and then put those ideas into your own words. “I think when you are given a script it’s not yours and when you can take it and kind of mold it to suit you, you do more. If I copy off of you then I’m copying your words. It’s not me. So when it’s you, you can modify things a little bit more.” (Int. 1)

The mathematics in MiF conflicted with Sheila’s identity as a confident teacher who could successfully explain concepts to some of her most struggling students. This challenged her trust in the new curriculum and shook her trust in herself. Although she liked parts of the new curriculum, the lower test scores and the emphasis on problem solving and novel applications of new concepts concerned her. Because the pretests
provided information on students’ background knowledge, Sheila felt alarmed when students performed well on the pretest but poorly on an end of chapter assessment.

“I’m telling you at the beginning when you give it [the pretest] they are getting them all right and then at the end it’s like, what? What have I done? Obviously I missed something. It does make you…It used to be when you gave a test and they did well you thought, “Oh, I did a great job. Now it’s like, “Well, that’s gone.” (Int. 1)

**Beliefs about teaching and learning.** On the Beliefs about Teaching and Learning Mathematics Questionnaire, Sheila stood out as a second grade teacher who most often differed from the majority; six times out of 13 times when there was any difference at all. She felt strongly about only four of the items, one of which described her confidence about her math ability, “I usually feel confident about my ability in mathematics” (Q17). This answer is in harmony with the aspect of Sheila’s professional identity as personally comfortable and sure of herself.

Sheila viewed mathematics as a set of rules and procedures that combine to become a way of thinking used to solve problems. Sheila’s survey results revealed an overall orientation toward constructing knowledge through experience with an emphasis on repetition and practice. She saw the connection between math and problem solving but thought invention and creativity resulted from learning the right procedures.

Sheila viewed second graders as able problem solvers who worked and thought better independently than in discussion with their peers. Sheila was the only teacher in the study who believed that classroom discussion impeded learning. Sheila emerged as a directive teacher in her survey answers, although her interest in adapting instruction based upon student needs was revealed in her disagreement with “An
effective math teacher plans thoroughly and sees to it that she sticks to it, so that time is not wasted in the classroom” (Q19). Overall, Sheila tended to create a math classroom that reflected her beliefs that math was learned best through direct instruction and independent practice.

*Orientation toward curriculum.* Sheila was oriented toward SFAW curriculum materials as an interpreter. Because she taught with SFAW for 20 years she no longer needed to use the text resource. Rather, she brought in and created materials that followed the book out of familiarity and trust. She liked the sequence of SFAW and liked that she was able to create and bring in other materials like manipulatives, games, stations and literature. She reported that she usually taught students who were not in the more advanced level so she was able to develop her own methods of assessment.

With MiF, Sheila changed her orientation and became a follower. She stopped creating new materials because she said, “it’s already made for you, it’s already there” (Int. 1). She reported that because it’s the first year of use, she is following a script and trying to use every part of the resource, a much different approach than she followed with SFAW.

It’s funny, the first day Angela was like, “Was that you with the manual?” I was like…she kept saying, “You with the manual?” I said, ‘I know, it’s killing me.” You definitely need to take that manual home and get yourself into it. It’s kind of like taking a class (Int. 1).

Over time, Sheila would likely return to a more interpretive orientation; carefully following the book, but using her own words and activities, as she almost felt offended when she was coloring between the lines. “When you are given a script it is not yours, when you can take it and mold it to suit you, you do more” (Int. 1). Sheila felt that during
the first year you “do it the way everyone tells you, the second year you loosen up and during the third year you make it a little bit more yours” (Int. 1).

In summary, Sheila’s unique position as one of only a few black women in the five elementary schools and her many years of experience contributed to her stance as a follower of the new MiF curriculum, even though she felt she had, over the years, interpreted the old curriculum so completely that it was her own. Although Sheila presented as a confident extrovert, her interview comments belied her concerns about the rigorous mathematics content and her need to use a different resource. Sheila viewed mathematics as a set of rules and procedures that, over time, combined to become a way of thinking that could be used to solve problems. This was not philosophically aligned with the underlying MiF philosophy, which used problem solving as a base. Sheila believed in repetition and practice but believed that her students were capable of problem solving independently without classroom interactions with their peers.

**Tara: Old School.** “When we got towards the end, we picked and chose what was the most important because we knew we weren’t getting through the entire curriculum. But for the most part we followed it the way it was. But when we got to the end, we would go through and say, ‘Okay, we’re going to do this lesson. We’re going to do that lesson.’ Just what we thought were the most important things that we needed to get to” (Int. 1)

**Identity and agency.** Tara was a relatively young second grade teacher at HES. She had eight years of experience, all at this elementary school and was part of a close
second grade team with a strong team facilitator. She taught an above level class for the first year of MIF implementation, blending both the 2nd and 3rd grade books. Tara represented her above-level team at the MiF monthly meetings. Tara loved teaching in general and second grade in particular. “I love working with children and watching them grow. It’s just a really rewarding profession that you get to see the change you are making every day” (Int. 1).

Tara was a teacher who felt very comfortable with the previous Scott Foresman series because the way it presented concepts and skills was familiar to her. She had a great deal of trust in the way concepts and procedures were approached and developed in SFAW.

The Scott Foresman series was more like the way that I learned math so it was familiar to me. It made sense to me when I was teaching it. This (MiF) is a little bit different because it’s a new approach. I felt it (SFAW) was effective, but I know there are so many different programs out there now that it was kind of that old school way of doing math. (HT, Int. 1)

MiF challenged Tara’s confidence. She liked the structure of the previous planned curriculum, including the text and the District objectives. She was one of the very few teachers who found the objectives worthwhile and used them formatively with her students. Tara was committed to lifelong learning; she was determined to learn the new material and sought out ways to expand her knowledge of content. She was open to receiving help and support and used resources from other teachers to learn how to better teach the bar model concept.

Tara presented as a worrier who lacked confidence in her ability to transmit important concepts to her above level students. She expressed concerns about changing
the curriculum resource. Because it was the first year of MiF, Tara felt that she used to have more flexibility to supplement the curriculum. Tara worried about the pacing and about “getting through the curriculum” (Int. 2). She referred to feeling scared during the early months of implementation but as time passed she indicated that she was now looking forward to going back and using MiF again. By the end of the year, she felt more confident about her ability to make the curriculum her own and to make decisions that benefited her students. Tara felt that she benefited from her participation in the team meetings. “I was very hesitant at first. I remember sitting in those meetings last year and it was not clicking with me. I thought maybe I shouldn’t teach the above level kids. But as the year went on…I’m really happy that I was part of that group. It really helped a lot. It helped me “ (Int. 1 & Int. 2).

Beliefs about teaching and learning. Tara tended to express strong feelings on the teaching and learning questionnaire, strongly agreeing or strongly disagreeing on eight of the 20 survey questions. These strong views speak to Tara’s identity as a teacher who feels much more comfortable with familiarity and structure and who worries about change and doing things differently. Tara agreed, but not strongly, with the survey statement, “I usually feel confident about my ability in mathematics” (Q17), further illustrating her comfort with the mathematics thinking and pedagogy she was used to.

Tara viewed mathematics as a set of rules and procedures that needed to be learned well in order to become a good math student. She recognized second grade math as complex and problem solving as important, but thought there were established ways to solve problems and that students shouldn’t veer away from them. Tara disagreed with
the questionnaire statement: “Even if you get the answer right, you may not understand the mathematics behind the problem” (Q4) and disagreed with the statement: “Some problems in mathematics have no answers” (Q5). She strongly disagreed with this statement: “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems” (Q7) but disagreed that “Good mathematics students develop their own way of doing problems” (Q10). Tara agreed with the questionnaire statement “It is better for second graders to use an established procedure than to invent their own ways of doing things” (Q15) and strongly disagreed with the statement: “Second grade math does not require much knowledge of mathematics” (Q16).

Tara’s survey results revealed an overall orientation toward constructing knowledge as a way of learning mathematics, as long as other experts determined what was to be constructed. Tara strongly disagreed with the statement, “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems (Q7)” and disagreed with the statement, “Good mathematics students develop their own way of doing problems”(Q10). She agreed with the statement, “A very important thing to do in learning mathematics is to practice a lot in order to master the procedures (Q9) and strongly agreed with the statement, “For second graders, it is important to have concrete experiences with mathematical concepts” (Q20). Tara also agreed with the statement, “Children learn math best through repetition” (Q3) and with the statement, “Second graders should work frequently with math manipulatives” (Q8). Tara views student experiences of practice, repetition, solving problems and working with manipulatives as methods for actively engaging in building mathematical understandings.
Tara’s questionnaire responses revealed an inclusive view of second graders as capable learners of mathematics. Tara thought discussion could enhance the learning process but did not believe that working with peers was the best way for children to learn. She strongly disagreed with the survey statement: “Very young children are not capable of engaging in mathematical problem solving” (Q1) and disagreed that: “Many second graders simply cannot “get” mathematical concepts” (Q12). She disagreed with the survey statement, “Children learn best by working with their peers” (Q2) and strongly disagreed with the statement, “Discussion among students in a second grade math classroom impedes learning” (Q6). Tara’s self-reported identity as a teacher who preferred following previously determined rules and procedures is affirmed through her survey responses.

Tara viewed herself as a director of learning in her math classroom as revealed by her strong agreement with Q19: “An effective math teacher plans thoroughly and sees to it that she sticks to it, so that time is not wasted in the classroom” and Q11: “Students should not leave a math class feeling stuck”. Tara also agreed “Students learn best if the teacher organizes the work clearly for them” (Q13). Under her direction, she felt that students could learn problem-solving skills and critical thinking before knowing all the math algorithms as evidenced by her strong disagreement with (Q18) “I make sure all of my students master basic computational skills before going on to problem-solving and puzzles”. Overall, Tara tended to take responsibility for creating a classroom where her students could practice procedures and use them to solve problems.
**Orientation toward curriculum.** Because of Tara’s familiarity and comfort with the SFAW curriculum, she tended toward an interpreting orientation. The previous resource had been in use for more than ten years by the time Tara started working at the school and other teachers in her school had already been interpreting the materials for many years in order to keep them current and in line with changing standards and expectations. Tara would occasionally do this herself and generally teach straight from the SmartBoard lessons she either borrowed or created. She regularly developed her own warm-ups and used them to spiral back to previously learned concepts. Tara reported that students did not have a textbook; this really necessitated an interpretive stance.

In her early work with MiF, Tara was oriented toward interpreting as well by bringing in concepts and pedagogy from the old series. She wanted to continue to use some of the SFAW worksheets and thinking activities, as she considered this a good way to extend some of the ideas in MiF. During Interview 1, Tara expressed that the guided practice and the teacher resources for reteaching, enrichment and extra practice did not contain enough problems for students so that as teachers, they had to supplement with other materials. After using this approach for several chapters, however, she became more attuned to a follower approach, as attention needed to be paid to the significant differences in content between SFAW and MiF. One primary reason for this was the change in assessment practices. The assessments provided by MiF were very different than those previously given and even the strongest students were struggling to experience success on them. Because Tara prided herself on ensuring that students had exposure to
tested material, she found herself really digging in to the MiF teacher resource in order to understand it more deeply.

Overall, Tara was a teacher who felt very comfortable with the previous series because it was philosophically aligned with the way she had learned math. She was committed to lifelong learning and sought out knowledge to overcome her worry and discomfort with the new series. Tara expressed strong feelings on the questionnaire and her answers highlighted her comfort with familiarity and structure and her concern about change. Tara tended to see mathematics as a set of rules and procedures that needed to be learned well in order to be “good at math”. She tended to follow the lead of the text and her peers in designing her lessons and saw her students as capable learners. Tara wanted to steer learning in her classroom so that her students could practice procedures and use them to solve problems.

The Learners

Laura: Lifelong Learner. I definitely start at this background page and I kind of figure out well what did the series authors want to accomplish in this chapter and why is it placed where it is, why is this chapter four and not chapter one or later in the year. And I went back and actually highlighted because the first couple of planning days before we started teaching bar models, we were planning it out ahead of time and I was confused. I thought why am I teaching these bar models, I mean, what’s behind it (Int. 1)

Laura was a second grade teacher with thirteen years of experience, all at the same elementary school and all in first and second grades. Laura taught an above level class at
the same school as Dominic and was the daughter of one of the District’s high school guidance counselors.

**Identity and agency.** Laura’s professional identity was shaped by her thirteen years of experience at this school and by her family’s history of involvement in education. She was steeped in the culture, not only of teaching in general, but also of working in the same school district as her dad. She didn’t like math when she was in elementary school, “I found it hard and confusing and I didn’t get it” (Int. 2) so she found a great deal of intrinsic value in helping students learn and in making a difference in their feelings about math. She also truly loved the subject matter and liked to consider what the authors were trying to communicate when designing instruction. She loved working with second grade children because they “love school and for the most part, they love coming to school” (Int. 1). Laura was always inspired by seeing a second grader’s light bulb of understanding go off in a new way of thinking.

Laura generally felt confident about her ability to explain mathematical concepts (Q16) and she was a thoughtful and reflective teacher. Her confidence extended to a willingness to acknowledge her own discomfort with some parts of the new series, particularly Chapter 4: Introduction to Bar Models. She saw herself as a student, studying and highlighting the teacher guide in order to reduce the confusion she initially felt with this new topic. As she related, “I’m just as confused until I work through and figure it out” (Int. 1). Laura demonstrated a high level of commitment to learning to teach the new concept of bar models and thought it was important to understand not only how to create and use them to solve problems, but also how bar models would be used in
the future. “It was difficult; I mean this is a difficult chapter to be discussing ‘cause it is so new to everybody. We had to be sticklers for the different types of bar models” (Int. 1).

Part of Laura’s teacher identity included her view of herself as a lifelong learner, always looking for additional resources or ideas about curriculum and how to respond to student needs. As she says, “I’m always seeking out new things and there are always new things made…I’m always reinventing the wheel, making more work for myself” (Int. 1). This view extended to daily instruction and she tended to feel empowered to make curricular choices before and during a lesson even though she felt that because it was the first time through the curriculum, they should stick closely to what was written. She reports, “I definitely felt like we had the power to make some small accommodations here or there or to switch a lesson, you know those kinds of things” (Int. 1).

Laura was her school’s second grade team facilitator, and although this was not a supervisory position, it did tend to contribute to her role in the MiF implementation team as a leader among her peers. Her school was often ahead in their planning and Laura was willing to make instructional decisions with confidence. Laura was enthusiastic about the team meetings and found that they influenced her planning by helping her look at things ahead of time, in preparation for collaborating with others. Her commitment to lifelong learning was again illustrated by her view of the team meetings as an opportunity to be a better math teacher, “more organized, a little more structured and able to see from beginning to end” (Int. 1).
Laura saw herself as an experienced teacher who understood a good deal about both mathematics and pedagogy in her school. This helped her to feel comfortable and confident about making adaptations to even the new curriculum, after reflection and review. She taught an above level second grade class for many years and was familiar with designing curriculum to meet student needs. As an additional example of her agency, when the MiF team met, Laura led a discussion on ways they could adapt MiF to better include the writing piece.

We discussed the writing piece and how heavy that [the old series] was in explaining your thinking in writing and so, you know, I think we were all in consensus yesterday that we didn’t want to lose that. Where can we find more opportunities in the new series to put that? (Int. 2)

Beliefs about teaching and learning. Unlike Dominic, Laura had few strong opinions. She agreed with nine of the twenty survey items, strongly agreed with four, disagreed with five of them and strongly disagreed with only two. This may speak to Laura’s identity as a former learner who struggled with elementary mathematics, perhaps feeling a little less confident about her views of mathematics teaching and learning, who now acted as a lifelong learner to help her students have a different experience of learning.

The TTLM questionnaire revealed that Laura tended to recognize the complexity of fundamental second grade mathematics and conceptualized it as a set of rules and procedures. Laura disagreed with the survey item, “Good mathematics students develop their own ways of doing problems” (Q10) and agreed with the statement, “It is better for second graders to use an established procedure than to invent their own ways of doing
things” (Q15). She strongly agreed with the statement, “Even if you get the answer right, you may not understand the mathematics behind the problem” (Q4) and disagreed with the survey item, “Some problems in mathematics have no answers” (Q5). Laura also disagreed with the statement, “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems” (Q7) and disagreed with the statement, “Second grade math does not require much knowledge of mathematics” (Q16).

Laura’s conceptualization of mathematics influenced her perspective on mathematics teaching and learning. The questionnaire revealed that Laura tended to see mathematical learning as additive, concepts and procedures needed to be taught in an orderly fashion and certain of them built one on top of the other. Laura disagreed with the survey statement, “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems (Q7) and disagreed with the statement, “Good mathematics students develop their own way of doing problems” (Q10). She agreed with the statement, “A very important thing to do in learning mathematics is to practice a lot in order to master the procedures” (Q9) and strongly agreed, “For second graders, it is important to have concrete experiences with mathematical concepts” (Q20). Laura also agreed that, “Children learn math best through repetition” (Q3) and “Second graders should work frequently with math manipulatives” (Q20).

Laura tended to view second grade learners as capable problem solvers who learned through interacting with their peers. She strongly disagreed with the survey
statement, “Very young children are not capable of engaging in mathematical problem solving” (Q1) and disagreed that, “Many second graders simply cannot “get” mathematical concepts” (Q12). Laura also strongly disagreed that, “Discussion among students in a second grade math classroom impedes learning” (Q6) and agreed that “Children learn best by working with their peers” (Q2).

Laura tended to view herself as a transmitter of math learning, taking a good deal of responsibility for the learning that happened in the classroom. She agreed that, “Students learn best if the teacher organizes the work for them” (Q13) and “I make sure all of my students master basic computational skills before going on to problem-solving and puzzles” (Q18). Laura strongly agreed “Students should not leave a math class feeling stuck” (Q11) and “An effective math teacher plans thoroughly and sees to it that she stick with it, so that time is not wasted in the classroom” (Q19).

**Orientation toward Curriculum.** Laura’s orientation toward curriculum materials was that of a student learning from the text. Laura thought the way to fully understand something was to study the text to learn the author’s intent. She was philosophically aligned to MiF’s positioning on thinking and problem-solving. Studying the text was a stance that Laura used with SFAW also. She viewed the old curriculum positively and thought it provided strong support for the teacher in the form of lesson goals and objectives and differentiated practice. “The lessons were laid out, you know, if you weren’t exactly sure, they were laid out step by step” (Int. 1).

As her familiarity with SFAW increased and the series became more and more outdated, Laura often found herself searching the Internet for new worksheets or lessons
that could help her accomplish goals similar to the SFAW curriculum. In some ways the age of the text and its perceived value pushed Laura away from an orientation toward studying and toward a more interpretive stance. Over time, she began using the SFAW text and its accompanying resource less and less until she was really only accessing it to remind herself of what was next. By the time SFAW was replaced with MiF, Laura was comfortable using outside materials to support her teaching and used the textbook resources to make sure she knew what she was expected to do next. “Anywhere I saw whatever the topic might be, say, you know, fractional parts and halves, anywhere I would see something I would give it a try. And so many teachers do things like blogging and they share all their wonderful ideas” (Int. 1).

Laura was excited about the new MiF series and interested in how it would work. Even though she had migrated far away from the previous series, as she felt she had learned all she could from it, she quickly changed her orientation back to that of a student. Her changed orientation toward MiF materials was pronounced in Chapter 4 as she wrestled with how to design instruction around bar models, a new problem solving strategy. Laura studied the teacher resource to understand the author’s intent so she could explain and justify the content and pedagogy to herself.

I thought, why am I teaching these bar models, I mean, what’s behind it? And I went back and reread this whole paragraph, [which] explains bar models and how important it is and how it carries them through high school. Bar models was a new way of thinking for all of us, although we have always done problems solving with addition and subtraction (Int. 1)

In her ten years as a teacher, Laura was a student of the text and, when that was no longer possible, of the resources she could find online. During the first year of MiF, Laura
studied the text carefully, but she looked forward to the future when she could again enjoy seeking out new materials.

In summary, Laura was a compliant teacher/learner who found success in thoroughly studying the resources at hand to learn how to do her best work. Laura still carried the memory of finding math difficult and her identity was that of a teacher who was still learning both the fundamental mathematics and how to best teach it to her second graders. Laura saw mathematics as a set of rules and procedures and saw herself as a transmitter of math learning. She viewed her students as capable problem-solvers and found intrinsic value in watching and helping them grow. Laura felt that by studying the curriculum, she could present the material in an orderly and additive fashion, so students could be confident in their ability to do the math they were asked to do.

**Patti: Quietly Confident.** I find I still use websites, things like BrainPOP or, you know, math interactive game type things that are reviewing facts, so I still find I use those things. I’m not finding that I need to search as much for worksheets or classwork practice type pages. I feel like there’s a lot already there, that I have plenty to use in that sense (Int. 1).

**Agency and identity.** Patti had thirteen years of experience in grades K-3, with most of it occurring in second grade. She worked in several local school districts but has been at her current elementary school for the last six years. Patti’s work as a teacher began in a parochial school, then transitioned to public school. She taught across the grade spans, K-3. Patti found intrinsic value in the process of learning and enjoyed mathematics as a subject. She reported that she likes teaching because “I like that it’s
always changing in the sense that there’s a new way of approaching something. I like seeing the growth of students from the beginning to the end of the year. I like the creative aspects of it” (Int. 1). This year Patti taught an above level second grade class and helped to blend second and third grade MiF texts to meet the needs of accelerating students.

Patti presented as a confident lesson designer, in both her ability to understand and explain concepts as well as her ability to utilize available resources. She felt a good bit of freedom and agency in her ability to use the MiF resource to design whole group lessons: “…a lot of these images in the student textbook, I just go through with them as a group in guided practice. I kind of pick and choose from them [hands on activities] based on the time I have, or which ones I think would make more sense with what we’re doing.

“Patti’s confidence in her knowledge of second grade math did not overrule her intrinsic desire to help students learn and she took the new curriculum seriously enough to review it thoroughly. She had a commitment to lifelong learning in order to become a better teacher. Patti reacted positively if she discovered that she hadn’t done enough preparation or curriculum study and learned quickly to spend more time with the text.

I’ve found that I do have to read through it entirely, because I have had one or two times where I kind of looked and did a quick run-through, and thought, ok, I know where this is going and then figured out there was a piece there that I didn’t quite, you know, cover enough, or there was a piece that they needed some background on. (Int. 1)

Throughout the year, Patti took notes and planned for the next year, helping to ensure that she would learn from her experience. Patti felt the team meetings along with the time
dedicated to planning in the building were useful to her learning process and felt she was empowered to make decisions that supported their teaching and the learning of their students.

Thinking about next year, I think going through the first year with the pacing, now I have a better sense of that. I thought the meetings were really helpful for the first year to talk every month. In our building we met once a week and sat down every Monday just to kind of check in with each other. I thought that was good too.

**Beliefs about teaching and learning.** The TTLM questionnaire revealed Patti as a teacher with strong feelings about learners and about how learning occurs. Patti strongly agreed or strongly disagreed with seven of the twenty prompts, agreed with seven others and disagreed with the rest (six).

Patti viewed mathematics as a way of thinking rather than a body of knowledge or a set of rules and procedures. She agreed with the questionnaire statement: “Even if you get the answer right, you may not understand the mathematics behind the problem” (Q4) and disagreed with this statement: “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems” (Q7). Patti disagreed with the statement: “Some problems in mathematics have no answers” (Q5). “Good mathematics students develop their own way of doing problems” (Q10) was another survey statement with which Patti agreed. She disagreed with the questionnaire statement “It is better for second graders to use an established procedure than to invent their own ways of doing things (Q15) and strongly disagreed with the statement: “Second grade math does not require much knowledge of mathematics” (Q16). Her questionnaire
responses suggest a view of second grade mathematics as a complex way of thinking that includes invention and problem solving.

Patti’s survey results revealed an overall orientation toward constructing knowledge through experiences as a way of learning mathematics. Patti disagreed with the statement, “In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems (Q7)” and agreed with the statement, “Good mathematics students develop their own way of doing problems” (Q10). She agreed with the statement, “A very important thing to do in learning mathematics is to practice a lot in order to master the procedures (Q9) and strongly agreed with the statement, “For second graders, it is important to have concrete experiences with mathematical concepts” (Q20). Patti also agreed with the statement, “Children learn math best through repetition” (Q3) and strongly agreed with the statement, “Second graders should work frequently with math manipulatives” (Q8). Patti views student experiences of practice, repetition, solving problems and working with manipulatives as methods for actively engaging in building mathematical understandings. She felt particularly strong about the use of math manipulatives to illustrate and represent important mathematical concepts.

Patti’s questionnaire responses evidenced an inclusive and confident view of second grade students as learners and problem solvers and a belief that classroom social interactions improved learning. She strongly disagreed with the survey statement: “Very young children are not capable of engaging in mathematical problem solving” (Q1) as well as the statement: “Many second graders simply cannot “get” mathematical concepts”
(Q12). She agreed with the survey statement, “Children learn best by working with their peers” (Q2) and strongly disagreed with the statement, “Discussion among students in a second grade math classroom impedes learning” (Q6). Patti’s self-reported identity as a teacher who felt very comfortable using the text to design mathematical tasks is in agreement with her beliefs about second grade students as learners.

Patti saw herself as a teacher who fostered student inquiry as revealed by her disagreement with Q11 “Students should not leave a math class feeling stuck” and Q13 “Students learn best if the teacher organizes the work clearly for them”. She was willing to allow students to experience some discomfort and to wrestle with mathematical concepts. Patti agreed with the survey statement, “An effective math teacher plans thoroughly and sees to it that she sticks to it, so that time is not wasted in the classroom” (Q19) and disagreed with (Q18) “I make sure all of my students master basic computational skills before going on to problem-solving and puzzles”. Overall, Patti tended to plan for and create a classroom where her students could explore concepts and solve problems with the expectation that they were responsible for organizing their thinking and asking questions.

**Orientation toward curriculum.** Patti was oriented as an *interpreter* of the curriculum in both the SFAW and the MiF teacher materials. She had positive feelings about the old SFAW series and found many parts of it to be useful in her teaching practice. When using SFAW, she interpreted the author’s goals and the lessons but stepped away from the text when she couldn’t find enough practice for students or when she thought information and activities available through technology were better than what
she could find in the text. Patti appreciated the structure and step-by-step explanations of each concept that SFAW provided and found it useful for her and challenging for students. Like Laura, she particularly appreciated the emphasis on explaining thinking through writing and was already how to make that part of her future use of MiF. She also found the manipulative and hands-on activities that SFAW provided to be helpful to her instruction.

On the other hand, she interpreted MiF as much more intentional in it’s use of hands on activities and problem solving in a positive way. “I think that although the other series did have activities that connected to hands-on, I think this series is more intentional with it and it’s more of the procedure of how you get them through the concept. I think it is challenging in the sense that the thinking skills are threaded through more than maybe before” (Int. 1).

In summary, Patti was a confident teacher who found success in interpreting both the authors’ intent and the script of the text to guide her planning. She was committed to lifelong professional development and approached the introduction of MiF as an opportunity to learn. Patti viewed mathematics as a way of thinking and was oriented towards constructing knowledge through experiences as a way of learning mathematics. She tended to see learners as able problem solvers and thought peer-to-peer classroom interactions improved student learning. Patti felt that by reviewing the curriculum and interpreting the authors’ intentions, she could foster inquiry and learning for her students.
The Interpreters

Dominic: Teacher Not Presenter. So I look through at what the lesson wants me to teach, highlight the ideas that I want to focus on, but then I kind of say like okay, is there a way to do that, that I’ve already done that I really liked, or some other way besides, again looking at the textbook all day, every day. (Int. 1) Dominic was a second grade teacher with seven years of experience, all at the same elementary school. He taught an on grade level class for the first year of Math In Focus implementation. He was the only male on the on-level team and had changed careers to become a teacher. Previously, he had worked for a big box company as a manager. He was responsible for ensuring that products shipped and arrived on time and oversaw a group of employees.

Beliefs about teaching and learning. On the TTLM questionnaire, Dominic emerged as a teacher with strong views about learners and about teaching. In fact, he strongly agreed or strongly disagreed with thirteen out of twenty of the questions, more than any other survey participant. These strong views speak to his identity as a confident and independent teacher. Dominic also agreed with the survey statement: I usually feel confident about my ability in mathematics (Q17), further illustrating his personal sense of confidence.

Identity and agency. Dominic loved teaching and loved the students. Asked what he liked about teaching second grade, he replied, “What don’t I like about it? How many jobs can you have where your boss or employee gives you a hug or a high five every day?” (Int. 1). He was open about his dislike of his previous career and the value he found in teaching. He thrived on student feedback: “I have kids who write to me from
the middle school, “I still remember when you did that” (Int. 1). He spoke with pride about his students’ test scores on a midyear benchmark test

I was very surprised. I was very, very pleased and very impressed, especially because it is typically my philosophy, when taking a test. It would just be like, I could read this to you again, but after that, it’s kind of on your own (Int. 2).

Dominic tended to present as confident, independent and self-directed. He demonstrated a strong sense of self-efficacy, speaking often about how little he used the previous math textbook and how confident he felt about using a new concept, such as bar models. Dominic also asserted a strong independence; he was not that willing to follow the activities of a text and took responsibility if things didn’t go well. His interviews were sprinkled with comments like, “I’m barely even a workbook person, just because I find there are better ways. Sometimes they need it but there are better ways to cement an idea” or “I’m not a person who teaches to the test either” (Int. 1). These and other comments highlight Dominic’s individuality and confidence in his own conception of teaching second grade mathematics.

Dominic viewed himself as knowledgeable about second grade mathematics and skilled at interpreting curriculum, designing lessons and directing instruction. This was evident in his description of his work with the old math series and in his similar approach to MiF. About SFAW he said the following: “I mean I taught from my own knowledge of how to teach and used activities other people had given me. And then it was games, lessons I could find online, ways I knew to teach it, a lot of hands on stuff” (Int. 1). His instruction was influenced by his love of children’s literature and board games and he felt that using these outside resources enhanced teaching and learning in his classroom. He
stated the following: “I love literature. So I use literature. I mean, literally every lesson for a chapter if I can find the literature that goes with it, I will use it. Love games, good old-fashioned games. I try to find ways to engage then in a different way” (Int. 1).

His particular combination of agency and identity suggested that he would approach a new written curriculum with an eye toward interpreting it for his own needs.

The statement below from Dominic’s second interview illustrates his general philosophy about how he engaged and interacted with the new curriculum materials.

You get to know the program right? You know basically you can look at the big objective and then kind of plan around that. In the beginning, no because I just needed to know everything [that the book had]. But in the end, I would say for the past six or seven chapters I would look at the objective, the big idea they call it, and then all the little mini-topics, and I would just say like okay, do I have things that can do the same thing that this book is doing. (Int. 2)

Dominic felt that he wasn’t just a presenter he was a teacher. To him this meant he was an interpreter and a designer and that he knew best how to instruct the students in his class. “That’s why I’m a teacher. I’m not, you know, I’m not a presenter”, (Int. 1).

**Orientation toward curriculum.** Dominic’s self-described stance towards curriculum materials was that of an *interpreter*. If he was philosophically aligned with the curriculum’s methods, he was likely to use more of the text’s offerings. In his interviews, Dominic described his work with two previous curricula, *Everyday Mathematics* and SFAW. Prior to his work in this District, Dominic used *Everyday Mathematics* and liked the spiraling, activities, hands on materials and manipulatives that accompanied the series. He found these things lacking in SFAW and since the teachers he worked with had been using SFAW for a good many years, his experience of the
series was made up of the materials his teaching team shared with him. He reports the following about SFAW: “I don’t think I ever touched a workbook and I barely cracked open the textbook” (Int. 1). He evaluated SFAW as generic and a step backwards from Everyday Math.

Well, I don’t know that I could tell you I liked a whole lot about the series (SFAW). It was fine for the interim. When I did my student teaching I worked with Everyday Math. I liked it a lot. So with Scott Foresman, I just felt like it was a very generic math program, it was almost like a step backwards. So to be honest with you, because they were already like 15 years into it when I used it, a lot of people were giving me their own resources that they were using. I don’t think I ever touched the workbooks, let alone cracked open a textbook. (Int. 1)

Dominic described himself as philosophically aligned to MiF. Similar to Everyday Math, he found that MiF cycled back to extend a lot of the concepts taught and he felt that both series placed a strong emphasis on the use of concrete learning experiences. Dominic was conceptually aligned with the MiF series, even though he was still inclined to view the teacher resource as a guide for him to interpret. In his first interview, he enthusiastically remarked about his love of the bar model component while at the same time discussing how he might adapt a lesson to incorporate other things he loved, especially children’s literature and certain math websites.

I love the problem-solving component. The bar models, even though many of the parents are struggling with them, I find them to be brilliant (Int. 1)

I mean I love literature, so I use literature, I mean literally every lesson for a chapter, if I can find the literature that goes with it, I will use it. BrainPOP I love…I mean, it’s like a minute and a half and it’s either a good intro or wrap-up (Int. 1)
Overall, Dominic was a confident teacher who felt he knew and understood a good deal of second grade mathematics and how to best teach it. He found intrinsic value in teaching and was highly self-directed in his approach. Dominic viewed himself as a facilitator of classroom math activities that were guided by a textbook with which he was philosophically aligned. He felt his hands on approach included all students and developed mathematics as a way of thinking rather than a set of skills and procedures. By constructing activities that aligned with both the text and the curriculum, he felt he was able to meet the needs of students as problem solvers. His prior experience and general orientation to math curriculum materials as a curriculum interpreter helped him remain undaunted by the problem-solving challenges presented by MiF. Because Dominic was philosophically aligned to the new resource, he trusted the District curriculum and felt that the new text had what he needed to meet those curricular goals.

Ali: Deciding On the Fly. “I use the text not as much as a script, because that kind of just comes naturally to me. I feel comfortable talking about the material, so I guess I use the teacher guide for more the overarching ideas and looking at the specific problems that the kids are supposed to able to accomplish. If there’s ever something you haven’t taught before, it is nice to have that book to look over, just to see from people who have taught it before, what’s a good way to go about it.” (Int. 1) Ali was a second grade teacher with four years’ experience, a year in third grade and three years in second grade, all at the same elementary school. For the first year of MiF implementation, she taught an above level class; where 2nd and 3rd grade material was blended and she represented her schools above level classes on the Math In Focus team.

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Identity and Agency. Ali loved her students and loved the camaraderie she experienced in her school. If you ask her what she likes about teaching second grade, she’ll tell you, “Everything. I love the kids, they come ready to learn and they’re so sweet, and all the staff, and really, I just love the community feel” (Int. 1). She demonstrated a strong identity as a teacher who found both intrinsic and mission-driven value in working with students. Her interviews were sprinkled with child-focused comments and she tended to present a strong degree of self-efficacy in her lesson design and classroom instruction. She enjoyed pulling in outside resources or recommending alternate strategies if doing so motivated and encouraged students. About life as a teacher, she reports, “Life is good as a teacher. I love it. Helping the kids improve and getting to know them and I learn things from them too so it’s all-good” (Int. 1).

Ali was confident in her ability to be successful as a teacher and in her understanding of second grade mathematics as evidenced by her reflection on how she uses a curriculum resource. “I feel comfortable talking about the material, so I guess kind of more the overarching ideas. It kind of just comes naturally to me” (Int. 1). Ali felt comfortable responding in the moment to student needs and was always willing to make a decision that helped a child. She valued creating a safe space for learning in her classroom, as evidenced by this comment about instruction, “Generally I stuck with the curriculum but kind of just like on the fly during a lesson if I notice there’s someone, you know, I’m normally pretty good at thinking about ways to help that child” (Int. 2).

Beliefs about teaching and learning. On the TTLM questionnaire, Ali emerged as a teacher with moderate to strong views about teaching and learning second grade
mathematics. She strongly agreed or strongly disagreed with seven of the 20 survey statements, agreed with eight and disagreed with five. Overall, her views speak to her identity as a child centered teacher who loves helping students learn and who is comfortable making classroom decisions in the moment. Ali viewed mathematics as a body of knowledge with somewhat flexible rules and procedures accompanying it. She felt all math problems had a right answer and believed there were established procedures that students should use to find the right answer. Her questionnaire responses suggest a view of second grade mathematics as a complex body of knowledge that involved learning use math to solve problems.

Ali’s survey results revealed an overall orientation toward constructing mathematical knowledge through practice and repetition. She is a teacher who views student experiences of practice, repetition, solving problems and working with manipulatives as methods for actively engaging in building mathematical understandings. Ali’s questionnaire responses evidenced an inclusive and confident view of second grade students as learners and problem solvers and a belief that classroom social interactions improved learning. Overall, Ali tended to take responsibility for creating a classroom where her students could explore concepts and solve problems.

**Orientation toward curriculum.** Ali was oriented toward math curricula as an *interpreter*. She used SFAW for three years and felt it offered a lot of helpful practice for students. Ali evaluated SFAW as a highly structured series that introduced one concept at a time, then provided a good bit of practice. This appealed to Ali’s experience as a
math student and the satisfaction she experienced when she knew how to do something well.

They would learn a concept, then they would give you a lot of practice. The amount of practice helped build confidence for the kids to where they could say, ‘I can do this’. And I feel good doing it ‘cause I remember being a math student, and, when you knew how to do something really well, it made you feel good, so that’s a good feeling, where you can feel confident (Int. 1).

With a brand new math curriculum, Ali tended to vary between follower and interpreter. She interpreted many of the new materials in the context of pre-existing strategies and routines. When the concept seemed new to her, she adopted a follower stance and paid more attention to the author’s intent and methodologies. Multiple interview comments alluded to orientation toward the materials. She tended to follow the student text for direct instruction when using the Smart Board but preferred to interpret the problems provided for guided practice and homework by using well-known materials from prior experience, particularly online tools like BrainPop and Cool Math for Kids. However, she didn’t discount the need to use the text in a more scripted way for concepts and strategies with which she was unfamiliar. About bar models, she reports the following: “I think if there’s ever, like bar models, I’d never taught that before, so it was nice to have that kind of script just for me to look over before, just to see from people who have taught it before, what’s a good way to go about it” (Int. 1).

Overall, Ali was a confident teacher who felt comfortable talking about mathematics in her classroom by interpreting the text through the lens of her prior experience. She was both intrinsically motivated to help students and mission-driven to develop their math knowledge. Ali viewed math as a body of knowledge and saw her
role as a facilitator of learning. By constructing activities that aligned with both the text and the curriculum, she felt she was able to meet the needs of students as learners. Ali tended to feel that she was responsible for creating a classroom of children as learners and problem-solvers.

**Theresa: Self-Directed.** “In the old curriculum I went in for the big concepts. I also went in to know the pages so I could write my plans. I always feel adamant that if I’m not here the sub knows what pages to work on. I think that is a priority. Your priority is instructional delivery. You’ve got to make sure the kids are learning. This year I go in and actually look at it because it’s not internal yet. The first thing I go to every time is the lesson” (Int.1). Theresa was a second grade teacher with 24 years’ experience, all at the same school. She had taught Kindergarten through third grade. Theresa said she developed a love for teaching; she wasn’t necessarily born for it. She was the first in her family to finish college and, as she says, “to me it was a huge accomplishment. I always think of socioeconomic diversity when I think of diversity in this District. It’s an undervalued component. Assumptions are made…I’m always big to make sure I level the playing field once they walk in the door” (Int. 1). Theresa taught an on-level class for the first year of MiF implementation.

**Identity and agency.** Theresa’s years of experience in the District and background as the first in her family to finish college gave her a unique lens on teaching and on her students. She placed a high attainment value on finding and making a difference for students in need and had strong feelings about being inclusive and finding strategies to ensure that all students had equal access to learning. “There are a lot of Band-Aid
families that if you just pull off the top you see a lot underneath. So I think about not making assumptions when it comes to the cost of field trips or bringing in materials or if they have technology access at home” (Int. 1).

From early on in her career, Theresa identified as a self-directed teacher, empowered to make decisions about lesson design and instruction on a regular basis. As she says, “I have to say, I feel very comfortable because of the meetings. We have professional latitude and that makes all the difference” (Int. 2). Her earliest experiences in lesson design were in kindergarten and first grade, where the curriculum was a collection of resources and the curriculum itself was created by the teachers. Theresa still applies those techniques of decision making to her lesson planning. As a self-reported agent for equalizing the playing field, Theresa differentiated, but did so based on needs outside of mathematics, like attention or handwriting, rather than explicit math needs.

In addition to representing her grade level and school on the MiF implementation team, Theresa was the second grade facilitator. This gave her additional authority around instructional decisions related to planning and implementing MiF. Her elementary school team was often ahead of the other schools in their planning and their instruction. They felt they could make decisions they needed to make along the way. As attainment was part of her professional identity, she felt proud to be pushing forward and reported the following: “We came back [from the team meetings] with information guidelines but it wasn’t a cookie cutter. We never felt inhibited; we were blazing the trail” (Int. 2).

Beliefs about teaching and learning. On the TTLM questionnaire, Theresa emerged as a second grade teacher with few strong views about learners and about
teachers. In fact, she felt strongly about only three of the survey items, agreed with nine of the rest and disagreed with eight. Her areas of strong agreement or disagreement were focused around her belief that second graders were capable problem-solvers and everyone could learn mathematics. Theresa was confident about her ability in mathematics. She viewed mathematics as a way of thinking and problem solving. She believed that math can pose questions for which there are no answers and that invention and creativity are parts of being a good math student. She could easily envision a student-generated solution as better than an established procedure. Theresa’s questionnaire responses suggest a view of second grade mathematics as a complex way of thinking that includes invention and problem solving.

Theresa’s survey results revealed an overall orientation toward constructing knowledge by practicing skills and concepts through varied non-repetitive experiences as a way of learning mathematics. Theresa viewed student experiences of practice, solving problems and working with manipulatives as methods for actively engaging in building mathematical understandings. Her questionnaire responses evidenced an inclusive and collaborative view of second graders as math learners. She saw students as curious and able problem solvers who may need to talk or work with a peer to best learn a concept. Her questionnaire responses tended to affirm Theresa’s self-reported identity as a teacher who works hard to meet children’s needs. Theresa’s responses to questions about her view of self as a teacher indicate that she tends to be confident of her ability to teach second grade math and views herself as a director of mathematical learning. Overall, Theresa tended to take responsibility for creating a classroom where her students received
teacher directed instruction that met their individual needs. She felt strongly that she needed to resolve confusion before the end of an individual math class.

Orientation toward curriculum. Theresa enjoyed the old math series and was oriented to it in an interpretive way; she saw the curriculum resource as a tool to use as a guide to instruction. Theresa preferred instruction to planning and liked that SFAW was “very rigorous and you knew exactly where the students stood” (Int. 1) As the SFAW materials became more and more outdated she felt needed changes could be accommodated by “accenting” lessons and viewed technology as a means to make the old curriculum current. Theresa felt that the SFAW curriculum was clear for both teachers and families and allowed teachers to maximize their time with students.

In the new series, Theresa felt strongly about keeping the same orientation as she used with the previous math series. As she reported: “A lot of us, Megan and I especially, are making up our own worksheets. We take the concept here and make something a little more use friendly and make copies of it” (Int. 1). Theresa’s wealth of experience and confidence in her ability to explain concepts and skills to students gave her latitude in how she approached curriculum materials. Early on she was partnering with another second grade teacher in her building to make worksheets and seek out additional materials using online resources.

In summary, Theresa’s years of experience and unique lens as the first in her family to graduate from college contributed to her confidence, self-direction and independence as a teacher. She placed high attainment value on identifying and making a difference for students in need and approached curricular planning as an interpreter and
designer of curriculum materials. Theresa viewed math as a way of thinking and problem solving and liked to provide differentiated non-repetitive experiences for her students. She valued independence and self-direction in both herself and her students. Theresa saw her second graders as curious and able problem solvers who benefited from talking with peers about their math learning and saw herself as a teacher who’s role was to find and/or create materials that were effective for each child.

**How Individual Factors Matter for Curriculum Use**

Overall, my analysis found connections between the study participants’ beliefs about teaching and learning, individual identity & agency, and orientation toward curriculum that I hypothesize might influence their participation with MiF. Study participants who emerged as confident were more likely to feel self-directed and empowered to engage with a new curriculum. Those who felt that they were knowledgeable about second grade math and confident in their beliefs about their ability to teach it emerged as teachers willing to interpret the new curriculum using their experience and background. Conversely, teachers who felt that they were still learning and who were more worried about their ability to teach the new curriculum tended to orient themselves as followers or learners more likely to stick closely to the teacher resource. Study participants who viewed math as a way of thinking were both more likely to be self-directed in their approach to teaching math and more inclined to view student learning as a social enterprise; teachers who viewed learning as social and collaborative saw themselves as facilitators rather than transmitters of learning.
In my Chapter 4 analysis of the MiF second grade materials, I noted that the authors provided more information about the authors’ intentions and explanations of the mathematics than they did about anticipating student response and encouraging adaptations. I also noted that the teacher scripts in chapters 4 & 16 leaned heavily toward explicit information, speaking through the teacher rather than to the teacher. MiF had a familiar look and feel to it for these study participants, as it was in many ways similar to the SFAW series in use previously. Connecting this piece of my analysis with that of this chapter on the individual teachers beliefs, identity & agency, and orientation toward curriculum, I anticipated that those teachers orientated as interpreters would find it easier to make high quality adaptations to the MiF curriculum. Because these teachers were confident and felt knowledgeable when designing mathematics instruction, and inclined to adapt the curriculum to meet their students’ needs, they were not likely as affected by the lack of information about student misconceptions and the mathematics associated with the Singapore Modeling Method.

As I discussed in Chapter 7, these teachers, Ali, Dominic and Theresa, participated with MiF in a more adapting and adopting way than teachers oriented as followers or learners. Teachers oriented as followers struggled to act as mediators of the MiF text for their students and were therefore more likely to participate as thorough piloters of the text, reading and enacting the written curriculum more thoroughly. This helps to explain Denise’s feeling of being overwhelmed and Tara and Sheila’s feeling surprised by students’ responses to the scripted nature of the curriculum and possibly betrayed by the resource itself. Laura and Patti, oriented as learners, took a more
cautious approach than the interpreters, making some adaptations and adoptions, yet generally sticking closely to the text. Chapter 7: Situating Teacher Participation Between Teachers and Text, triangulates this data and examines these ideas more closely.
CHAPTER 6: THE SOCIAL NATURE OF TEACHING AND LEARNING

ANALYZING THE TEAM MEETINGS

In addition to examining the MiF second grade curriculum and gathering information on individual teacher factors, in this study, I met with and facilitated the work of eight teachers and five math specialists as they collaborated to implement a new mathematics written resource. I sought to understand how participation in a professional learning group might influence teachers’ work with a new mathematics resource. My third research question guided my analysis of the team meetings.

How do teachers participate with a new mathematics curriculum resource and with each other when working in a professional learning group and how does this matter for their curriculum use?

The results of my analysis support Remillard’s (2005) finding that educative teacher materials can enhance teaching when sustained and supportive teacher learning accompanies their use. By designing the professional teams to be ongoing, collaborative, and focused on utilizing the text for approaches and strategies for teaching and learning (Borozi & Fonzi, 2002; Silver et al, 2009; Collopy, 2002; McDuffie & Mather, 2009), I was able to both support the teachers and gain insight into the ways in which the teams mediated their participation with MiF.

In this chapter, I first describe my conceptualization of professional learning groups then provide an overview of meeting topics. I briefly discuss how the teams mattered for curriculum and then illuminate teachers’ participation on the teams by describing their interactions with the text and with each other through the use of five
vignettes. As developed in Chapter 3: Methods, the selected vignettes represent the topics most commonly discussed in multiple meetings and by multiple participants. In addition, the vignettes represent conversations that resulted in adaptations to the curriculum resource. After each vignette, I analyzed the conversation by describing how it was initiated and steered, where the expertise we used for decision-making was located, and what types of participation occurred. To describe the participation, I again used Drake and Sherin's (2009) model for how teachers read, evaluate and adapt curriculum resources. Following the vignettes, I used the work of Davis and Krajcik (2005) to assess the products created or substituted by the teams during the adaptation phase in order to determine whether they added educative or structural features to the text.

**Conceptualization of Professional Learning Groups**

In this study, I conceptualized professional learning groups as a community of teachers who share a specialized knowledge base that includes both content and pedagogical knowledge about how students think (Sowder, 2007). Because I sought to understand how the professional learning team in this study participated with a curriculum resource, I built on the work of McDuffie & Mather (2009) who investigated how teachers in a professional learning group participated with a new curriculum resource. I learned about the nature of teachers’ participation with each other and with the MiF text through an examination of how conversations were initiated and steered and what products or agreements emerged as a result.
Researchers Role

In my professional role as math supervisor for the school district studied, I solicited and developed agendas and facilitated each of the meetings. Agendas were typically loose, in the sense that, although certain planned topics were on the agenda, teachers’ feedback was solicited prior to and during each meeting and then acknowledged so that if a team member had something they wished to discuss, there was always room to do that. Meetings typically opened with a statement from me about planned topics then a request for an update by school. These updates included how teachers were progressing through the curriculum, where they saw themselves in relation to the curriculum and to each other and any concerns that may have emerged since the previous meeting.

Analysis of the Team Meetings

I tabulated the themes from the meeting agendas to see how often and which topics resurfaced over the course of year and across the two teams. Table 6.1 illustrates an AM and PM agenda from the November 6, 2013 meeting. These two agendas typify the planned and unplanned meeting conversations by topic. Table 6.2 shows the range of topics and the months in which they were important agenda items in either on level meetings, above level meetings or both.
Table 6.1

Example of agenda topics

<table>
<thead>
<tr>
<th>Above Level Team Meeting Agenda 11.6</th>
<th>On Level Team Meeting Agenda 11.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pace</td>
<td>Pace</td>
</tr>
<tr>
<td>Assessments</td>
<td>Report Card</td>
</tr>
<tr>
<td>Fact Fluency</td>
<td>Bar Models</td>
</tr>
<tr>
<td>Manipulatives</td>
<td>Fact Fluency</td>
</tr>
<tr>
<td>Useful teacher tools</td>
<td>Chapter 3 Test</td>
</tr>
<tr>
<td>Upcoming chapters</td>
<td>Manipulatives</td>
</tr>
<tr>
<td>Benchmark Assessment</td>
<td>Homework for 2-day Lesson</td>
</tr>
<tr>
<td></td>
<td>Benchmark Assessment</td>
</tr>
<tr>
<td></td>
<td>Chapter 5 Planning</td>
</tr>
</tbody>
</table>

Table 6.2

Range of Conversations Across Levels and Months

<table>
<thead>
<tr>
<th>ABOVE-LEVEL MEETINGS</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Parents</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fluency</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pacing</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Issues</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mathematics Content</td>
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<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ON-LEVEL MEETINGS</th>
<th>November</th>
<th>December</th>
<th>January</th>
<th>March</th>
<th>April</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fluency</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pacing</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Teaching Strategies</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mathematics Content</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Issues</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Teacher Team Participation

Teachers’ participation during the meetings was typically initiated in one of three ways. The teachers often generated questions about topics or concerns related to the text or its implementation that had emerged since we last met. As meeting facilitator, I sometimes inserted a topic that I felt was essential to the continued successful implementation of the new text. Occasionally, teachers resisted the use of the text by avoiding an inserted topic or taking it in another direction. Once teacher participation was initiated, it could be steered by any team member or combination of team members. Because the group's common purpose was to implement the MiF resource, steering participation often resulted in a closer examination and analysis of the text itself. Examining the text and its resources often led to a deeper discussion of the topic, resulting in greater understanding of mathematical content or pedagogy related to the curriculum or exposed teachers’ needs in relation to the curriculum. Teachers’ participation was organic and collaborative by design. Other practical and logistical conversations also occurred, as evidenced by the sample agenda and the topics maps listed on page 3 of this chapter, but the most meaningful teacher learning was around the types of conversations referenced here.

How the Team Meetings Mattered for Curriculum Use

The nature of teachers’ participation in a professional learning team supported the implementation of the MiF resource. By examining the meeting agendas, I learned that discussion topics recurred over multiple meeting and months and were directly connected to the challenges posed by the new curriculum series. The meeting processes involved a
A series of conversations initiated and subsequently steered by team members that included teachers, math specialists and the facilitator. I noted that there were often structural or educative adjustments made to the curriculum as a result of these conversations. Sherin & Drake (2009) define educative curriculum materials as those designed to promote teacher learning for both instructional decision-making and generalized knowledge. Remillard (2012) defines structure in curriculum materials as the way in which the materials address the teacher, including the way the materials look, whether they speak to or through a teacher, how they are organized and where they are located.

The conversations during the team meetings were often educative and/or structural and resulted in products that supported teachers’ enactment of the new curriculum. Table 6.3 below lists conversation topics from which significant discussions emerged. Who initiated the conversation and who steered the discussions are noted. If the conversation resulted in an educative product or resolution, it is listed in the fourth column. Following the table is a descriptive analysis of five of the conversations, identified in bold in the first column of Table 6.3. These vignettes serve to provide context for the reader and to illuminate the social nature of teacher learning in this setting.
Table 6.3
Illustrative conversations from the team meetings

<table>
<thead>
<tr>
<th>CONVERSATION TOPIC</th>
<th>INITIATION</th>
<th>STEERING</th>
<th>ADAPTATIONS/PRODUCTS/STRUCTURAL CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning across the chapters under time constraints (5.16.O)</td>
<td>Teacher Facilitator</td>
<td>Teacher Facilitator</td>
<td>Adaptations to lessons including skipping a unit assessment or combining lessons</td>
</tr>
<tr>
<td>Discussing differences in teacher/text philosophies (11.6.O)</td>
<td>Teacher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Looking ahead to future chapters</td>
<td>Teacher (11.6.A) Facilitator (3.5.O) Facilitator (5.16.A)</td>
<td>Facilitator</td>
<td>Backward design document for Chapter 17 Blended End-of-year assessment</td>
</tr>
<tr>
<td>Developing pedagogy for the teaching of bar models (11.6A)</td>
<td>Facilitator</td>
<td>Teachers Math Specialists</td>
<td>List of useful strategies for teaching bar models Backwards design for Chapter 4</td>
</tr>
<tr>
<td>Developing a different understanding of mental math (3.5A)</td>
<td>Teacher</td>
<td>Facilitator Math Specialists Teachers</td>
<td>Blended Syllabus</td>
</tr>
<tr>
<td>Resolve teacher differences (11.6A)</td>
<td>Teacher</td>
<td>Teacher</td>
<td>Agreed upon measure for reporting to families about fact fluency</td>
</tr>
<tr>
<td>Develop an understanding of what was available in the text and how to use the resources. (12.5.O/A)</td>
<td>Facilitator</td>
<td>Math Specialists</td>
<td>Examination of three chapters in the text supported by resources and materials</td>
</tr>
</tbody>
</table>
### Resolved teacher concerns about assessments (12.5.O)

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Facilitator</th>
<th>Examined the assessment and adapted it as determined by the team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>Facilitator Math Specialists</td>
<td></td>
</tr>
</tbody>
</table>

### Develop an understanding of expectations in grades 3 & 4 (4.3.O/A)

<table>
<thead>
<tr>
<th>Facilitator Math Specialists Teachers Facilitator</th>
<th>Examined the PA Core standards and released problems to align second grade content and pedagogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designed a Chapter 11 syllabus by working backwards from the chapter assessment</td>
<td></td>
</tr>
<tr>
<td>Math Specialist Math Specialists</td>
<td>A syllabus connecting each test question to text resources</td>
</tr>
<tr>
<td>Introduce Pacing Guide (1.9.O/A)</td>
<td>A chapter pacing chart and guide</td>
</tr>
<tr>
<td>Facilitator Facilitator Math Specialists</td>
<td></td>
</tr>
<tr>
<td>Adapt ing lessons (4.3.O)</td>
<td>Cent res and activities for the chapter on money</td>
</tr>
<tr>
<td>Teacher Math Specialist</td>
<td></td>
</tr>
</tbody>
</table>

### Illustrative Vignettes

**Blending two grade levels for above level math**

The above level team was in an unusual situation when it came to implementing MiF. After the first grade implementation, the decision was made to start all second grade students in the second grade MiF book, even though math was leveled into on and above. This was a change in practice as above level second graders typically jumped right into the third grade book at the beginning of the school year. With the change in series and its increased level of difficulty, District teachers and administrators decided to start all classes in the second grade book and blend the third grade book whenever it was appropriate. This caused additional questions from parents and also placed additional
pressure on the above level team to not only implement a new series but also to blend two
grade levels of the new series. In this vignette, teachers on the team participated with
MiF to carefully blend the chapters from the second and third grade text on mental math.

As was often the case, the conversation began with a question from one of the
second grade teachers. “Are we supposed to start using second grade mental math and
estimation, test on that chapter and then go into third grade mental math and testing or are
we doing a combined unit?” (3.5A). One of the teachers on the team was usually several
days ahead of the others and the team often looked to LB for information about her
experience, as they did in this case. She reported,

We did addition strategies the last two days, out of book 2 and book 3. In
previous chapters we had kind of rushed through the chapter opener and
the review but for this chapter we did it. We spent a whole day on the
chapter opener and review because I hadn’t taught number bonds before
so I refreshed what I needed to do and brought it back to the surface for
them as well…”(ALTM, 3.5.14)

The above quote illustrates the need for teacher attention to a new kind of mathematical
content, number bonds, which were taught in grade 1, and used but not retaught in grade
2. Teachers in this District had not used number bonds before so using the “recall prior
knowledge” part of the MiF was essential to teachers in implementing Chapter 10:
Mental Math and Estimation. Content reviewed from grade 1 included the following: a)
adding ones mentally using the “add the ones” strategy, b) adding tens mentally using the
“add the tens” strategy, c) subtracting ones mentally using the “subtract the one strategy,
d) subtracting ones mentally by recalling number bonds and e) subtracting tens mentally
by using the “subtract the tens” strategy as depicted in the pages below (MiF, 2B, pp. 2-3)
Figure 6.1: MiF strategy for mental addition (Keong, Ramakrishnan, & Choo, 2013, pp. 2-3). Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

A team member says,

I have a question. I want to ask it now. We have the chapter test for mental math and it says solve these problems mentally. Are we saying to the kids that they can’t use scratch paper? Are we saying that any strategies are ok? Personally, I’m kind of like whatever strategy you could use, does it. I don’t know how other people feel (ALTM, 3.5.14).

This question illuminates the need for discussion around strategies for teaching and learning. It is particularly illustrative because mental math was not pedagogically unpacked in the SFAW grade 3 text and although the idea of mental math was not new for these teachers, explicitly teaching it and then assessing it was. As the facilitator, I suggested that the team examine the assessment to see what the expectations are and also take a look at Book 3, Chapter 2 to see how the topic builds from one grade to the next.
(3.5A). The exchange below illuminates differences in what a relatively small group of elementary teachers means when they talk about mental math and what this same group holds as expectations for student work.

*FC:* Lesson 2 (2B10) is a three day lesson right?

*LB:* Yes with all the different strategies. Lesson 2, Mental Addition, it’s called. And that’s one with eight, nine different strategies to go over.

*FC:* …And then we’re just talking about exposing students to those…all those strategies?

*LB:* Sure, you can’t make them use the strategies.

*FC:* Right, but we are going to expose them and then when they get to the test we’re saying use whatever. What do other people think?

*TM:* It says solve; use mental math.

*LB:* But they said that on the PSSA’s too and the kids had scrap paper there.

*FC:* Well, we don’t want the PSSA’s to be our guide.

*TM:* I see two sides here. What if they were to draw a number bond to try and help themselves? I don’t know. Visualizing separating the number, adding the hundreds then the ones.

*TM:* I’m just picturing kids writing the math problem on their desk and then erasing it. Imagine that you forgot or didn’t feel comfortable using that strategy.

*FC:* Well, there’s no identified strategy that you have to use. So, that would be one thing if you had to do it a particular way, but you don’t.

*TM:* That’s tough if you can’t recall.

*TM:* I mean they’re writing stuff down on their homework so on their homework they’re not…the way they break it out here, so I personally feel like we should.

*FC:* Well the thing is if they use scratch paper, then they are not doing mental math. They’re going to add them. So then you’re essentially not
assessing mental math. You’re assessing adding. Is that what you want to assess?

*TM:* In the standard response, they’re given room to draw it out and solve it. Even though it says mental math, here’s this nice big space.

*FC:* So in this chapter, you’re the teachers. What do you want to assess of the children? What do you want them to know and be able to do at the end? And whatever that is, I’m ok with that.

Teachers had further discussion as they reflected upon the work that was being asked of the students and used their experience of these learners to consider what they thought they would be able to do. By examining the differences between the second and third grade chapter, team members begin to separate the text expectations from their own.

*TM:* Looking at the second grade test I can think, “OK, I can see taking everything away from them”. Looking at the third grade test with some of those balanced equations, that I can see really being a high bar to kind of get them to.

*TM:* Some of them struggle with just balancing equations and then when they have to do it in their head…

*FC:* Well, could there be an option to have a no scratch paper part and a scratch paper part? Are there certain things where you think they should be able to do them in their heads or do you think none of this?

*LB:* For a second grade test I agree. Take away the scrap paper. Twelve questions, you have to deal with it. Just do the mental part.

*FC:* So as a smart second grader, an above level second grader, what do you want them to be able to do?

*TM:* To do it mentally.

*FC:* Why don’t you talk about that in your building pairs and take five minutes and try to pin it down for yourselves. Because if we can decide that, then we’ll know what to test.

Each second grade team member and their school’s math specialist worked together on Chapter 10 (2B) to determine how they saw the assessment playing
out for the students. They applied some techniques they used in planning chapter four to backwards design their lessons from the chapter assessment. As they looked more deeply into each chapter, they recognized that Chapter 2 (3A) builds on what was learned in 2B10 and the team agreed that they are comfortable with expecting students to work without scratch paper on 2B10. Participating closely with the MiF teacher resource helped the teachers feel more comfortable about teaching the content and having high expectations for student learning.

AD: I feel like the second grade test is doable. I feel better after looking at it. I feel like the kids will be ok.

AD: It looks like maybe in second grade, strategies are in and of themselves. In third grade it seems they combine [strategies]. For example, in second grade “add the tens” is a strategy by itself. In third grade they’re adding tens then adding ones.

FC: Let me get a sense of how you’re seeing it. Are you seeing merging the two (chapters) or are you seeing teaching chapter 10 (2B) then chapter 2 (3A)?

AD: I think we’re trying to figure out how to merge it without losing any key points in the lessons.

PC: We talked about just kind of going through the second test (3A) and then looking at the third and sort of pulling out maybe what we felt was a repeat and what was new and kind of extending them that way.

AD: We talked about if we were to merge the two so we are doing the mental addition from grade 2 and then the mental addition from grade 3 and then after going through the addition then go through the subtraction so blend it that way.

Analysis. This conversation occurred in two parts. A team member who wondered about how they should blend the two chapters on mental math initiated the first. It was then steered by one of the other team members who was ahead of the others
in her pacing. Because she had already done some thinking about and teaching of this chapter, the team was able to use her expertise to participate with the text. She directed them to the needed background knowledge and the team could read this for the script, evaluating what background knowledge students needed to successfully complete the chapter. A team member who wondered how teachers should assess student learning for these chapters also initiated the second part of the conversation. As facilitator, I steered the discussion toward the text by suggesting that the assessment be more closely examined to determine what teachers thought students should know and be able to do at the end of the blended chapter. The expertise was located with both the text and with the teachers in their knowledge of their students. Teachers and math specialists evaluated the chapters by considering expectations for student learning. As a result of the team's participation with both the text and each other, teachers adapted the text by creating a guide for blending the two mental math chapters and by creating a blended assessment.

Engaging around the topic of blending chapters and mental math led teachers to important interactions with the text. Because more than one member of the team shared the original initiating teacher’s concern the discussion was valued by most and informed all members of the team. Team members examined their thinking around an important mathematics concept, mental math and shared ideas on what it meant to them and therefore to their students. Once their thinking was solidified, they were ready to interact in the work of blending chapters from the second and third grade texts. This type of interaction, sifting carefully through a new curriculum and blending chapters, was not easily accomplished; this was work that could only be done in a team.
It’s Like a Whipping - Fact Fluency (11.6)

One of the earliest concerns to emerge from teachers was MiF’s lack of explicit practice and expectation of fluency for basic facts. Neither the student text or teacher resource mentioned knowing or practicing addition or subtraction facts and multiplication facts are introduced by spending time teaching strategies for the multiplication tables. In Chapter 6 (2A), tables for 2, 5 and 10 are taught first using skip counting and dot paper (MIF, 2A). Division for these same tables is taught using related facts, if 3 x 2 = 6, then 6/3 = 2 and 6/2 = 3. Multiplication facts are not revisited until Chapter 15, when students learn tables for 3 and 4, using the same strategies of dot paper, skip counting and related facts (MIF, 2B). Teachers in this study had a long history of using Mad Minutes, fact booklets and other strategies for memorizing facts to develop fluency. Skip counting was used to learn the concept of multiplication but repeated practice and tests were the common route to fact fluency in these elementary schools. In particular, a child’s ability to quickly regurgitate the facts was considered an essential component of the above level student’s skill set and weekly timed tests were common across the elementary schools.

Teacher’s concerns emerged via email and fact fluency was placed on the November meeting agendas. Because the curriculum was new, even teachers most likely to adapt the curriculum were not yet comfortable doing so. Therefore, teachers felt a bit of panic, as they wanted to address the need for fluency but they didn’t feel able to adjust the curriculum. As part of my planning for the meeting, I researched and provided several articles highlighting strategies and games for developing fact fluency. I knew that I had different beliefs about fact fluency and how it might be approached but I also knew
that some of the teachers on the team measured their and their students’ success by how fast and how accurately they could recall basic facts. I asked team members for more information about the problems emerging with fact fluency for addition and subtraction as well as for multiplication and division. What emerged was more of a concern about what counted as successful fluency in grade 2 in the above level and in the on level and how to assess and report it than how to help students develop it. Above level teachers tended to be happy with giving a timed test of 100 problems, some teachers did not feel like 100 was enough (11.6A). On-level teachers felt that the disparity between using 36 for on level and 100 for above level was too extreme. The conversation below highlights the cognitive conflict some of the teachers were experiencing and how the teams unraveled the concern.

Teachers on the above level team briefly referenced why they felt fluency was needed but then discussed using 100 as a cutoff.

*FC:* So everyone in the above is doing a hundred problems?

*TM1:* We’re doing a hundred problems in four minutes for addition and then five minutes for subtraction. If it’s 90 or above, you get a plus. Those numbers I just said, that’s something that Rachel and I just decided years ago. It’s not something that’s ever been told to us.

*TM2:* I like that if it’s ninety percent and above then it’s a plus. So eighty-nine percent is a check; I mean percentage wise it makes sense. What I did was look at the old objective test and just applied the same percentages.

*FC:* So that’s a difference of sixty questions and do we really think that there is that much of a difference in second grade between on level and above level in terms of fluency? Should there be that much of a difference and if there shouldn’t then there’s the problem.
TM3: I don’t think there should be because honestly, the program is not having – they are teaching them the strategies. We need them to be fluent because eventually that’s [using the strategies] going to take too much time. I don’t see why our kids should be that much more fluent than the on-level kids.

TM4: Do we need to have 100 problems or do they only need thirty-six?

TM3: I think our on levels felt that the thirty-six was plenty for the on levels. I think we felt that 100 was a lot.

TM4: I feel like fifty.

TM1: Maybe this was just like my bubble in my classroom, but I felt like the hundred was appropriate because I only have a couple of kids that are not making that seventy expectation.

On-level teachers, who were giving 36 problems, had a different conversation (11.6O).

TM1: Personally, I think that we like 36. I mean I noticed for my own group that if I were to give them 100, they’re using a lot of what we call finger tools just to do their basic computation. So I don’t know if anything more than 36 would be fair. I don’t think they would do well.

TM2: I would agree, but I do have a few students who might be able to go past 36. So they’re going to be sitting.

FC: What about differentiating the assessment, if you’re great at it, here are 100.

TM3: That came out because we have a first grade teacher that moved to second grade. It was a good philosophical question, there’s just this big gap…So it was posed and we’ve always stuck with 36, it’s been our benchmark in the grade. So I just think that 100 is a big leap up, but I can see her point.

TM4: I think long term for the child. I’d rather have a very informal differentiation that doesn’t cause too much work or time for me, but…if an on level student can do 100 problems in five minutes because he’s just really good at it, but he’s not good at defining it…

FC: Well, I agree. I actually think the above level, the 100 is killer, if you’re a slow worker but a great thinker; why not be able to do a 36…
TM3: But you know this one teacher kept throwing it out there and I just, okay we got to come up with an answer so it can make everybody move forward…

FC: So what do you think would be best?

TM3: We came up with a barometer of; if they got to 36, let’s give them a test out of 50. I think 36 is what I put on the report card, but in the comment section, such and such has mastered beyond the expectation.

After this discussion, led by a teacher who was bringing the concern to the group from her elementary school, the on-level team felt good about reporting on 36 problems, but measuring more and differentiating for individual students.

Analysis. An on-level team member initiated the conversation about fact fluency via email. After checking with other schools, it was added to the agenda, as it seemed to be a common topic of discussion in the buildings. As facilitator, I attempted to steer this conversation towards a philosophical discussion of how fact fluency is developed. The on-level team member who initiated the discussion steered the conversation toward how to assess fact fluency and note it on the report card. The expertise here was with the teachers of both above and on-level classes since they knew best what had been done in the past. In their reading of the MiF text, these team members considered what was needed to develop fluency with facts and determined that the text did not have it. Team members agreed to adapt the text by substituting their previously used methods of practicing and assessing speed and recall of basic facts. This example of a resistant conversation illuminates engagement and interaction in a different way. Fact fluency was an agenda item because teachers requested it. However, their method for developing fact fluency was to hold students accountable through testing a number of facts or a set of
facts; they were willing to teach the strategies found in MiF, but ultimately, they felt students learned the facts by memorization and testing. Teachers engaged in the conversation about fact fluency by ignoring the text’s philosophy around fact fluency and redirecting the conversation to the methods they were most comfortable with. In this case, they engaged around how to assess without causing student distress.
Local Expertise (12.4.O/A)

This vignette is an example of a conversation initiated by me as the meeting facilitator and steered by the math specialists. Each of the five elementary schools had on staff an elementary math specialist. The specialists supported students and teachers in all the grades by pulling struggling students for extra support, pushing into teacher classrooms for extra support, attending morning team meetings to share information and providing content support as requested by teachers. For the District implementation of Math In Focus, they provided workshops for all teachers and, during the 13-14 school year, they helped grade 2 teachers specifically. The math specialists were trusted human resources who attended all the team meetings associated with the MiF implementation and who often worked with the classroom teachers during the meetings to design lessons and help address concerns. They worked closely with me on the MiF implementation and I often discussed agenda items with them. For the December meeting, I asked them to take a larger role in educating the teams about three upcoming chapters.

In developing the December agenda, I could see that grouping the three measurement chapters made sense and would give us a chance to reinforce some planning strategies we were already suggesting to teachers, including a) previewing the assessments and using them to plan instruction, b) planning for and using manipulatives and c) carefully examining and working through the real world problems found in every chapter. At the December meeting, I asked the specialists to use their expertise to preview for the teachers Chapters 7-9 (2A) on metric length, mass and volume. These chapters were selected because they utilized bar models, which teachers had struggled
with in Chapter 4 and because they emphasized the use of manipulatives, which some teachers were resisting because of the logistics of using them and because of their prior belief that using them demonstrated a lack of mastery by students.

In both the on and above-level meetings, the math specialists walked the teams through each chapter and did some activities from the chapter with them. They demonstrated the use of manipulatives and provided online resources to accompany the text. Materials needed to duplicate the activities were given to each teacher so that little planning was needed to actually enact the activity in their classrooms. At the end of each chapter, teachers completed one of the activities in the chapter, the first involving measuring string, the second reading a scale and the third, using different sized containers to measure volume. The excerpts below highlight for the reader how the specialists interacted with the teachers on these chapters and what the specialists thought was important to share.

When sharing information about Chapter 7, Patty, one of the math specialists, first reassured the teachers that Lessons 1 & 2 are fairly traditional and similar to what they’ve taught in the past, while identifying relevant vocabulary and content. This specialist provided a list of online resources for the teachers and demonstrated how they worked during the meetings. She also strongly emphasized the use of manipulatives to help students visualize challenging content.

PM: What I did was I just put kind of like the highlights that we discussed as math support people that we thought might be a little bit different, or might be something you want to focus on. So the first chapter, or first lesson, it’s Chapter 7. But the first lesson pretty much, this is going to be the first time the kids are exposed to just standard units.
PM: So the first thing is just the [students] looking to see what a meter is, you know what’s higher, what’s lower. So it’s pretty much what you’ve done in the past. It’s not really that different.

PM: And then lesson two is also pretty straightforward. They use subtraction skills to compare the heights, but the numbers are small. So they don’t have to use big numbers or do a lot of borrowing or carrying. And there the exposure is tall or tallest, shorter, shortest, longer, longest and they’ve heard those words in first grade.

In Chapter 8, specialists Lisa and Jess talked about the bar models that accompany the word problems in this chapter on mass. They used a backward design model to identify skills needed for success on the chapter test and to reassure teachers that the bar models are considered a support for students rather than a tested topic. Teachers were not used to designing instruction by working back from the assessments because they had previously developed their own assessments. However, using the assessments to foreshadow instruction was valuable for some teachers as they designed their lessons.

JG: Yeah, the bar models are not specifically tested, although the kids can use them to help with some of the problems.

LM: They’re heavy on the chapter review. So when you do the chapter review with the kids, don’t panic. There are one, two, three, four, five, six bar model problems, and let’s see, five of them are two-step. So that’s really tough. But when you get to the test, the test does not have those specific types of bar model problems, but students might choose to use bar models to solve some of the more algebraic ones.

LM: When you do look at the test, I would just pay close attention to questions eight through 13, and then refer back to the lessons that reinforce those concepts. I think they rely heavily on the concepts in lesson 4.

LM: So I think, if I were to think of one thing in that chapter that I really needed to focus on, it would be the different kinds of scales, and how to read them.

JG: I’d also like to point out the Thinking Cap.
**JG:** So it’s page 210, the second page of the Thinking cap. You have on one scale a box and two balls, on the other scale you have a box and one ball. So the first question is, what is the mass of one ball. So you’d have to look at both of the scales and figure out, ok, the mass of a box and a ball is 300 the mass of the box and two balls is 500. So what’s the difference? One ball would be 200. And then the second question, what is the mass of the box?

![Figure 6.2: Thinking Cap on Mass](image)

**Figure 6.2:** Thinking Cap on Mass (Keong, Ramakrishnan, & Choo, 2013, p. 210). Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

In a similar fashion, the two other math specialists, Trish and Linda, dissected some of the difficult concepts in Chapter 9: Volume. They chose to highlight two and three step word problems in certain lessons and hidden concepts of multiplication and division on the chapter test. Interpreting multi-step problems was another challenging piece of MiF and teachers who were working the problems in advance were experiencing a higher degree of success and comfort with the new series. Demonstrating how much could be learned by examining the problems in detail and doing them in advance encouraged the team to not only do this themselves but also to share the idea of doing this with the other teachers in their buildings.
TP: Chapter nine is very sort of similar to the other two chapters in that they do a lot of comparing…I think Nancy probably has that test as well, and you might want to look at some of those questions in there. And everybody should have the measuring pieces in their supplies.

TP: One thing we want to be careful about, we noticed in the volume piece that again at the end of the chapter you have real world problems…but there are problems that actually have three steps in them. If you look at the Let’s Practice page, student page 281, you see the problem below

![Figure 6.3: Real World Problem (Keong, Ramakrishnan, & Choo, 2013, p. 281). Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company](image)

TP: So that’s a two-step.

TM: Oh and even number four has three add-ins to it, so it’s a three part and then the whole, which is not as hard but still a new concept.

LK: ...they actually have to use multiplication and division in this chapter to figure out ...so it has like half as many so then you have to figure that out. And it’s mostly two half, and then twice. So on the test, they, it says the same thing. They’ll show some pictures like in number two so you have the jug holds three cups, the pail holds nine, how many jugs would you need? So they have to divide the nine by three.
Figure 6.4: Volume problem (Keong, Ramakrishnan, & Choo, 2013, Assessments p.63). Images from MATH IN FOCUS. Copyright © by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company

TP: So I mean they can circle the pictures there, but it’s still a division concept.

LK: And it’s not lined up real nicely where they show three, three and three.

TP: It’s not in an array.

Analysis. This was a steered experience initiated by me as the meeting facilitator and steered by the math specialists. What was notable in this conversation was that there was less engagement in the form of discussion and more interaction with the text at the direction of the specialists. The experience was relevant as these chapters were coming up soon and the math specialists were seen in the building as helpful experts, who often provided strategies for mathematics teaching and learning. Additionally, the chapters expanded upon student understanding of the bar model chapter and made significant use of manipulatives, which were provided to each member of the team. This meeting was less about resolving concerns and developing solutions than about learning how to use
the materials and text to teach the mathematical content. This close study of the resource is similar to what the Japanese refer to as Kyouzai kenkyo, which literally means document research, a central component of Japanese lesson study (Watanabe, T., Takahashi, A., & Yoshida, M. (2008).

“They’re going to bomb it.” (12.4.O)

The MiF teacher resources included a book of assessments to go along with each chapter as well as benchmark tests every four chapters. The District decided to use these assessments for two reasons. First, it would help them implement the new series by creating an accountability system for using the new materials and second, rather than spend time designing assessments, teachers could spend the time planning their lessons. Questions on the assessments were often difficult and/or novel and even when teachers used a backwards design model to plan a unit, some problems on the assessments would throw students and teachers for a loop. Scores on the unit assessments were not shared and teachers could provide help as needed, after all, the students were only in second grade. The Team decided, however, that they wanted to give the first Benchmark (Chapter 1-4) just to see how they were doing in implementing the new curriculum. The Team discussed providing less help on these tests as it was not an assessment that would go back to students and/or parents and we really wanted to see what the children could do on their own. The following conversation illuminates the fears teachers had about how their children would do on this assessment and about how their performance would be interpreted by the District.

**DP:** The only other concern that we have for the on grade level and it’s just something to see if we talk about it or not. But we’re really concerned
about the benchmark tests. And we truly feel that these kids are going to bomb it. Having looked at it, it looks hard.

*TM:* It is hard.

*DP:* And I truly believe they’re going to bomb it. To go back to chapter 1, which we haven’t really done the concepts of place value since chapter 1, I mean kind of in addition and subtraction, but to not only test them on the concept but the actual application of it, they’re going to struggle.

In response, the Team decided to examine the assessment closely so we could see what we thought of each of the questions. One of the math specialists projected the benchmark on line so the team could take a collaborative look at the individual questions.

Although the math specialists had already reviewed the questions, most of the team’s second grade teachers had not examined it closely.

*FC:* Patty’s going to bring up the Benchmark. Has everyone taken a close look at it?

*FC:* Here it is up here on the screen if you want to take a look. So Dominic, do you want to take a look? You’ve looked right?

*DP:* I did. I mean I didn’t do it really in depth, but I was like, wow, ok, not all of them, but I’m saying.

Once the team started examining the problems one by one, they could identify exactly which of the problems were causing them concern. Teachers spent some time discussing strategies they would likely use to help students during the assessment, without providing direct help with concepts or procedures.

*FC:* The teacher is going to read them [the problems] and then the teacher’s voice will emphasize the important words. They’ll do it naturally.

The same teacher also raised a concern about how the scores would be used and how to score the bonus questions. He wondered whether there was an expectation that teachers
would review the chapters prior to the assessment, but was somewhat comforted to learn that the tests would not go home and that the data was to be used to inform instruction only. The teacher was beginning to relax at this point, but was still double-checking to ensure that the data was only formative and not evaluative for him or the students.

**Analysis.** This conversation was initiated by a teacher who took the risk of airing his concern about how his students would perform on an assessment where they might be compared with other students. As facilitator, I steered the Team towards reading the assessment as a script so they could evaluate each item and consider how their students would perform. Examining each question seemed to reduce the distress of the teacher who initiated the conversation. Thinking about the individual problems moved the concern from the unknown to the known. This resulted in team members discussing and agreeing upon strategies that they would use to help children do their best without prompting them. Ultimately, the Team did not make any adaptations to the assessment.

This conversation illustrated the role that trust played in the group’s inquiry on multiple levels, trust in the curriculum, trust in the students, and trust in me as a District administrator. It took courage for the teacher to raise this concern with the team and with me. By taking a stance of looking closely at the assessment as a team, we could clearly see which questions might cause difficulty for students and we could also see that there were many questions that students would be able to do successfully. The Team could also discuss strategies for providing help without providing answers and attempt to create a more equitable testing environment for all students.
Third grade PSSA Released items (4.3A)

As the months passed, all of the teachers were beginning to think about upcoming state tests, the PSSA’s. These tests were also on my mind and since part of the reason for moving to a new math curriculum resource was the change to the PA Core Standards and the resulting change in PA assessments I included released PSSA items on the April team meetings. PSSA testing does not begin until the third grade, but I felt it would be a valuable experience for second grade teachers to take a look at the released items and see where second grade content fit in. I also felt that reviewing these items might be motivating, since teachers appeared to be feeling somewhat tired of the challenge of the new material.

*FC:* Another reason for examining these questions is that… at this point in the year you sort of get like I do, asking do I really have to do, be this different? Why can’t I just be the way I was for the last X years when I was teaching? It was perfectly fine and kids learned a lot. So I think this sort of shares with us what our students are going to have to be exposed to and be able to do. And I think we’ll find that motivating.

Classroom teachers were paired with the math specialist from their building and asked to identify the skills needed for each problem and where it was located in the 2-4 grade level progression, in their opinion. I asked teachers to have a conversation in building pairs first to be followed by a larger group discussion. I believed that team members would be able to use these problems to reflect upon some of the mathematics content in MiF.

The conversation below in the above level team illustrates some key ideas about the MiF content and how it connected to external expectations. The identified content included some of the same topics teachers and students had been struggling with throughout the year; explicit teaching of strategies for solving multi-step problems,
balancing equations to introduce algebraic thinking, using bar models as a tool, and mental math, just to name a few. The Team also discovered that generally, at least 25% of what was tested in third grade was actually taught in the MiF second grade text.

TM1: In second grade, the idea, the concept is taught, but the name isn’t applied to it. Like they wouldn’t say this is the commutative property. So I think it’s second and third.

TM1: I was thinking because the, as Ali just said, the multi-step problems, we have those and I think at the beginning I was saying, ok this is a two-step problem, and I’ve verbalized to the kids so I’m trying to kind of wean them off of that and say more, okay, think about this, is this a one-step, is this a two-step.

TM2: The balancing equations I thought was something that even at a second grade level was new compared to maybe what they had been exposed to before. And it looks like that will help also.

TM3: I actually, I can’t believe I’m saying this, used the bar model to solve one of these. So I’ve used the bar models and I think they are going to be helpful.

TM4: We’ve just been through the estimating and rounding chapter, and there was, at the beginning, quite a bit of that. And understanding that vocabulary of estimate, and what that means. That’s there; I mean that’s what we do.

TM5: Some of the problems lend themselves to multiplication facts and the inverse, so the turnaround factor, a number of those on here, and they’re introduced in second grade.

TM5: Well, there were equal share problems with division. They were in the second grade. As long as there were factors of three and four, which was coming up. There are others with the bar model problem that Tara talked about and then there’s one with 42 divided by 6. I mean the fact comes in the third grade book but the process came in second grade.

FC: That’s right, so generally, at least a quarter of what they’re going to be tested on we’re teaching in second grade.

Analysis. This conversation was initiated by me, as facilitator, but steered by the teachers and math specialists, as they examined the released items and standards and
compared them to the MiF resource. They read the released items for the big ideas and evaluated how they connected to the material they were teaching. After considering where the PSSA questions fit into the grade 2 MiF content, they could adapt their instructional emphases to attend to problem solving and model-drawing as integral pieces of the second grade curriculum.

**Outcomes of the Team Meetings**

In Chapter 4, I identified three areas in which the MiF curriculum could challenge the teachers in this study: form, mathematics, and pedagogy. Individually, teachers might tend to respond to the challenges of the curriculum based upon their orientation toward curriculum, beliefs about teaching and learning and identity and self-direction. Bringing the teachers together as part of a team gave them an opportunity to make visible, to themselves and others, their beliefs and thinking as well as their orientations toward the materials. This process is an example of what Cochran-Smith & Lytle (1999) called “knowledge of practice” and Rogoff (1994) calls communities of learners. Including the math specialists as part of each team gave teachers on the team an “expert” to add to their individual and group thinking. The result was that the teams became an opportunity to use the MiF resource as a framework for creating a curriculum by and for the study participants, and through their representation, the teachers on their teams.

The teams’ responses to the agenda topics often resulted in adaptations to the MiF curriculum, as evidenced in Table 7.3. I wondered whether the agenda topics were connected to the challenges of MiF suggested in Chapter 4 of this study so I compared the agendas to the challenges in form, in mathematics and in pedagogy. The relationships
between the two were easily discerned. With the exception of Fact Fluency, which was not identified as a potential challenge, all of the text challenges were represented in the agendas. Conversations about the assessments occurred in six of the above level agendas and in three of the on-level agendas. Pacing conversations and discussions of pedagogy occurred in every meeting for both teams. Discussions of the mathematics occurred in three of the meetings of each team. Contextual factors like parents or the newness of the series were discussed in five of the meetings for each team.

Table 6.4

Comparison of Team Agendas and MiF Challenges

<table>
<thead>
<tr>
<th>Team Agendas</th>
<th>Text Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td>Assessments</td>
</tr>
<tr>
<td>Fluency</td>
<td></td>
</tr>
<tr>
<td>Math Content</td>
<td>Model Drawing, Concepts introduced earlier, Multi-step problems</td>
</tr>
<tr>
<td>Teaching Strategies</td>
<td>Concrete-Pictorial-Abstract, Model drawing</td>
</tr>
<tr>
<td>Pacing</td>
<td>Pacing</td>
</tr>
<tr>
<td>Parents</td>
<td>Newness</td>
</tr>
</tbody>
</table>

I had conjectured that the team meetings were places where team members could air concerns and resolve them through collaborative conversation. During my analysis of the meetings, however, it became clear that the teams did much more than simply share ideas and resolve concerns, they also adapted the MiF teacher resources, i.e. those resources that are used by the teacher to enact instruction, by creating or adding new materials, substituting new or existing materials for some of the MiF content and omitting some of the MiF content. In other words, through the coming together as a group with the MiF text as a centerpiece, products emerged that could influence the enactment of the
MiF curriculum. These products were a regular byproduct of the conversations initiated and steered by team members. The products included a pacing guide for both on and above level teachers, unit syllabi for certain blended above level chapters, backward design documents for Chapter 4 on bar models and Chapter 11 on money, parent letters addressing difficult topics, blended assessments for above level chapters, answer keys for assessments that delineated the awarding of points, modified assessments to respond to teachers' concerns and highlights of certain activities thought to promote student understanding. Multiple examples of these products can be found in appendices C-K.

I assert that teacher’s participation with the text and with each other resulted in educative or structural text adaptations that supported teachers in their efforts to anticipate student thinking, make appropriate adaptations, reflect on mathematical content and pedagogy, understand MiF authors' intentions and learn the mathematics and its accompanying pedagogy. Table 6.5 below summarizes the teams' products and where they fit into the Davis & Krajcik framework.
Table 6.5

Team Products and their Nature as Educative or Structural

<table>
<thead>
<tr>
<th>Product</th>
<th>Educative or Structural Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B10 &amp; 3A2 Blended Syllabus</td>
<td>Promoting adaptations, Fostering teacher reflection, Structure</td>
</tr>
<tr>
<td>Parent Letter on Mental Math</td>
<td>Anticipating student thinking</td>
</tr>
<tr>
<td>Pacing Guide</td>
<td>Structural, Fostering teacher reflection</td>
</tr>
<tr>
<td>Backward Design Chapter 4</td>
<td>Fostering teacher reflection, Promoting adaptations</td>
</tr>
<tr>
<td>Backward Design Chapter 11</td>
<td>Fostering teacher reflection, Promoting adaptations</td>
</tr>
<tr>
<td>2A1 &amp; 3A1 Blended Assessment</td>
<td>Promoting adaptations, Structure</td>
</tr>
<tr>
<td>2B15 &amp; 3A6 Blended Assessment</td>
<td>Promoting adaptations, Structure</td>
</tr>
<tr>
<td>Modified Benchmark 2A(1-6)</td>
<td>Anticipating student thinking</td>
</tr>
<tr>
<td>Highlighted Activities for Chapters 7-9</td>
<td>Learning the mathematics and pedagogy, Fostering teacher reflection</td>
</tr>
</tbody>
</table>

Of the products made by the teams, I identified five to be a result of teachers’ need to make appropriate adaptations, five as a result of teacher reflection, two as stemming from the anticipation of student thinking and one as a support for learning the mathematics and its pedagogy. Five of the products caused structural changes to the text, either by rearranging the order of topics, changing the duration of lessons, or modifying an assessment. Of note, when analyzing the text resource, I found the areas of promoting adaptations and fostering teacher reflection to be lacking in the MiF teacher resource. It is possible then, that the professional learning teams acted to compensate for deficiencies in the educative nature of the text.

Summary. The small teacher professional communities used to support the elementary teachers in implementing a new math curriculum met the conditions advocated by Collopy (2003), Silver et al (2009) and Remillard (2005). That is, the
teams were ongoing, sustained a focus on implementing the new curriculum, and targeted teaching and learning. Through my analysis I learned that bringing teachers together in teams with a common purpose helped them focus on the curriculum resource and how to use it to design instruction. I also learned that these teams of teachers “filled the void” when it existed by creating materials that helped them implement MiF and modifying existing MiF materials when they found them to be less than satisfactory. These new or modified materials added structure or educative elements to the curriculum.
CHAPTER 7: SITUATING TEACHER PARTICIPATION IN THE PARTNERSHIP BETWEEN TEACHER AND TEXT

In Chapters 4, 5, and 6 of this dissertation, I analyzed and presented findings about the influence of three factors on teachers’ participation with curriculum materials: the individual teacher, the nature of the curriculum materials, and the influence of professional learning teams. This Chapter looks across the three chapters to draw conclusions about how teachers participate with curriculum individually and as part of a team. I used the data to examine patterns of teacher participation with old and new text resources and with each other. My analysis of participation relied heavily on the work of Remillard and Bryans (2004) around the construct of orientation toward curriculum, a set of beliefs and dispositions related to curriculum use, and Drake and Sherin (2009), who identified the construct of curriculum strategies as consistent patterns in how teachers read, evaluate and adapt curriculum materials before during and after instruction.

Overall, when Math in Focus was introduced, teachers shifted their participation from less involved with the text to more involved with the text. Teachers reported participating with many of the teacher resources that accompany MiF and they carefully stated how they read and responded to the materials as they planned instruction. Teachers described challenges associated with the curriculum materials and how they evaluated them for instruction. The shifts in participation from less to more involved were mediated by both individual and curricular characteristics. Membership on a team mediated both the teacher and the text and the relationship between the two. Most striking in this research was the relationship
between membership on a learning team whose focus was on participating with MiF to design instruction and subsequent participation with the materials during planning sessions. Products developed by the teams were evidence of ways in which teachers responded to the MiF curriculum and adapted the materials or created new materials to meet their needs, effectively changing the curriculum resource.

My conclusions support the research of Remillard (2005, 2012) and Remillard & Bryans (2004) about individual teacher factors, asserting that even if teachers share a common knowledge base, different orientations toward curriculum materials will result in different instructional practices, including the ways in which they participate with curriculum materials. My conclusions also support the research of Stein, Silver & Smith (1998) and Franke & Kazemi (2001) on professional learning teams, suggesting that working collaboratively with others can influence teachers’ instructional practices. Further, like McDuffie & Mather (2009), I assert in this dissertation that professional learning teams can help teachers focus more closely on the resource and view it as a framework for reasoning through strategies for teaching and learning. Participating with the text through a team can change both the teacher and the text.

**Patterns of Individual Participation with Math Curriculum Materials**

I wondered how second grade teachers' participation with MiF was different than with SFAW. According to Remillard (1996, 1999, 2000, 2005), teachers tend to approach a new written resource in the same way they approached the old. Drake & Sherin (2009) concluded that over time, as teachers learn more about the series, they
come to trust the materials; participation is dynamic. This study found an overall shift from less participation with SFAW to more with MiF, at least through the first year of use. Table 8.1 below illustrates an overall shift from an intermittent and narrow participation with the SFAW to a much more thorough participation with MiF. Predictably, implementing a new resource requires more attention to the lessons and pages simply by virtue of being new. As indicated in my analysis of the written resource, the previous math resource (SFAW) was in use in the schools for more than 20 years. Teachers made many adaptations to the series over that time period and four of the eight study participants used it intermittently and narrowly. Two of those four had been in the district for a long period of time, 22 and 24 years. The other two were from the same elementary school and worked together closely. Only Denise was still a thorough piloter of SFAW and even though she had been in the District for 19 years, she still used the SFAW series as her primary tool for math instruction. The other three study participants had taught in the District for anywhere between four and 13 years. With their school grade-level teams, they were adapting and adopting the SFAW series to stay aligned with new standards and pedagogy.
Continuum of Participation with Old and New Math Resource

Continuum of Participation With SFAW & MIF Curriculum
(Adapted from Remillard & Bryans, 2004)

Intermittent & Narrow

Adopting & Adapting

Thorough Piloter

SFAW

Dominic Sheila

Theresa

Laura

Tara Patty

Ali

MIF

Theresa

Dominic

Ali

Patty

Laura

Tara Sheila

Denise

Denise
Patterns of participation among teachers

Transitioning to a new text took time and commitment from all of the study participants, shifting the weight of participation for most away from intermittent and narrow and toward thorough piloting. Three distinct patterns emerged from the comparison between old and new. Some teachers reported very different participation, some reported subtle but significant shifts toward more thorough use and several reported very little change. Dominic, Sheila and Laura participated with MiF much differently than they participated with SFAW. During the first year of MiF use Dominic moved from an Intermittent and Narrow use of SFAW to an Adopting and Adapting use of MiF. Laura and Sheila showed the most change, moving from an Intermittent & Narrow use of SFAW to a Thorough Piloter use of MIF. Theresa, Ali and Denise moved very little in the transition from SFAW to MiF. Theresa used SFAW intermittently and narrowly and continued to use MiF in the same way; relying on self-confidence in her knowledge of second grade mathematics and in materials she knew and trusted. Ali also minimally changed her participation, using SFAW in an adopting and adapting way and continuing this practice with MiF. Denise participated with SFAW by using it thoroughly and relying on it to deliver instruction. She used MiF similarly, attempting to use all of the teacher resource to enact the new curriculum. Two of the study participants, Tara and Patty showed a subtle tendency to participate more thoroughly with MiF than with SFAW, moving from adopting and adapting to thoroughly piloting.
Processes of participation among teachers

In this study, I wondered what processes teachers would use when participating with the new resource. In addition to describing teacher text interactions through the lens of Remillard and Bryans (2004), I used Drake and Sherin’s (2009) curriculum strategies framework to describe teacher participation with curriculum materials through reading, evaluating, and adapting them. To remind the reader, by reading, teachers are examining curriculum materials; by evaluating they are considering what they read in terms of students and themselves; and by adapting they are omitting, replacing or creating materials for use in the classroom. Using data from the two interviews and the constructs above, I describe more deeply the level of each teacher’s participation with MiF. Table 7.1 below summarizes how teachers read, evaluate and adapt the written curriculum prior to instruction.

Table 7.1

Teacher Participation with Math in Focus Resource Before Instruction

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Read</th>
<th>Evaluate Before</th>
<th>Adapt</th>
<th>Types of Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominic</td>
<td>Big Ideas</td>
<td>Considers whether he has an activity that can replace something in the book</td>
<td>Yes</td>
<td>Omits activities (workbook)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider what the authors intend</td>
<td></td>
<td>Substitutes activities (active experiences, literature, BrainPOP)</td>
</tr>
<tr>
<td>Laura</td>
<td>Script</td>
<td>Considers what the students need in order to be able to complete the tasks</td>
<td>Yes</td>
<td>Omits activities (warm ups and lesson openers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adjusts pacing</td>
</tr>
<tr>
<td>Teacher</td>
<td>Resource</td>
<td>Considerations</td>
<td>Omissions/Adjustments</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Patti   | Big Ideas and Problems | Considers the wealth and variety of resources that accompanied the series | Yes | Omits activities (warm-ups, hands on, pretests)  
Moves activities (thinking caps)  
Adds activities (BrainPOP, interactive games) |
| Denise | Script | Considered what might help students understand difficult concepts | No | Omits activities (Problems of the lesson, Warm-ups) |
| Tara | Big Ideas and Problems | Considers whether the lessons were aligned with her own thinking  
Considers what she needs to know to teach her students | Yes | Substitutes activities (warm-ups - makes own)  
Adjusts pacing  
Omits activities (problems of the lesson, common errors, pretests)  
Adds activities (additional homework problems) |
| Shelia | Script | Considers the difficulty of the material and how she can help struggling students | No | Omits activities (common errors, manipulatives) |
| Theresa | Big Ideas and Problems | Considered what was highlighted on a page  
Considered how students would respond to the resources | Yes | Omits activities (overview, differentiation, pacing guide, warm ups, pretests)  
Substitutes activities (online resources, worksheets) |
| Ali | Big Ideas | Considered what made sense to her in terms of teaching her students  
Considered what activities and tasks she might have that could replace what was in the book | Yes | Omits (pretests, differentiation resources)  
Substitutes activities |

During the interviews, teachers walked through the resource with the interviewer and talked about which parts they used and how they approached the activities and tasks. Laura, Denise and Sheila, teachers who read for the script, tended to omit activities but
not substitute. Sheila and Denise rarely made adaptations at all, usually trying to do all of the activities listed in the teacher guide. Teachers who read for the big ideas or big ideas and problems tended to omit some activities but also to add or substitute activities. These teachers created their own activities, used something they had used previously, or appropriated something they found on line or in a different resource. Two of the eight teachers reported that they evaluated the tasks and activities with only the students in mind, while two considered only how the activities or tasks fit into their planning or what they might already have that might accomplish same objective as a task in the resource. Four of the teachers considered both the students and how the activities of the text fit into their thinking or illustrated the authors’ intent.

**Details of participation with MiF**

**Theresa** participated with MiF in an intermittent and narrow way with occasional forays into the teacher resource. She reported that she looked at the big words on a page so she knew what the authors were trying to cover and did actually look at the resources because she hadn’t internalized them yet. A light bulb on a page will attract her and she may look below the student page to see a little bit more about what she need to do, recognizing that if she is stuck, she has a resource for more information (Int. 1). She did tend to use the thinking caps and she tried some of the hands on activities, finding some to be good and some to be not so good (Int. 2). Theresa views the teacher resource in this way, “it is fine if you’re going to be a generic teacher, but within a month, you know your kids better than any book” (Int. 1). She considers the chapter overview and math background good for a new teacher and believes that the lesson objective tells her
everything she needs to know. Theresa believed that even in Chapter 4, she needed to supplement by going online or making up worksheets.

During Theresa’s second interview, she shared more about what parts of the teacher resource she was really using, tending to talk much more about how she used the student resources rather than the teacher supports. She did move through the curriculum in the way it was ordered and did not feel a strong need to change that. Theresa also noted some things she found interesting about the text in general. For example, she reported liking the idea of having the common core standards right in the text and using the pacing guides but found that they did not always work for her.

I placed Dominic in the Adapting and Adopting category even though his self-described use of MiF contained attributes of all three types of participation with curriculum materials; thorough piloting, adapting and adopting, and intermittent and narrow, even though he was an intermittent and narrow user of the SFAW series. Dominic tended to use the new MiF curriculum as an adopter and adapter, reading for the big ideas and adopting many of the strategies and activities but adapting his instruction to include his own activities. If the content was new to him, like Chapter 4 on Bar Models, he acted more as a thorough piloter, because his prior experience did not offer a suitable adaptation. Dominic found much to value in the new curriculum. Similar to Everyday Math, he found that MiF cycled a lot of the concepts taught back for extension and he felt that both series placed a strong emphasis on the use of manipulatives.

Dominic typically began his lesson design by reviewing the planning and pacing guide then looking at the individual lessons for the big ideas and instructional objectives.
He remarked that he “didn’t really look at the rest of the stuff” (Int. 1). He acted at times like a thorough piloter, though, especially in Chapter 4, when he remarked that because he was unfamiliar with bar models, he tried to teach the chapter exactly the way they recommended (Int. 1). By the time the class reached Chapter 16, another bar model chapter, he reported that although it initially looked daunting, once he looked it over he felt more comfortable making design decisions, adopting the content but adapting his plans to order the chapter differently, use different manipulatives, access a non-MiF online resource and assess after each of the three lessons instead of at the end of the chapter (Int. 2).

**Ali**’s participation with MiF tended to vary between thorough piloting and adopting and adapting, with an emphasis on adapting and adopting. She used many of the materials, but often viewed them in the context of pre-existing strategies and routines. Ali reported that she only glanced over the introductory and background material, but looked at all of the teacher resource pieces to see what was needed for each lesson. She sometimes felt frustrated that the pacing guide was not accurate and that two-day lessons with only one homework set were tricky for her. Ali was not wedded to the MiF teacher resource and she occasionally created some of her own resources, particularly Smart Board lessons to accompany her instruction. Ali tended to stick to the curriculum generally but adapt it as she was actually teaching. The decision to adapt the curriculum usually resulted from noticing a child who needed help and then responding to that.

Ali’s looked more closely at the teacher resource for Chapter 4 because she had not taught bar models before. She used the vocabulary of bar models and the big ideas.
Still, she reviewed the activities in this chapter and selected only those she felt might be useful in her instruction. In Chapter 16, Ali was still designing instruction based upon parts of the resource that resonated with her. She tended to base her lesson design on the planned homework, as she wanted to make sure she was sending home problems that students were able to do.

Laura’s use of MiF tended toward thorough piloting, even though she was an intermittent and narrow user of SFAW. Her thorough piloting was pronounced in Chapter 4 as she wrestled with how to design instruction around bar models, a new problem solving strategy. She read for the script, starting with the background page in order to figure out what the authors wanted to accomplish. She asked herself questions like, why is this chapter placed where it is and why do they want me to teach bar models now. She studied the paragraph about bar models and how they are so important to later learning. This reinforced her belief that she needed to design lessons that delivered the bar model content exactly as MiF intended (Int.1). Laura took notes in the margins so she would be able to refer to them later. Once she felt she understood the authors’ intent, she tended to jump right into the lessons without spending time on lesson warm ups or openers.

During the first year of MiF, Laura used a thorough piloting model to learn about the new resource. In Chapter 4, she felt that by studying and reading the chapter, she was able to make the connection between bar models and number bonds, a first grade topic. In Chapter 16, she was still thoroughly piloting, spending a lot of time with the word problems and breaking them down. Laura also tended to emphasize vocabulary in her
lesson design so she could assist her students with identifying key words and eliminating extraneous information (Int. 2). She indicated that she would again like to adopt alternative materials or adapt the series to meet her and her students’ needs once she felt comfortable with the new series. As she said, “I’m not going to do everything the same way [next year], but having a basis of experience and my notes will help me put something together” (Int. 2).

**Tara** participated with the MiF curriculum primarily as a thorough piloter. She had used the SFAW resource by adopting and adapting it to meet her needs and found it to be aligned with her philosophy about teaching and learning mathematics. She did not find MiF as aligned with her philosophy, so early on reported the need to supplement it with some additional materials. Tara read for the teacher resource for big ideas and problems, except during chapters that she felt were different than the way she thought and taught. Tara felt that MiF really stressed vocabulary and caused her some difficulty when the homework was different than what students learned that day in class.

During both Chapters 4 and 16, Tara participated as more of a thorough piloter than as an adopter and adapter. She found chapter 4 on bar models to be the very challenging, since modeling was a problem solving strategy that was new to her. Up until then, Tara had substituted some activities with her own activities and omitted other activities. She also found herself responding to multiple parent emails, which caused her some concern. When she got to Chapter 16, also on bar models, she recalled the difficulties she had had with Chapter 4 and reported that she “really had to sit down and pre-teach myself on how to teach the chapter” (Int. 2). In her planning she used “every
part” of the teacher resource, the lesson of the day, background, chapter opener, etc. She also began adding additional homework problems because she felt students needed additional practice and preparation for the assessments. Tara reported that she was looking forward to having the background knowledge now so she could pull in some of the activities she previously used and that students enjoyed.

**Patti** participated with the MiF teacher materials as a thorough piloter, but one who read for big ideas and problems rather than a script. She tended to thoroughly use SFAW also, but adopted and adapted some of the materials in order to meet her students’ needs. She found MiF to be consistent from chapter to chapter and because there were many and varied materials, she didn’t have to search for worksheets or class practice. Patti reported that she appreciated the intentional use of activities, hand on ideas, and mathematical thinking that was threaded throughout the lessons.

Patti relied heavily on the introductory materials in MiF Chapter 4, since it was a new concept for both her and her students. She read the overview to become familiar with the mathematics background and the skills trace across the grades. She looked briefly at the planning and pacing guide, but tended not to go back to it once she took a look. Patti pointed out that for her, it was important to thoroughly read each lesson in order to make sure she knew where it was going (Int. 1). In Chapter 16, Patti still read everything just to know what was involved and to pull out important vocabulary. Little or no adapting or adopting was done at this point, because she still felt there were plenty of resources for her and for her students. In the future, Patti looked forward to adding more journaling to the curriculum, as she felt that was a missing piece in MiF.
**Sheila** participated with MiF as a thorough piloter after previously using SFAW intermittently and narrowly. Although she read SFAW for the big ideas, she read MiF for the script because it was new, taking the manual home and really studying it. Generally she felt that during the first year of a new series, you have to do it the way the book tells you to. She followed the pacing guide and used the background knowledge, even though it was sometimes time-consuming. Over time, she will make the series hers (Int. 1). Sheila thought the MiF curriculum in general was about a year ahead of what she used to teach and was concerned about the challenging vocabulary and reading level. She was surprised to find some teachers adopting and adapting the activities and pedagogy in the teacher resource early in the first year (Int. 2).

When teaching Chapter 4, Sheila participated as a thorough piloter, but found that her students struggled with the material. Her response to this was to review her lessons and think that perhaps, even though she was closely following the MiF teacher resource, perhaps she might have done things a little differently if she was more experienced with the series. In her second interview, Sheila reported that she found success with struggling students by veering away from the text itself and going one step further in terms of instruction. She continued to thoroughly use the MiF resource, but found ways to add problems or instruction, beginning the process of adapting and adopting to meet her students’ needs. Sheila omitted very little of the teacher resource, opting to use as many of the parts as she could.

**Denise** participated with MiF as a thorough piloter, similar to her participation with SFAW. Denise worked with the SFAW curriculum for most of her elementary
teaching career and felt that she was effective in achieving student learning through the thorough use of SFAW. Denise felt that she was not familiar with the “big picture” of MiF and that the new teacher resource was a bit overwhelming (Int. 1). She did not read over the chapter overview or background, but spent the bulk of her planning time in the heart of the individual lessons, thoroughly examining the lesson script and trying to deliver each lesson just as the book suggested. Denise reported feeling afraid to adapt, omit or replace lessons because she was afraid she might miss something (Int. 1).

Denise found Chapter 4 to be very challenging and reported going through the manual step by step and exchanging a lot of emails with parents. She started out by using the chapter opener, because, as she says, “otherwise I wouldn’t know where to begin” (Int. 1). Denise also tried to use the manipulatives and considered them helpful to students by making them feel better about the difficult math (Int. 1). In Chapter 16, Denise continued to pilot the materials thoroughly as she believed she needed to go through the text as it was presented in order to learn it then “tweak it afterwards” (Int. 2). She tended to always use the “learn” sections of the teacher resource and to use the Smart Board presentations she had created with her team.

Denise’s participation as a thorough piloter had pluses and minuses during her first year of MiF use. On the minus side, there was a wealth of information for teachers included in MiF and using all of it was difficult. Denise, perhaps because she was oriented toward thorough piloting and therefore using it all, found the new text overwhelming. Even though her questionnaire responses suggested that she saw math as a complex way of thinking, her lack of confidence in her own mathematical
understanding kept her from truly developing this view with her students. Because of her thorough piloting, she followed the old text explicitly and was very used to teaching arithmetic strategies or procedures before developing mathematical concepts. The problem solving focus of MiF and its development of concepts through a concrete to pictorial to abstract approach often felt at odds with her beliefs about how math learning occurs. A benefit of her thorough piloting was her use of the manipulatives that came with the series. Although she sometimes found it challenging to prepare the manipulatives in advance, she acknowledged that students like them and that the use of concrete models helped students understand more difficult concepts.

**Influence of Curricular Characteristics of MiF with Participation**

Based on the research of Remillard (2005) and Davis & Krajcik (2005), I wondered how the curricular features of Math in Focus would matter for teachers' participation with the resource. In this study, curricular features mattered for all but one of the eight study participants when considering their participation with MiF. In Chapter 4, I identified eight challenges that teachers in this study might experience when participating with Math in Focus over the first year of implementation. These challenges could be classified as occurring in three distinct areas; mathematics, pedagogy and culture/context or some combination of the three. Of the eight identified challenges, four were related to mathematics; five to pedagogy and four were related to culture/context. Three of the math challenges were also challenges to pedagogy and one of the math challenges was also related to culture/context. Of the five pedagogical challenges, I considered two as
also challenges to the culture/context of the schools in the study. Each of the challenges is further explicated in Chapter 5: The Nature of the Curriculum.

As teachers participated with MIF for the first time, they experienced some individual challenges and responded to them differently. Affirming the research of Collopy (2003) and Remillard & Bryans (2004), personal characteristics of the teachers appeared to influence the way in which they experienced the MiF resource as they participated with it for the first time. Worried teachers who were followers articulated experiences with a greater number of challenges throughout the year. Denise reported experiences with all eight of the challenges, Sheila with six and Tara with five. Confident or compliant teachers reported the fewest experiences of challenge: Ali, Theresa and Patti (1); Laura (2) and Dominic (3). Table 7.2 summarizes teacher responses to the challenges posed by the new curriculum.

Table 7.2

<table>
<thead>
<tr>
<th>CHALLENGE</th>
<th>TARA</th>
<th>SHEILA</th>
<th>DOM</th>
<th>ALI</th>
<th>LAURA</th>
<th>THERESA</th>
<th>PATTI</th>
<th>DENISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Newness</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Lesson Management</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3. CPA pedagogical approach</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4. Use of model drawing</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5. Assessments include novel problems</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mastery curriculum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Six of the eight study participants found the newness of MiF to be a challenge. This manifested itself in interview comments that mentioned that the pacing guide was not accurate, that certain pieces were important to read so that you could know what was going on, and that next year would be much easier. Laura reported that Chapter 4 specifically, was difficult to discuss because it was so new to everyone (I1), and Tara stated that MiF was different because it was new (I1) and that she was worried about the pacing and worried about getting through everything (I2). Sheila felt that she didn’t know what she had to work with because MiF was new (I1).

Sheila, Tara and Denise admitted to being challenged by the problem solving strategy of model drawing contained in Chapters 4 and 16. Sheila, Dominic and Denise found the introduction of algebraic concepts and its accompanying need to interpret math in context challenging for them and for their students because of the emphasis on language and reading. They felt they did a good bit of text interpreting for students, as the reading was complex (#2). Sheila, Laura, Teresa, Tara, Dominic and Denise were challenged by the unit assessments, finding that they were difficult for children, asking them to solve novel problems and apply learned skills (#5). More than any other teacher, Denise remarked on feeling overwhelmed by the manual and the demands of manipulative use. Sheila, too, found that preparing and using the manipulatives was
challenging for her and confusing for the children (#1, #3). Sheila also found the earlier introduction of certain concepts and procedures to be challenging for her and her students (#7). Parent response to the new material (#8) was challenging for Tara and Denise.

Because texts can help teachers enact and maintain high-level tasks (Stein & Kim, 2009) and help promote teacher learning (Ball & Hill, 1996; Hill & Charalambous, 2012; Remillard, 2000; Stein & Kaufman, 2010) through the use of structural and educative features, I wondered what features MiF had and how they supported teachers. The MiF materials contained structural features that were well-received by the teachers in this study. The MiF teacher resource tended to be more supportive to teachers in their explanations of the math and math practices and their descriptions of the authors' intentions, than in helping teachers anticipate student responses and encouraging curriculum adaptations.

**Influence of Personal Characteristics on Participation with MiF**

Remillard & Bryans (2004) concluded that teachers' orientations toward curriculum resources were influential in predicting how those teachers would participate with the resource while Sherin & Drake (2004) concluded that a productive disposition towards the resource would result in higher quality participation. In this study, I found that teachers' stance toward materials helped to determine their participation with MiF. Orientations as followers or students of the curriculum tended toward to be thorough piloters, while teachers oriented as interpreters were generally adopter/adapters. Theresa, who sustained intermittent and narrow participation with both the old and new curriculum
demonstrated a strong belief that the teacher knew her students and how to teach them and remained an independent participator with math curriculum materials.

**Influence of the Professional Teams on Participation with MiF**

Participation in the Professional Learning Teams mattered for all of the teachers. Teams such as these have been found to be central to fostering teachers learning (Stein, Silver & Smith, 1998; Franke & Kazemi, 2001). Based on this study, I make three assertions associated with the professional teams. First, participating on a learning team whose focus is on designing instruction using a new curriculum mediated teachers' participation with the curriculum. Second, participating on a learning team whose focus is on designing instruction supported classroom instruction by helping participants create educative or structural materials. Third, participating on a learning team whose focus is on designing curriculum using a new resource can help teachers unpack and better manage the challenges associated with a new resource. Figure 7.2 below describes the influence of the team on both teacher and text.

![Figure 7.2](image-url)

**Figure 7.2.** Influence of team participation on teacher and text
Teachers participated in three types of activities that forwarded learning together using the curriculum resource: a) discussions of what students needed to know and be able to do, b) sharing teacher knowledge of both content and pedagogy, and c) creating adaptations that improved MIF’s ability to support teachers. In their 2009 study, McDuffie and Mather developed the construct of curricular reasoning as a “specific form of pedagogical reasoning that teachers employ while working with curriculum materials to plan, implement and reflect on instruction” (p. 302). By maintaining a strong focus on engaging with the MIF text as a resource during the team meetings, the study participants utilized curricular reasoning as part of their process of learning together. In the paragraphs below, I list examples of outcomes of each type of curricular reasoning activity.

Creating adaptations to the curriculum most often occurred when teachers talked about the challenges associated with the form and mathematics of the MiF assessments or with lesson management. These adaptations to MIF’s educative or structural supports supported teachers in bridging the space between the written and intended curriculum. The adaptations included the following: a) backwards design for Chapters 4, 11 and 17, b) blended level syllabi for combined chapters, and c) a chapter pacing chart and guide.

Sharing teacher knowledge of content and pedagogy tended to happen when teachers talked about challenges associated with the mathematical underpinnings of the new curriculum, including model drawing and multi-step problem solving. Sometimes by design and sometimes emerging organically, sharing teacher knowledge assisted teachers in enacting the written and intended curriculum. Below is a sampling of some of
the conversations that resulted in shared knowledge: generating a list of strategies for teaching bar models, examining three chapters in the text, and creating centers and activities for Chapter 10.

The third type of curricular reasoning activity in which study participants most often engaged were discussions of what students needed to know and be able to do. These conversations were often the result of concerns about pedagogy or lesson management and again emerged both organically and by design.

1. Adaptations to lessons that might include skipping a unit assessment or combining lessons
2. Blending the end of year assessment
3. Blending the mental math chapters from MiF 2 and MiF 3
4. Examining standards and connecting them to second grade MIF content and pedagogy.

Implications of Teacher-Text Participation

There are three important lessons that curriculum leaders can take from this study. First, it is important to know your teachers. Second, it is important to carefully select and implement a new resource. Third, it is important to provide professional development in the form of a collaborative team where teachers examine the text closely in a group of similar others with expertise on hand. For math curriculum leaders, a textbook resource is an essential asset for supporting teachers in lesson design and instruction. Especially with a new text, the quality of the mathematics, as well as the quality of the supports for teachers is also critical. In this study, seven out of the eight teachers shifted to a more involved participation when faced with a new resource and their orientation toward
curriculum materials as well as their self-efficacy and confidence influenced the way in which they approached MiF and participated with it. Lesson 1 for curriculum leaders - it is important to know your teachers.

The form, mathematics and pedagogy associated with the MiF text presented challenges to the teachers in this study. MiF looked traditional and was structurally similar to previously used materials, but the concept development, expectations for student achievement and level of teacher understanding needed were different than in the past. The educative supports in the MiF text, in this case weighing heavily on clarifying the authors’ intentions and explaining the math, were helpful to teachers but did not go far enough in supporting their pedagogy and instructional strategies. Lesson 2 for curriculum leaders – the resource matters.

The idea that teachers participating together around curriculum design and implementation can create or adapt materials to fill in text gaps in structure and educative materials is vital. Teachers have always adapted materials to meet their students' needs, but, in this study, participation on a team helped teachers examine the materials more closely, thus learning more about what the resource had to offer to teaching and learning. Collaborating supported teachers who were less confident about adapting or creating new materials and empowered all study participants to make decisions about the MiF curriculum and how to best use it in their individual classrooms. A third lesson for curriculum leaders - organizations that design professional development where professional teams are purposeful and focused on curriculum, can mediate differences and possible difficulties in teachers’ participation with a resource and the contents of the
resource itself  No curriculum resource or individual can act as the sole learning agent in the classroom. Teachers need to come together to apply the processes of curriculum participation through reading, evaluating, and subsequently adapting or creating new materials.

Although seven out of the eight teachers in this study participated more thoroughly with the new curriculum than they had with the old, it is significant that they all valued the time working with their peers and felt it gave them permission to adapt and adopt curriculum more freely with the support of others. This suggests that teacher text participation was not only a result of individual teacher or textbook factors, but also a result of the time spent engaging in focused, collaborative work with others with common goals. Rather than purchase curricula that are “teacher proof”, we might consider supporting our teachers in becoming “curriculum proof”, in the sense that they have the agency and support of their peers to make curricular decisions that benefit their students.
APPENDIX A: QUESTIONNAIRE

Q1: Very young children are not capable of engaging in mathematical problem solving.

Q2: Children learn best by working with their peers.

Q3: Children learn math best through repetition.

Q4: Even if you get the answer right, you may still not understand the mathematics behind the problem.

Q5: Some problems in mathematics have no answers.

Q6: Discussion among students in a second grade math classroom impedes learning.

Q7: In second grade, it is more important for students to have the multiplication facts memorized than to be able to solve problems.

Q8: Second graders should work frequently with math manipulatives.

Q9: A very important thing to do in learning mathematics is to practice a lot in order to master the procedures.

Q10: Good mathematics students develop their own way of doing problems.

Q11: Students should not leave a math class feeling confused or stuck.
Q12: Many second graders simply cannot "get" mathematical concepts.

Q13: Students learn best if the teacher organizes the work clearly for them.

Q14: Everyone can learn mathematics.

Q15: It is better for second graders to use an established procedure than to invent their own ways of doing things.

Q16: Second grade math does not require much knowledge of mathematics.

Q17: I usually feel confident about my ability in mathematics.

Q18: I make sure all of my students master basic computational skills before going on to problem-solving and puzzles.

Q19: An effective math teacher plans thoroughly and sees to it that she sticks to it, so that time is not wasted in the classroom.

Q20: For second graders, it is important to have concrete experiences with mathematical concepts.
APPENDIX B: INTERVIEW 1

Part 1. The point of this interview is to gather some information about the background of the teacher and to find out how the teacher views the old curriculum and how he or she uses the curriculum in general.

Teacher Background

A1. I first want to gather some basic background information. How long have you been teaching elementary school and what interests you about it? Probe the grade levels they have taught and the types of math they taught.

Teacher's conception of the previous curriculum

A2. Our previous series was the Scott Foresman Addison Wesley Mathematics series. We have been using this series in our District for 20 years. I'm interested in your feelings about the previous series and the previous curriculum, so this set of questions will ask you about that.

1. How long did you teach with the old series?
2. What did you like about it?
3. What do you think we should retain from the old series?
4. What do you think should be different with this new curricular tool?

A3. Over the years, we developed a set of District Objectives for each elementary grade, K - 4. With the onset of PSSA testing, we abandoned these objectives in grades 3 & 4 and with the adoption of this new series and our alignment to the PA Core Standards, we are abandoning the District Objectives in grades K-2. This next series of questions will ask about the old District Objectives.
1. How familiar are you with the old District Objectives?

2. What did you find useful about them?

3. What would you like to retain from these objectives?

4. These objectives are not aligned with the PA Common Core. Do you think we should continue using parts of them anyway?

A4. Janine Remillard believes teachers read for one of three purposes - for worksheets, for the scripts and for the big ideas. This question probes how you used the previous series in your teaching.

1. How did you use the previous resource in lesson design?

2. Try to classify it as one of the three purposes outlined by Janine. (If it doesn't sound like one of those, probe for more details).

3. Was it a good tool for your purposes?

4. Do you rely primarily on the series for your lesson design?

(If no, ask why).

(If yes, probe for more details).

5. What other resources did you use in lesson design besides the Scott Foresman series?

6. Which additional resources do you wish to keep using?

AS. Several researchers believe that curriculum materials can contribute to effective instruction if they are carefully created to assist the teacher with the enactment of mathematical tasks. Did our old series provide:

1. Helpful material on student thinking?
2. Connections between the current lesson and previous and future lessons across grade spans?

3. Background materials to assist teachers in their planning?

4. Which of these did you use and which was helpful to you?

A6. Did you omit any chapters or lessons in the old resource? If yes, how did you decide what to omit?

A7. Thank you so much for talking with me today.

Is there anything else you would want to add that is related to using a textbook series for teaching mathematics?

Part II

During this part of the interview, I'm trying to find out more about how teachers are using the new resource. Since we recently completed Chapter 4, I will ask about this chapter.

Teacher Use of New Curriculum

Now I'd like to talk about the new resource. Let's go through chapter four on Bar Models. Walk me through what you liked and didn't like then what you used and didn't use.

1. Teacher Guide

2. Chapter Planning Guide

3. Chapter Overview

4. Vocabulary

5. Big Ideas
6. Chapter Opener
7. Recall Prior Knowledge
8. 5 minute Warm Ups
9. Lesson Organizer (ex. p.96)
10. Differentiated Instruction
11. Guided Practice
12. Problems of the Lesson
13. Hands On Activity
14. Common Errors
15. Student Workbook
16. Smart Board Lessons
17. Virtual Manipulatives
18. Interactivities
19. Extra Practice worksheets for students
20. Enrichment worksheets for students
21. Pre-tests
22. Chapter Review/Test

Did you feel you needed to supplement with additional materials? If yes, probe for what types of materials and where they were found.

Thanks very much for talking with me today. This is the first of three interviews. The second one will occur in late January or early February.
APPENDIX C: INTERVIEW 2

Part 1

The point of this interview is to gather some information about teachers’ views of their agency as professionals around curriculum use as well as their feelings about the resource

A. Teacher agency and engagement with curriculum

1. During our team meetings, it was stated several times that you, as teachers, needed to make decisions that worked best in your classroom and you, as members of a building culture, needed to make decisions that worked for the culture of your building.
   a. Did you believe this to be true, i.e. did you feel you could do what you thought best with the new series?
   b. Were you able to make decisions that were best for kids around the new series?
   c. Do you think having that influence over the curriculum enacted in your classroom helps you be a better teacher?

2. This year we tried to implement the Math In Focus text in the order in which it was presented even though sometimes we had ideas about changing the order of things.
   a. What did you like about that and what didn’t you like?
   b. Will you make some changes next year based on your experience this year?
   c. Do you feel comfortable doing that?

3. This year we gave the assessments as they were written. These assessments are considered applications of the skills learned in the chapter and the problems on the assessments are often multi-step. These assessments caused some distress, as students
did not always score really high grades like they did with our old series. What are your feelings about these assessments?

4. What are your ideas for helping students who are struggling with some of the concepts in the new series?

B. Teachers’ Use of the New Curriculum –

1. In our last interview we walked through Chapter 4 on Bar Models. We talked about what you used and didn’t use and how you went about planning. Let’s do the same with Chapter 16.
   a. Teacher Guide
   b. Chapter Planning Guide
   c. Chapter Overview
   d. Vocabulary
   e. Big Ideas
   f. Chapter Opener
   g. Recall Prior Knowledge
   h. 5 minute Warm Ups
   i. Lesson Organizer (ex. p.96)
   j. Differentiated Instruction
   k. Guided Practice
   l. Problems of the Lesson
   m. Hands On Activity
   n. Common Errors
2. Did you feel the need to supplement with additional materials? (If yes, probe for what types of materials and where they were found)

3. What do you feel you learned over the course of the year about 2nd grade math, students, families, and self?

4. How do you feel about the new resource?
BIBLIOGRAPHY


Brown, M., & Edelson, D. (2003). Teaching as design: Can we better understand the ways in which teachers use materials so we can better design materials to support their changes in practice. *Evanston, IL: The Center for Learning Technologies in Urban Schools.*


