CO-TEACHING AND MODELING: THE WORK OF COACHES AND TEACHERS AS
THEY ENGAGE IN ONE-ON-ONE MATHEMATICS PROFESSIONAL DEVELOPMENT

BY

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DISSERTATION

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ABSTRACT

School districts across the nation are enlisting the help of instructional coaches as their intensive support is thought to embody high-quality professional development (Desimone & Pak, 2017). Instructional coaches draw heavily upon the practices of modeling and co-teaching with teachers, yet we know little about this work (Gibbons & Cobb, 2017). Although some coaching studies have focused on modeling and co-teaching, these studies have primarily focused on literacy coaches' implementation of these practices, or they have only been mentioned peripherally as part of mathematics education studies. To address this gap, in this qualitative study I partnered with two instructional coaches and five elementary teachers in one Midwestern district to explore how coaches and teachers engage in modeling and co-teaching cycles.

To attempt to better understand the complexity surrounding the practices of modeling and co-teaching, I observed 11 planning meetings, 23 lessons, and four reflection conversations to gain insight into *how* the instructional coaches and teachers enacted modeling and co-teaching cycles. Furthermore, I completed 27 semi-structured interviews with the instructional coaches, teachers, principals, and district-level administrator who was charged with providing professional development for these coaches. I engaged in an open coding process to analyze fieldnotes and audio recordings, examining the focus and depth (Coburn & Russell, 2008) of coach-teacher interactions and statements made during interviews. Once codes were developed and applied to all data, I worked with an independent coder to establish reliability. Once coding was complete, I tabulated frequencies and percentages to detect patterns within and across the five coach-teacher pairings, as well as within and across the practices of modeling and co-teaching.

Several stories emerged across all sets of findings. First, a set of complex conditions at the school and district-levels made it challenging for these coaches to enact modeling and co-teaching. Namely, the coaches struggled to gain access to classrooms due to the specific coaching model implemented in that district, the coaching evaluation system created a set of perverse incentives that prompted these coaches to circumvent the teachers in order to maximize student gains on pre- and post-assessments, and these coaches were spread quite thin as additional responsibilities were added to their already full plates. Due to this set of competing external conditions, I observed significant differences between the coaches' enactment of modeling and co-teaching and recommendations from the literature. Last, at the micro-level, overall, the coach-teacher talk tended to center on logistics and other day-to-day implementation details related to the materials, schedule, classroom management and the district-provided curriculum, while discussions about mathematics and student thinking, for example, rarely surfaced.

This study sheds light on the critical challenges that emerged for these instructional coaches and teachers while engaged in modeling and co-teaching cycles. To help enhance the implementation of modeling and co-teaching, it may be productive to (a) develop a protocol that coaches and teachers can use to guide their interactions, helping foster deeper conversations about pedagogy, mathematics, and student thinking, (b) explore innovative ways to evaluate the work of instructional coaches that aligns with their day-to-day work and focuses on their impact on teachers, (c) ensure that coaches are provided with adequate professional development that further deepens their mathematics content knowledge, as well as their specialized coaching knowledge so they understand how to enact high-impact modeling and co-teaching cycles with teachers, and (d) consider implementing a content-coaching, rather that instructional coaching,

model at the elementary level which would position the coaches as content experts instead of

generalists expected to coach across multiple content areas.

DEDICATION

I dedicate this dissertation to my beloved mother, Elena Saclarides, who fell asleep in the Lord during the third year of my doctoral program on July 18th, 2015. Mom, I thank you for instilling in me the importance of getting an education and your unwavering encouragement to pursue my doctoral studies. While I would give anything to have you here to support me at my defense and embrace me at graduation, I know you are proud of me. Throughout my entire doctoral program, I felt the warmth of your smile and your incessant guidance as you cheered from heaven. I love you, Mom, and may your memory be eternal.

While losing a mother during my doctoral program proved to be an immeasurable devastation, I also received the most joyous title of my life: a mother. After the birth of my son following my fourth year in my doctoral program, I looked towards the legacy of my mother with increasing reverence. I relied on memories of my mother for teaching me about patience, strength, and unconditional love as I navigated the duality of being an academic and mother.

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CHAPTER ONE:

INTRODUCTION

Teachers across the country are being called upon to implement the new Common Core mathematics standards as well as other instructional reforms, which urge teachers to change *what* and *how* they teach. Still, teacher change is very difficult to achieve, and the professional development literature states that teachers do not necessarily learn what is needed from traditional, whole-group, one-shot forms of professional development. Hence, many schools are enlisting the help of school-based instructional coaches, as their intensive and ongoing support is thought to embody aspects of high-quality professional development.

While much attention has recently been given to research on coaching, more is needed to better understand what opportunities for learning this affords teachers. Specifically, two common ways in which coaches work one-on-one with teachers is through modeling and co-teaching lessons in teachers' own classrooms. Still, we know relatively little about what actually happens during modeling and co-teaching. Hence, in this exploratory study, I set out to answer the following research questions:

1. For what reasons might coaches decide to engage in a modeling or co-teaching cycle with an in-service teacher? For what reasons might these in-service teachers request to engage in a co-teaching or modeling cycle with their coach?

2. How do the coaches and in-service teachers engage in modeling or co-teaching cycles as a form of mathematics professional development?

3. From the perspectives of coaches and in-service teachers, what are the perceived benefits of engaging in the modeling or co-teaching cycles in the mathematics classroom?

4. According to coaches and in-service teachers, what challenges emerge during modeling and co-teaching cycles? Furthermore, what conditions must be in place to help alleviate these emergent challenges?

I now turn to discuss my personal connection to this research topic.

A Personal Connection

As a former instructional coach at a Title I elementary school in inner-city Phoenix, I provided professional development for individual and groups of teachers based on student and teacher needs, mostly in the area of mathematics. I became a coach as my district was switching from the old Arizona state standards to Common Core while also adopting and implementing a new mathematics curriculum called *New York Engage*, which is now referred to as *Eureka*. Furthermore, my school district was continuing to push teachers to implement mathematical tasks and engage students in patient problem solving, which I was also expected to support through my coaching efforts. My building principal also wanted me to implement bar modeling, also known as Singapore Math, in all classrooms across the elementary school as a problem solving strategy. Through this experience, I became acutely aware that teachers would need a significant amount of support navigating the new Common Core standards, implementing the new curriculum, teaching through mathematical tasks, and teaching their students new problem-solving approaches. I utilized various professional development strategies for the teachers at my school, including co-planning, co-teaching, modeling, engaging in a lesson observation cycle, analyzing student work and rehearsals. My principal was extremely supportive and ensured that my time was protected to be solely spent supporting instruction and learning at my school instead of being diverted to other administrative tasks or piling on extra duties. After five years teaching 6th, 7th and 8th grade mathematics, being an instructional coach was a painful experience

at times as I missed being in the classroom with my own group of students. I knew, however, that I wanted to influence the instruction and learning of mathematics on a larger scale than just my own classroom, which is why I was drawn to the position.

My background as a former instructional coach greatly influences my research interests as I am generally interested in how professional development, as implemented by an instructional coach, can help in-service teachers implement high-quality mathematics instruction, ultimately enhancing students' understanding of mathematics. As an instructional coach, I was interested in better understanding exactly what teachers were learning from the group and one-on-one professional development experiences I provided. Specifically, during my year as a coach, I was frequently asked by teachers to come in and either model or co-teach a lesson. I began to wonder what prompted teachers to request one strategy over the other and exactly how they were benefitting from modeling or co-teaching. This interest informs the current study as I seek to better understand how instructional coaches and teachers engage in modeling and co-teaching.

Rationale for Mathematics Coaching

Education researchers have referred to instructional coaching as "the strategy du jour" (Coburn & Russell, 2008, p. 224), as well as "the preferred professional development strategy" (McGatha, 2017, p. 71) to enhance teachers' instruction and students' understanding of mathematics. Indeed, there has been a significant push for schools to incorporate instructional coaches for four reasons.

Support teachers' enactment of high-quality mathematics instruction. Teachers may need help implementing NCTM's vision of high-quality mathematics instruction (Martin & Herrera, 2007; NCTM, 2014), which emphasizes five key features. First, teachers must promote

discursive communities in their classrooms where students share their ideas, construct convincing

arguments, develop a language for expressing mathematical ideas, and see things from a

different perspective. Second, teachers must implement *mathematical tasks* that have multiple

entry points, incorporate various representations and tools, foster different solution strategies,

draw upon students' prior knowledge and experiences, and encourage students to actively engage

in reasoning and sense making. Third, teachers must possess in depth knowledge of *how*

students learn mathematics so that they can intentionally and systematically gather evidence of

students' mathematical thinking. Fourth, teachers must possess a *deep understanding of the*

mathematics they teach so that they can create clear, explicit and rigorous mathematics goals for

students describing what they will learn and understand as a result of instruction. Fifth, teachers

must foster a *learning environment* that encourages students to make sense of mathematics. As

this vision may represent a significant shift from the way many teachers previously taught

mathematics (Hiebert, 1999), teachers may require a great deal of learning to enact this type of

instruction envisioned by reformers (Ball & Cohen, 1999).

Coaching as high-quality professional development. Much of the professional

development available to teachers has been "woefully inadequate" (Borko, 2004, p. 3), reflecting

a host of fragmented and superficial one-shot workshops that offer an overabundance of

activities and strategies for teachers' consumption (Ball & Cohen, 1999). Current research

reflects a consensus regarding features of effective professional development, including content

focus, active learning, duration, collective participation, and coherence (Desimone, 2009).

Desimone and Pak (2017) argue that school-based coaching can be viewed as a form of high-

quality professional development, embodying these core features as they can focus their

discussions with teachers on content and how students learn that content, build in opportunities

for active learning through a myriad of one-on-one and group coaching activities, continuously meet with teachers throughout the school year, engage groups of teachers in either the same grade level or content area, and ensure they align professional development with initiatives at the state, district and school levels. Hence, instructional coaching seems to encompass key, research-based ideals about how teachers learn best.

    Positive impact of a coach. There is a growing body of research demonstrating the positive impact that elementary mathematics coaches can have on teachers (Neuberger, 2012; Polly, 2004; Yopp et al., 2014) and students (Campbell & Malkus, 2011; Ellington, Whitenack, Edwards, 2017; Foster & Noyce, 2004; Obara & Sloan, 2009). Thus, as district administrators and principals seek to implement professional development at their schools that can positively influence teachers and students, school-based mathematics coaching seems promising.

    Policy. Last, district, state and federal policy initiatives intent on enhancing educational opportunities for all students point to instructional coaching as one strategy to achieve this goal (Coburn & Woulfin, 2012). For example, the Every Student Succeeds Act of 2015 recommends that districts implement coaching to assist teachers as they design and implement assessments, differentiate their instruction to reach all students, and design effective instruction. Hence, such policy initiatives may also provide the impetus needed for districts to implement coaching structures.

A "Risky Investment"

    Despite its promise, this high-quality form of professional development is also considered a "risky investment" for school districts (Mangin, 2009, p. 764). On the one hand, instructional coaching requires school districts to make a "steep financial investment" (Mangin, 2009, p. 763). In particular, one study found that, when compared with other more traditional forms of

professional development, instructional coaching is 6 to 12 times more expensive (Knight, 2012). Furthermore, when districts make decisions to hire instructional coaches, they often fund these positions by diverting Title I funds that would otherwise be used to, for example, buy new and innovative technologies and curricula for student consumption, or pay for an extra classroom teacher at a grade level with particularly high student enrollment. On the other hand, instructional coaching is also considered risky because it can potentially result in "short-term loss of valuable human resources" (Mangin, 2009, p. 764). That is, as experienced classroom teachers leave the classroom to assume instructional coaching roles, they are often replaced by novice teachers with less experience, which could negatively impact classroom instruction quality. Hence, given the significant investment coaching requires, it is critical that we understand how best to implement instructional coaching, including challenges that arise and supports that make it successful.

Overview

In this study, I examine the ways in which instructional coaches engage with teachers in one-on-one settings through modeling and co-teaching. As outlined in this introduction, there are compelling reasons why school districts are seeking to implement instructional coaching at their schools, as well as reasons why some view instructional coaching as a risky endeavor. In Chapter 2, I address the literature base related to instructional coaching, more generally, and then co-teaching and modeling, more specifically. In Chapter 3, the methods chapter, I outline the study I conducted with two instructional coaches and five elementary classroom teachers. This study explores how these coaches engaged in modeling and co-teaching cycles with individual teachers. The chapter describes the research settings, as well as the methods of data collection and analysis. In Chapters 4 and 5, I present the results for each of my research questions, first

focusing on the practice of modeling in Chapter 4, and then discussing the co-teaching results in Chapter 5. Last, in Chapter 6, I begin by summarizing all results – across both practices of modeling and co-teaching – for each research question, while discussing the ways in which this study's findings map onto prior studies. Then, I discuss three key themes that emerged across both sets of modeling and co-teaching data: (1) the impact of external factors on the modeling and co-teaching cycles; (2) differences between modeling and co-teaching as described in the literature and as observed in this study; and (3) the lack of conversations about mathematics. Last, I examine the study's limitations and implications for both school-district personnel and researchers.

CHAPTER 2:

LITERATURE REVIEW

In this literature review, to help situate my study, I begin by discussing what is meant by a "coach," as well as the definitions of various coaching structures. Next, I describe the general work of coaches in one-on-one and group settings, and then focus specifically on the empirical research on modeling and co-teaching. Last, I discuss the frameworks that both situate and guide the analysis for this study.

Definition of Terms

Coach vs. Specialist

Various terms are used interchangeably to describe the role of an individual who supports the learning and instruction of mathematics at a school: math coach, math specialist, math support teacher, math resource teacher, and more" (Dacus, Felux, & Snowdy, 2007, p. ix). I will distinguish between coach and specialist as the literature mostly utilizes these two terms. A *mathematics coach* is "an individual who is well versed in mathematics content and pedagogy and who works directly with classroom teachers to improve student learning of mathematics" (Hull, Balka, & Miles, 2009). A *mathematics specialist* not only coaches individual teachers, but also assumes curricular, instructional, and assessment responsibilities at the school-wide level by working with groups of teachers to enhance the learning and achievement for all students at a school (Campbell & Malkus, 2014). Thus, coaching can be considered a subset of the activities performed by a specialist.

Coaching Structures

There is no set structure used by coaches while enacting their work. The *content-focused coaching structure* places student learning of mathematics at its core, as content-specific coaches

enhance teachers' mathematics and pedagogical knowledge (Loucks-Horsley et al., 2009; West & Staub, 2003). In the *peer coaching structure*, two teachers are paired at a school as they complete a pre-conference to discuss a targeted area of improvement; conduct an observation; and finally have a post-conference to reflect on the lesson, share observation data, and target a new area of focus (Joyce & Showers, 1980). In the *cognitive coaching structure*, the coach serves as a mediator between an individual and his or her thinking by posing questions that engage the teacher in reflective thought on a path towards self-directed learning (Costa & Garmston, 1994). Last, in the *instructional coaching structure*, a partnership is created between the coach and teacher as they engage in the (1) pre-conference; (2) observation, modeling, or co-teaching; and (3) post-conference cycle, focusing on behavior, content, instruction, and formative assessment to uncover positive aspects of a teacher's instruction (Knight, 2007). A coach-specialist may engage in any one or more of these structures depending on teachers' needs, district initiatives, personal preference, and other factors.

This Study

In this study, I focus on the work of coaches instead of specialists. Therefore, for the remainder of this chapter and the entire dissertation, I refer to my participants as coaches, but as the data will indicate, they take on a variety of roles in the school, including some that go beyond that of a coach. Furthermore, the two coaches with whom I partnered work in a school district that adopted an instructional coaching structure. That is, instead of solely focusing on mathematics, the instructional coaches provide professional development in all content areas to teachers in grades K-5. I now discuss individual, as well as group, coaching activities.

Individual and Group Coaching Activities

To impact classroom teachers' knowledge and instruction, *both* individual and group settings may be important places of learning. As Campbell and Griffin (2017) argue, "Ideally, the coaching model allows at least two settings wherein elementary teachers may enhance their knowledge and transform their teaching, namely by engaging in *individual* interactions with a coach and by participating in a *grade-level team* led by the coach" (p. 2). Jackson and Cobb (2013) concur that one effective professional development design entails using one-on-one coaching to support teachers in their classrooms as they apply what they learn from group professional development experiences. Conversely, the authors contend that coaches' individual work with teachers can also inform what they focus on in group professional development.

While there are dozens of individual and group activities in which coaches can engage teachers, it is important to consider which ones are likely to lead to changes in teachers' instruction, as well as positive outcomes for students. In their conceptual analysis, Gibbons and Cobb (2017) identified potentially productive activities used by coaches with teachers that not only met the standards of high quality professional development, but also demonstrated a positive impact on teachers. Ultimately, four potentially productive coaching activities were identified for groups of teachers (doing mathematics, examining student work, analyzing classroom video, participating in lesson study) and two potentially productive coaching activities for individual teachers (co-teaching, modeling).

Recently, scholars have focused their attention on innovative forms of *group* professional development implemented by coaches for teachers, such as Math Lab (Gibbons, Kazemi & Lewis, 2017) and Teacher Time Out (Gibbons, Hintz, Kazemi & Hartmann, under review). Research on one-on-one activities, however, has received substantially less attention (Cobb & Jackson, 2011; Gibbons & Cobb, 2017). Hence, this study contributes to the knowledge base

regarding coaching activities that can be used with teachers in one-on-one settings. In the following sections, I primarily draw upon teacher education research, as well as literature describing how to support novice in-service teachers, as I examine what we *do* know about the practices of modeling and co-teaching. I begin with modeling.

Modeling

This study explores how two instructional coaches implemented modeling and co-teaching cycles with five in-service teachers. This section provides a description of modeling and how it has traditionally been implemented with pre-service teachers in teacher education programs or with novice teachers as part of a mentoring program. I conclude by drawing attention to the limited research documenting how modeling has been utilized with in-service teachers.

What is modeling? Gallimore & Tharp (1992) describe modeling as a practice by which teacher educators intentionally display certain teaching behaviors with the goal of promoting student teachers' professional learning. As "[t]eacher candidates must…form visions of what is possible and desirable in teaching to inspire and guide their professional learning and practice" (Feiman-Nemser, 2001a), modeling can be viewed as one way to help teachers form this vision of high-quality instruction. A search for studies related specifically to modeling yielded three studies, two focusing on pre-service teachers in teacher education settings, and one focusing on novice in-service teachers as part of a mentoring program. All three are discussed below.

Modeling for pre-service teachers. Much of what we know about modeling comes from the pre-service teacher education literature (Clarke, Triggs, & Nielsen, 2014; Lunenberg, Korthagen, & Swennen, 2006). In their literature review theorizing the work of cooperating teachers, Clarke, Triggs, and Nielsen (2014) named 11 different categories describing their work

in teacher education. One of the categories, "Modelers of Practice," describes how modeling is one way that cooperating teachers can provide important images of teaching to pre-service teachers, but Clarke, Triggs and Nielsen also note that it should not be the only practice used to help pre-service teachers learn to teach.

In their case study, Lunenberg and colleagues (2006) observed 10 teacher educators across four Dutch institutions on two occasions to better understand how they incorporated modeling into their practice. Prior to their study, the researchers identified four types of modeling from the literature: implicit modeling, explicit modeling, explicit modeling and facilitating the translation to the student teachers' own practices, and connecting exemplary behavior with theory. In their study, they found that six out of the 10 teachers implemented explicit modeling, where they made explicit which choices were being made while teaching and why, but it was usually unplanned and done in passing. Of the six teachers who implemented explicit modeling, four demonstrated explicit modeling and facilitating the translation to the student teachers' own practices. In this type of modeling, the teacher educator facilitates discussions about how student teachers can make their own decisions about how to apply what they saw during the model to their own teaching, as the expectation is not that students should simply mimic what they saw modeled. Finally, none of the teacher educators implemented the last model, connecting exemplary behavior with theory, where practice and theory are explicitly linked.

Modeling for novice in-service teachers. Additionally, we also know that modeling is a common strategy that can be used to support novice in-service teachers, often in the context of a mentoring program. In her study, Feiman-Nemser (2001b) examined the practices of one exemplary mentor teacher, and drawing upon 10 hours of interview and observational data,

identified eight moves he implemented while working with in-service teachers. One of the practices, modeling, was described as a way for the mentor teacher to "give living examples of one person's ways of teaching" (p. 25) so that the in-service teachers could "pick up particular teaching ideas" and "clarify general characteristics of good teaching" (p. 25). Furthermore, the mentor teacher described the importance of stopping to explain what he was doing and why throughout the lesson so that the less experienced teachers could see what teachers with more experience, such as he, noticed.

These three studies consistently highlight one essential aspect that the modeler needs to embody while modeling. He or she cannot simply leave it up to chance that the observing teacher will notice certain pedagogical teacher moves or understand the reasons motivating such moves and how they impacted student learning. Rather, the modeler must consistently stop to help the teacher make those connections by providing rich explanations. Doing so has the potential to create a rich learning environment for the teacher.

Modeling as implemented by coaches. Although coaches frequently model lessons for in-service teachers, empirical research on how coaches can and should implement this practice is relatively rare. A search for coaching studies related to modeling with in-service teachers produced four studies, two focusing on literacy coaches and two on mathematics coaches. I discuss each study below.

Literacy coaches. Bean and colleagues (2010) sought to better understand how 20 literacy coaches spent their time over a five-day period. Drawing primarily upon self-reported data gathered from interviews, they found that the 20 coaches spent most of their time engaged with individual teachers (23.6%). Specifically, when working with individual teachers, 12 of the 20 coaches modeled lessons for teachers 10% of the time to illustrate a particular instructional

strategy/approach (for example related to assessment), demonstrate how to use new materials, or support new teachers with behavior management. The authors also found that formal reflection conversations about the modeled lessons seldom occurred, and when reflection conversations did occur, they were informal and brief.

In their study on literacy coaches, Vanderburg and Stephens (2010) examined how specific actions taken by the coaches were perceived to be valuable to teachers. Interviews demonstrated that 17 out of the 35 teachers perceived modeling lessons to be a very helpful practice as it helped them "see the strategies in action" (p. 151).

Taken together, these studies primarily drew upon interview data to provide a sense of what might motivate some coaches and teachers to engage in a modeling cycle, and also highlight one potential challenge of consistently engaging in formal reflection conversations. These studies do not, however, utilize observation data to shed light on what happens *during* the modeling cycle, including the substance of coach-teacher interactions during the planning conversations leading up to the modeled lessons, as well as the enacted modeled lessons and informal and formal reflection conversations after.

Mathematics coaches. As part of a large-scale study that examined the work of middle school mathematics specialists, Ellington, Whitenack and Edwards (2017) *briefly* described the work of two coaches as they modeled and co-taught lessons (co-teaching will be discussed below). For teachers who taught the same lesson during all class periods, as is typical in a middle school setting, the coach modeled the lesson during the first two class periods. In the first class, she asked teachers to "listen as if they were the learner and to evaluate how they thought the lesson went" (p. 189), and during the second lesson, she requested that teachers continue to observe, but this time put themselves in the teacher's role while following the lesson

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plans and teacher notes. During the third class, the coach and teacher co-taught the lesson, and during the last class, the teacher led instruction without any interruptions or assistance from the coach. Furthermore, the coach and teacher debriefed about instruction that same day. While Ellington and colleagues (2017) provided a *glimpse* into what modeling episodes looked like for the coach and teachers in a mathematics setting, questions still remain as to what modeling might look like in an elementary setting where teachers do not teach the same lesson all day long, as well as what challenges emerged while modeling, and the conditions that could potentially alleviate those challenges.

In their three-year study, Lord, Cress and Miller (2008) sought to better understand how 165 teacher-leaders[1] assisted with math and science reform across 40 urban school districts. Interview, survey and observation data with subsets of 165 teacher-leaders indicated that the teacher-leaders commonly enacted six practices when supporting individual teachers, two of which were demonstration teaching (also known as modeling) and co-teaching (discussed below). Regarding modeling, Lord, Cress and Miller discussed the teacher-leaders' motivation to model lessons for teachers, which included providing "visual images of how standards-based instruction should look" (p. 61) for novice teachers, and showing skeptical, experienced teachers "that their students were indeed capable of undertaking challenging work" (p. 61). While the findings from this study help us better understand what might motivate coaches to engage in modeling cycles, the authors did not describe what actually happened during the modeling cycles, or, what motivated the teachers to engage in the modeling cycles. I now turn to explore the co-teaching literature.

Co-teaching

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[1] Lord, Cress and Miller (2008) define teacher-leaders as "individuals who are released full-time from their classrooms…to work with their colleagues on a districtwide reform agenda" (p. 55).

This section provides a description of co-teaching and how it has traditionally been implemented with pre-service teachers in teacher education programs, concluding with a glimpse into the limited research documenting how co-teaching has been utilized with in-service teachers.

What is co-teaching? During co-teaching, two teachers facilitate instruction to the same group of students with the dual purpose of providing additional opportunities for students to learn and teachers to improve their practice (Tobin & Roth, 2006). In a typical co-teaching cycle, two teachers jointly plan a lesson, then execute the lesson with their students, and afterwards debrief and reflect about it (Tobin & Roth, 2006). It is well documented in the literature how co-teaching can be used as a model to assist students with special needs who are placed in the general education classroom (Conderman, Bresnahan, Teacher, & Pedersen, 2008; Friend, Cook, Hurley-Chamberlain, & Shamberger, 2010). In the professional development literature, we know most about how co-teaching can be used with pre-service teachers in the context of a teacher education program (Eick, Ware, & Williams, 2003; Gallo-Fox & Scantlebury, 2016; Guise, Habib, Robbins, Hegg, Hoellwarth & Stauch, 2016; Murphy & Beggs, 2005; Murphy, Beggs, Carlisle & Greenwood, 2004; Scantlebury, Gallo-Fox & Wassle, 2008). We know less, however, about how co-teaching can be implemented by coaches with in-service teachers as a form of professional development (Bean et al., 2010; Ellington et al., 2017; Lord, Cress & Miller, 2008; Munson, 2017; Poglinco et al., 2003). I begin by examining the co-teaching studies featuring pre-service and mentor teachers.

Mentors co-teaching with pre-service teachers. Many studies have examined co-teaching with pre-service teachers as part of a teacher education program. To help narrow the focus to studies that would be most pertinent to the current study, I excluded co-teaching studies

exploring pre-service teachers in special education settings as the current study took place in general education classrooms. Furthermore, I selected studies that focused on the enactment of co-teaching between the mentor teacher[2] and pre-service teacher, rather than studies centering on how two or more pre-service teachers enacted co-teaching together during their field placement. I made this decision as the relationship and power dynamics between a mentor teacher and pre-service teacher are more similar to that of an instructional coach and teacher, with the mentor teacher and coach both positioned as more experienced others. Ultimately, this led to the identification of six empirical studies. Instead of discussing each study below, I draw connections across them and consider the following themes: (1) the various enacted co-teaching models; (2) commonly cited perceived benefits; and (3) emergent challenges and conditions that helped address the emergent challenges.

   Co-teaching models. According to the literature, a single, standard co-teaching model for mentor and pre-service teachers does not exist. Instead, various models can be implemented in teacher preparation programs. For example, in the study described by Murphy and Beggs (2005), pre-service and mentor teachers were responsible for jointly planning lessons, while all lessons were exclusively written by mentor teachers in the study conducted by Eick, Ware and Williams (2003). Furthermore, regarding co-teaching models, some studies feature what Baeten and Simons (2016) refer to as "the assistant teaching model" where one individual assumes responsibility for facilitating instruction while the other assists. For example, the pre-service teachers in Eick, Ware and Williams's (2003) study enacted this type of co-teaching model as two (out of a total of 10) pre-service teachers teamed up with a cooperating teacher for two

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[2] The studies used the words mentor teacher and cooperating teacher interchangeably to refer to a more experienced other who co-teaches with pre-service teachers. I use the word mentor teacher in this literature review.

successive class periods. During the first period, students observed and assisted the classroom teacher, while in the second period, students led the teaching while the classroom teacher assisted. Baeten and Simons (2016) also discuss "the teaming model" where the mentor and pre-service teacher share responsibility for the delivery of instruction. The 21 pre-service teachers in Scantlebury, Gallo-Fox and Wassell's (2007) study adopted this model as they developed co-responsibility with their mentor teachers for facilitating instruction.

Perceived benefits. Primarily through interview self-report data, numerous perceived benefits were mentioned across these co-teaching studies. I have grouped the perceived benefits into the following three categories, and will discuss each separately: perceived benefits to the (1) pre-service teachers; (2) mentor teachers; and (3) students.

Pre-service teacher perceived benefits. A commonly reported perceived benefit from the pre-service teachers is that the co-teaching experience increased their teaching confidence. For example, comparing pre-/post- survey data from 51 pre-service science teachers, Murphy and Beggs (2005) found that after engaging in co-teaching with a mentor teacher, the pre-service teachers reported an increase in their confidence teaching science, as well as an increase in other general pedagogical areas, such as questioning and explaining ideas to children. Furthermore, through reflective journals and group discussions, Eick, Ware and Williams (2003) found that 10 pre-service teachers reported learning to become more comfortable, confident and assertive as a result of their co-teaching experiences.

Mentor teacher perceived benefits. The mentor teachers, too, perceived that they benefitted from participating in co-teaching cycles with pre-service teachers. On a larger scale, 38 mentor teachers studied by Murphy and Beggs (2005) indicated in their interviews that they learned new ideas, deepened their own science knowledge and reflected on their own teaching.

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In Gallo-Fox and Scantlebury's (2016) study, eight mentor teachers indicated in 24 interviews across two years that, as a result of co-teaching, they felt rejuvenated with their teaching, expanded their instructional toolboxes, reflected more on their own practice, changed their teaching as they tried out new approaches, and broadened their professional roles to become teacher leaders and teacher educators. On a smaller scale, drawing upon semi-structured interview data, Guise and colleagues (2016) found that one mentor science teacher perceived that he learned how to adopt the Next Generation Science Standards, and new ways of delivering his content. Taken together, these studies demonstrate that the mentor teachers appreciated reflecting on their practice, and perceived they experienced pedagogical and content-related benefits.

Student perceived benefits. Student benefits were reported in two studies. On a small scale, drawing upon interview data, one pre-service teacher and one mentor teacher studied by Guise and colleagues (2016) perceived that the co-teaching experience made content more accessible to students as, with two individuals in the room, they could be more attentive to students' questions, and also describe a concept using multiple perspectives to enhance student understanding. On a much larger scale, Murphy, Beggs, Carlisle and Greenwood (2004) found that, in comparison to children (n=1,000) who had not been placed in a co-taught classroom, the participating children (n=286) indicated through surveys that they enjoyed science lessons more, and there were also fewer age and gender differences in science attitudes.

Emergent challenges and conditions. Due to their related nature, emergent challenges are discussed in tandem with conditions that could help alleviate the emergent challenges. From the perspectives of the pre-service and mentor teachers in these studies, one commonly mentioned condition that helped bring about a successful co-teaching cycle was open and ongoing

communication between the pre-service and mentor teachers (Eick, Ware & Williams, 2003; Guise, Habib, Robbins, Hegg, Hoellwarth & Stauch, 2016; Murphy & Beggs, 2005; Scantlebury, Gallo-Fox & Wassel, 2008). Negative relationships between the mentor and pre-service teachers tended to put a strain on such open and ongoing communication patterns (Gallo-Fox & Wassel, 2008). Furthermore, on a structural level, the pre-service and mentor teachers also perceived that it was important to consistently set aside time to co-plan and engage in reflection (Gallo-Fox & Scantlebury, 2016; Guise, Habib, Robbins, Hegg, Hoellwarth & Stauch, 2016; Scantlebury, Gallo-Fox & Wassel, 2008). Failure to regularly engage in co-planning led to a number of challenges, including that the mentor and pre-service teacher did not have a common understanding of their instructional plans, student goals, or how to coordinate teaching activities (Gallo-Fox & Wassel, 2008). Last, the pre-service teachers studied by Eick, Ware and Williams (2003) desired support from their mentor teachers during the co-taught lessons with logistical items, such as passing out or collecting materials, or managing classroom behaviors by, for example, disciplining a student.

In summary, these studies help shed light on various co-teaching models that can be used with pre-service teachers and document the challenges, essential components, and the ways in which pre-service and classroom teachers perceived their participation to be beneficial. I now turn to discuss the more limited research available describing how co-teaching has been implemented with in-service teachers as a form of professional development.

Coaches co-teaching with in-service teachers. A search for coaching studies related to co-teaching with in-service teachers produced two studies focusing on literacy coaches, and three studies focusing on mathematics coaches. The literacy studies will be discussed first.

Literacy coaches. In the study referenced above, primarily using self-reported data gathered from interviews, Bean and colleagues (2010) found that the 20 literacy coaches they studied spent the highest percent of their time working with individual teachers (23.6%). Under this umbrella of coaching individual teachers, co-teaching was the third most frequently reported activity[3] (13%), which was described in the following way: "Co-taught lessons consisted of the teacher and the coach each working with a small group of students, either after the teacher or coach had done a larger group introductory lesson" (p. 101). The participating coaches reported using co-teaching to help teachers with behavior management, differentiate instruction by facilitating small groups or center work, get to know challenging students, lend a helping hand, or establish their own legitimacy as a coach.

Poglinco and colleagues (2003) examined how 29 literacy coaches helped teachers implement America's Choice school design. As evidenced by interview data gathered from the literacy coaches and teachers, co-teaching was mentioned as one of the activities used by the literacy coaches to help teachers implement literacy workshops. Several of the coaches decided to first model for the teacher, then co-teach, and end by observing the teacher. Regarding emergent challenges, one teacher perceived that her coach felt uneasy about being positioned as an expert: "I don't think she felt comfortable being the knowledge base" (p. 23).

These two literacy coaching studies primarily make use of coach and teacher interview data to help us better understand why some coaches may choose to co-teach lessons with a classroom teacher. They also provide a general overview regarding how some coaches may decide to structure their co-taught lessons. However, very little evidence is provided describing *how* the coaches and teachers together engaged in the co-teaching cycles, highlighting the

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[3] In their study, coach-teacher conversation was the most prevalent individual activity in which coaches engaged with teachers, followed by observation and then co-teaching.

substance of the coach-teacher talk during the planning and reflection meetings, as well as the enacted co-taught lessons.

Mathematics coaches. Three studies were located that *lightly* touch upon how coaches enacted co-teaching to improve mathematics instruction. Given their direct relevance to the current study, I discuss each in the space that follows.

As part of their large-scale study on middle school mathematics coaches referenced above, Ellington and colleagues (2017) described how one coach and one teacher co-taught lessons together. According to the authors, during co-teaching episodes, the coach introduced new concepts while the teacher assisted with whole group instruction while also managing student behaviors, Although this provides a *brief* snapshot into what co-teaching looked like for one coach and one middle school teacher, questions regarding how this would look in an elementary setting, the benefits and challenges perceived by the coaches and teachers, as well as the substance of the coach-teacher interactions during the co-teaching cycle still remain.

Munson (2017) positioned herself as an expert coach as she enacted a form of co-teaching called side-by-side coaching to support three elementary teachers as they responded to student thinking. In comparing video recordings of each teacher's instruction before and after the four week side-by-side coaching episodes, Munson found that after coaching, as teachers conferred[4] with students, they were able to more effectively advance student thinking, as evidenced by a significant increase in the number of nudges[5] enacted. Specifically, after the side-by-side coaching episodes, the teachers were 50% more likely to confer with a nudge. One

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[4] Munson (2017) defines confer as an interaction "in which teachers and students work together to uncover and advance student thinking" (p. 471).
[5] According to Munson (2017), "a nudge is an instructional response to the elicited student thinking which advances that thinking while maintaining sense-making" (p. 471).

limitation worth highlighting is that Munson served in the dual roles of researcher and coach, thus raising questions about how this would play out with a school-based instructional coach.

In their comprehensive study of coaching, Campbell and Griffin (2017) studied 21 coaches in 21 schools across 11 school districts, and found that the most prevalent self-reported coaching activity[6] over a two-year period was co-teaching (12-15%), while only minimal time was spent planning for, or debriefing after the co-teaching episodes (1%). Campbell and Griffin also shed light on emergent challenges – namely the lack of time coaches and teachers had to engage in co-planning and reflection: "Without co-planning for instruction and subsequent reflective debriefing, how can co-teaching be a route for…changing teachers' instructional practice?" (p. 10). Given that the study spanned 21 schools, it relied on coach-reported survey data as opposed to in-depth classroom observations. Hence, although the study helps us understand how coaches may allocate their time, it does not illuminate the substance of coach-teacher interactions during co-teaching, or the benefits teachers perceive.

Taken together, these three studies offer researchers a starting point for beginning to understand how coaches and teachers together engage in the complex task of co-teaching. Specifically, they highlight the roles of one coach and one teacher during co-taught lessons (Ellington, Whitenack & Edwards, 2017), the impact of one coach on three teachers' abilities to advance student thinking (Munson, 2017), and challenges 21 coaches faced consistently finding the time to plan and reflect about the co-taught lesson (Campbell & Griffin, 2017). These prior studies do not, however, examine the substance and depth of coach-teacher talk during the co-teaching cycle, perceived benefits experienced by the coaches and teachers, or conditions that

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[6] The coaches logged their daily professional activities according to the type and time on an iPad application that was then transmitted to the research team.

need to be in place to ensure a successful co-teaching cycle. In the following section, I present the research questions that guided this investigation.

Research Questions

Prior research indicates that coaches work with teachers in both individual and group settings, and that both contexts have the potential to provide rich learning experiences for teachers (Campbell & Griffin, 2017; Jackson & Cobb, 2013). However, research describing how coaches engage with individual teachers in their classrooms is relatively rare (Cobb & Jackson, 2011; Gibbons & Cobb, 2017). In their conceptual analysis, Gibbons and Cobb (2017) identify modeling and co-teaching as two one-on-one activities in which coaches can engage teachers to enhance their learning. However, as described above, most of the research examining modeling or co-teaching focuses on pre-service teachers in teacher education settings. Although several studies describe the use of modeling or co-teaching by instructional coaches with in-service teachers, many of these studies are limited to literacy coaches. The few studies that are situated in a mathematics education setting do not describe in detail *how* these strategies can be implemented with in-service teachers, *what* happens during modeling and co-teaching, and *what* coaches and teachers perceive to be beneficial as well as challenging. To address this gap in the literature, this study examines the modeling and co-teaching cycles enacted by two coaches with five in-service elementary teachers during mathematics instruction. Specifically, four research questions will be addressed in this exploratory study:

1. For what reasons might the coaches decide to engage in the modeling or co-teaching cycle with an in-service teacher? For what reasons might these in-service teachers request to engage in the co-teaching or modeling cycle with their coach?

2. How do the coaches and in-service teachers engage in modeling or co-teaching cycles as a form of mathematics professional development?

3. From the perspectives of the coaches and in-service teachers, what are the perceived benefits of engaging in the modeling or co-teaching cycles in the mathematics classroom?

4. According to the coaches and in-service teachers, what challenges emerge during the modeling and co-teaching cycles? Furthermore, what conditions must be in place to help alleviate these emergent challenges?

In the remaining sections of this literature review, I discuss three frameworks that guided this study. First, I present Campbell and Griffin's (2017) conceptual framework, as it situates the current study by providing a general, big picture overview of how coaches and teachers together engage in the coaching cycle. Next, I discuss Lave and Wenger's (1991) Theory of Legitimate Peripheral Participation as it offers a useful lens to understand *how* the teachers learned while engaged with the coach in the coaching cycle. Last, I turn to Coburn and Russell's (2008) depth framework, which I used to analyze coach-teacher talk during the modeling and co-teaching cycles.

Guiding Frameworks

Campbell and Griffin's (2017) Conceptual Framework

Drawing upon ideas from West and Staub (2003) regarding how the coach and teacher together engage in the coaching cycle (which involves a continuous process of planning, teaching, and reflecting), Campbell and Griffin (2017) developed a conceptual framework for how coaches and teachers learn during the coaching cycle (see Figure 2.1 below). According to this model, the coach and teacher first come together to engage in co-planning and goal setting

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for the upcoming modeled or co-taught lesson. Then, the coach and teacher enact the modeled or

co-taught lesson. After, the coach and teacher jointly and independently reflect about the lesson,

discussing topics such as student thinking and learning. This, in turn, is thought to shape the

coach's and teacher's beliefs about both mathematics and mathematics teaching and learning, as

well as their mathematical and pedagogical power (and educative power for the coach). Then,

the cycle starts again as the coach and teacher draw upon their respective sources of

mathematical, pedagogical and educative (in the case of the coach) power, as well as their

beliefs, as they plan, model and/or co-teach, and reflect.

Figure 2.1
Campbell and Griffin's (2017) Conceptual Framework of Coach and Individual Teacher Co-Learning

Fig. 1. Conceptual framework modeling coach and individual teacher co-learning through the coaching cycle
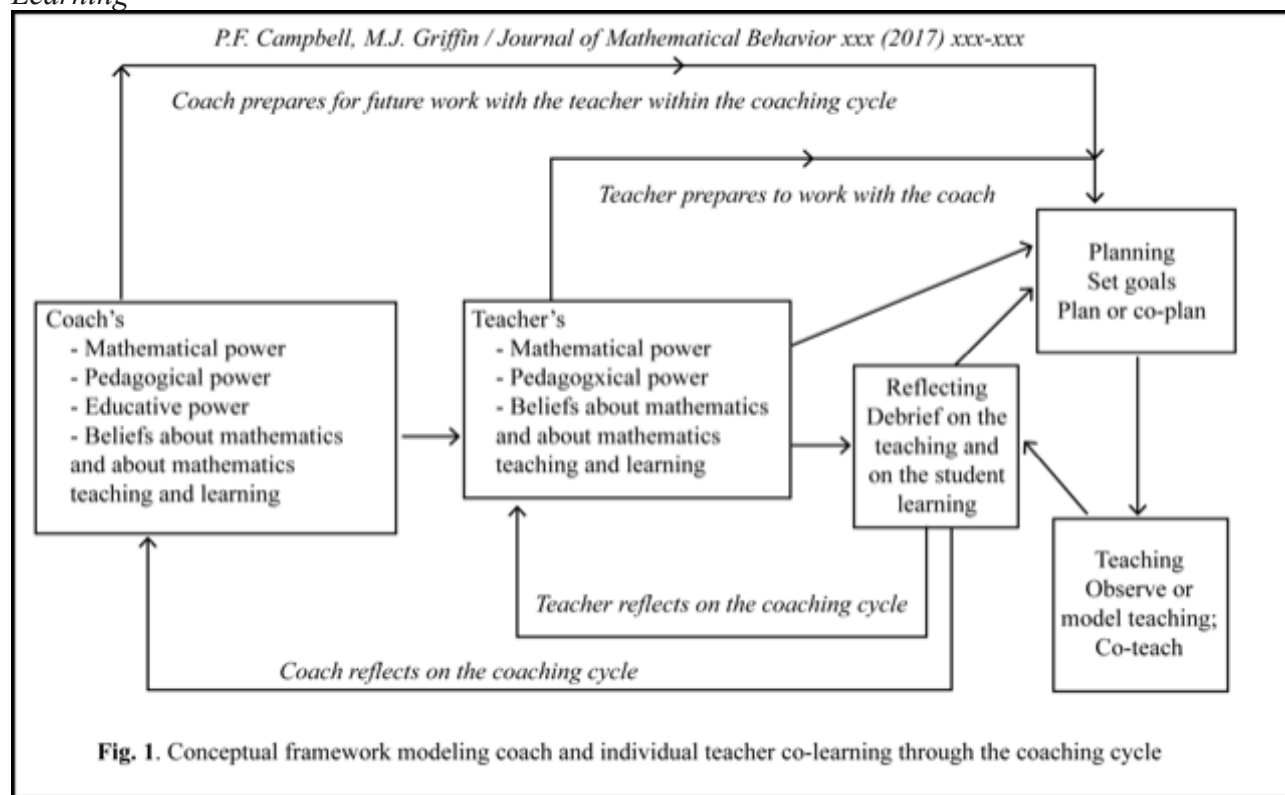
This conceptual model guided the current investigation in several important ways. First,

through data collection efforts – to the extent that it was possible – I wanted to be present for all

aspects of the modeling or co-teaching cycles as reflected in the figure above, including the

planning meetings, enacted modeled or co-taught lessons, and reflection conversations. I was especially interested in observing the formal and informal reflection conversations as, according to their diagram, these events (as opposed to the planning meetings and enacted modeled or co-taught lessons) heavily impacted and shaped learning for the coach and teacher.

Second, the conceptual framework promotes the idea that the coach, too, is impacted by the one-on-one professional development with the teacher. Thus, instead of restricting my analysis to the impact the modeling or co-teaching cycles had on the teachers, I also sought to better understand how the coaches perceived they benefitted from the cycles.

Third, one important aspect that seems to be missing from the model is how external conditions at the district and school-levels positively and negatively influence coaches and teachers as they engage in coaching cycles. From the coaching literature, we know that certain conditions must be met so that coaches can successfully engage in their work. Four general supports synthesized across the literature include the following: (a) support from district-level administrators for school-based coaching programs (Neufeld & Roper, 2003; Obara & Sloan, 2009); (b) a clear and specific delineation of coaches' roles that is made available to teachers and principals (Chval et al., 2010; Neufeld & Roper, 2003; Obara & Sloan, 2009; Rapacki & Cross Francis, 2014) and (c) clearly bounded coach responsibilities, with coaches not asked to take on additional responsibilities that go beyond their coaching role (Campbell, 2012; Chval et al., 2010; Neuberger, 2012; Neufeld & Roper, 2003); and (d) a positive and productive relationship with the principal (Gibbons, Kazemi & Lewis, 2017; Grant & Davenport, 2009; Neufeld & Roper, 2003; West & Staub, 2003). Hence, this was also something I wanted to pay close attention to during analysis.

As this study was exploratory, I did not want this model to constrain how I analyzed the data. In particular, I did not directly take up Campbell and Griffin's (2017) ideas of mathematical, pedagogical and educative power, nor did I measure the extent to which the teachers' and coaches' beliefs about mathematics teaching and learning changed over the course of the study. While I do parse coach-teacher exchanges about pedagogy versus exchanges about mathematics content (see Chapter 3), whether those exchanges impacted the coaches' and teachers' knowledge or beliefs is beyond the scope of this study. I did not specifically probe these topics in the pre- and post-interviews when asking about perceived benefits as I was more curious to see what naturally emerged through the conversations rather than leading the coaches and teachers down a particular path and making subtle distinctions between beliefs and knowledge[7]. As other researchers have begun to examine the extent to which teachers' beliefs (Neuberger, 2012) and knowledge (Yopp, Burroughs, Sutton & Greenwood, 2014) are impacted as a result of coaching, this was not the focus of my study and it also would have required a different set of research questions and study design. Instead, my goal was to address the gap in the literature articulated above by analyzing the coach-teacher talk during all aspects of the modeling and co-teaching cycles.

Campbell and Griffin's (2017) conceptual framework provides a broad overview of the main cycle activities and how they might ultimately benefit coaches and teachers, but it does not provide a clear lens for closely examining the interactions between coaches and teachers during

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[7] After collecting the interview data, I did attempt to discern the extent to which the coaches and teachers perceived their knowledge and/or beliefs were impacted as a result of the modeling and co-teaching cycles. I found that it was simply too difficult to tease out knowledge versus beliefs. When discussing the perceived benefits, at times it was clear that the coaches and/or teachers talked about how their beliefs were impacted ("What an a-ha moment for me to realize…student goal setting and student-led conferences…how easily in small steps they can be integrated."). However, other times it was less clear whether the coaches or teachers were talking about beliefs or knowledge ("I think the pacing she got a lot out of.").

the cycle, including how teachers are learning from coaches, and the substance of those interactions. In the following section, I discuss Lave and Wenger's (1991) Theory of Legitimate Peripheral Participation as it provides a way to think about how teachers may learn from coaches when engaged in the modeling and co-teaching cycles. Last, I discuss Coburn's (2003) dimension of depth and how it served as a useful tool to analyze the substance of the coach-teacher talk during the modeling and co-teaching cycles.

Lave and Wenger's Theory of Legitimate Peripheral Participation

Lave and Wenger's (1991) Theory of Legitimate Peripheral Participation describes a process by which the teachers in this study may have engaged with their coaches in hopes of learning new instructional practices. According to this theory, newcomers (teachers) are mentored by old-timers (coaches) as the newcomers strive to become experienced members and eventually old-timers of that same community. To achieve this goal, newcomers first participate in simple, low-risk tasks that are productive, necessary, and further the goals of the community. As newcomers start to become old-timers, they take on more responsibility and their participation takes forms that are more and more central to the functioning of the community.

An integral component of this theory is the idea of access: "The key to legitimate peripherality is access by newcomers to the community of practice and all that membership entails" (p. 100). The old-timers are tasked with providing a certain level of access through carefully scaffolded experiences where the newcomers gradually assume more and more responsibility if they are to truly learn something new.

The master's effectiveness at producing learning is not dependent on her ability to
inculcate the student with her own conceptual representations. Rather, it depends on her

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ability to manage effectively a division of participation that provides for growth on the

part of the student (p. 21).

Although the research questions and methods of this study do not specifically center around the

Theory of Legitimate Peripheral Participation, I paid attention to instances where the coaches

seemed to grant access to the teachers, as well as instances where access seemed to be denied to

the teachers. More will be discussed about access in Chapter 6. Arguably the most important

component of access during modeling and co-teaching is coach-teacher communication about

instructional and related issues. I now turn to discuss Coburn's (2003) concept of depth, as it

served as a lens to understand how the coach-teacher talk afforded or constrained learning

opportunities for the teacher.

Low- and High-Depth Interactions

In her discussion of instructional reform evaluation and scale-up, Coburn (2003)

conceptualizes depth as one way to demonstrate the opportunities teachers have to learn when

engaged in social interactions with others. Specifically, Coburn (2003) provides the following

suggestion for researchers interested in studying depth:

Capturing depth may require in-depth interviewing and classroom observation, refocused

on such indicators as the nature of instructional tasks, discourse patterns in the classroom,

and teachers' conceptions of knowledge and learning (p. 5).

Although I could not attend to all of these factors in a single study, I completed observations and

audio recordings of the modeling and co-teaching cycles to analyze patterns in the depth of

coach-teacher talk. Furthermore, Coburn and Russell (2008) apply Coburn's (2003) depth

dimension in their study and distinguish between low-, medium- and high-depth interactions.

According to them, while low-depth interactions focus on "surface structures and procedures,

such as sharing materials, classroom organization, pacing, and how to use the curriculum" (p. 212), high-depth interactions address "underlying pedagogical principles of the approach, the nature of the mathematics, and how students learn" (p. 212). Thus, it can be argued that there is little room for teachers to engage in meaningful learning if they are primarily exposed to low-depth interactions. Conversely, high-depth interactions have the potential to assist teachers in learning and implementing rigorous instructional approaches thought to positively impact student learning. As will be elaborated in Chapter 3, I apply Coburn and Russell's (2008) categories of low-, medium- and high- depth, to understand what types of opportunities the teachers had to engage in meaningful learning experiences.

In summary, in this chapter, I described what we know about the practices of modeling and co-teaching, primarily drawing from the pre-service teacher education literature, as well as research describing mentoring practices for novice in-service teachers. Additionally, I examined the scarce, available literature discussing how modeling and co-teaching have been implemented by coaches with experienced in-service teachers. Furthermore, I situated my research using Campbell and Griffin's (2017) conceptual framework, and then explained how Lave and Wenger's (1991) Theory of Legitimate Peripheral Participation could be applied to understand the process of teacher learning through the modeling and co-teaching cycles. Last, I discussed my plans to apply Coburn's (2003) dimension of depth to analyze coach-teacher interactions. In the following chapter, I turn to discuss my methods for gathering and analyzing the qualitative data for this study.

CHAPTER 3:

METHODOLOGY

As I sought to better understand the complexity surrounding the ways in which instructional coaches engaged with classroom teachers as they jointly worked towards instructional improvement, my research questions, and therefore research methods, are best aligned with a qualitative approach. As a reminder from Chapter 2, I investigated the following questions in this study:

1. *Why* do the coaches and teachers engage in modeling or co-teaching cycles?

2. *How* do the coaches and teachers enact the modeling or co-teaching cycles?

3. From the perspectives of the coaches and teachers, what are the *perceived benefits* of participating in the modeling or co-teaching cycles?

4. What are the *emergent challenges*, as well as *conditions* that could address these challenges, of engaging in the modeling or co-teaching cycles?

In the following sections, I describe my process for finding coaches with whom I could partner, and I provide useful context about District A's coaching program. Then, I outline my data collection and analysis methods.

Sample

Recruitment

To find instructional coaches with whom I could partner, I engaged in preliminary inquiries (Bogdan & Biklen, 2011) as I sought formal and informal knowledge from instructional coaches in various school districts. I created my own database by examining the staff directories on each elementary and middle school website to generate a list of coaches at each school. I then showed the lists to several colleagues who are particularly well connected with the local school

districts and asked if they knew any of the coaches and could recommend several who might be receptive and helpful. This line of inquiry led to the identification of four local coaches, three in School District A and one in School District B. Next, I sent an email (see Appendix A) to all four coaches briefly introducing myself and asking if they would be willing to meet in person or talk on the phone so I could better understand how instructional coaching works in their school district, determine topics for a potential research study, and start to build partnerships. All four coaches responded to my email and we met in person. These informal meetings lasted between 45 and 90 minutes as we discussed how the instructional coaching structure worked in their particular school district, what a typical week might look like for them, the various strategies they used to support teachers, how school-wide goals were created, and whether there was anything they were curious about regarding instructional coaching.

My idea for this dissertation emerged from these informal conversations. I wanted to be flexible enough to build my research questions and study design around something that was already occurring in the school districts, instead of imposing my own agenda on the instructional coaches and adding to their already very full plates. When I asked the coaches to describe how they supported teachers, all of the coaches mentioned modeling and co-teaching. In combing back through the literature, I realized that we actually know very little about how instructional coaches implement these forms of mathematics professional development with in-service teachers. Therefore, I focused my dissertation on modeling and co-teaching, as local coaches implemented these strategies with regularity, it would be a contribution to the literature, and the topic intrigued me as I reflected on my own experiences as an instructional coach.

Participants

The informal meetings referenced above ultimately led to the identification of three coaches who were willing to partner with me and participate in my study. However, as one of the coaches was not asked by teachers to regularly model and co-teach lessons in the mathematics classroom, I built this dissertation primarily around data collected from instructional Coaches Meg and Claire[8], and general information about these two coaches can be found in Table 3.1 below.

Table 3.1
Coaches Meg and Claire

Coach	Demographics	Grade Levels	Years Coached	Years Taught	Higher Education
Meg	White female	Elementary, K-5	2	21	Master's in Education Master's in Administration
Claire	White female	Elementary, K-5	3	10	Master's in Social Work Master's in Administration

I studied how Coach Meg enacted modeling cycles with Teachers Michelle and Mackenzie, and how Coach Claire co-taught with Teachers Cathy, Caroline, and Cecilia. As there are quite a few names to keep track of, I applied several strategies to help the reader distinguish between all participants. First, all modeling participants' names begin with the letter "M," while all co-teaching participants' names start with the letter "C". Second, both coaches' names (Meg and Claire) are one syllable. Third, the number of syllables in each teacher's name parallels the order in which they are presented in each chapter. For example, in Chapter 4, after I present Coach Meg, second I discuss Teacher Michelle (2-syllables) and third Teacher Mackenzie (3-syllables). In Chapter 5, I first present Coach Claire, then Teacher Cathy (2-syllables), followed by Teacher Caroline (3-syllables), and last Teacher Cecilia (4-syllables). While I provide a description of each teacher in Chapters 4 and 5, general information can be

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[8] All names are pseudonyms and I introduce the coaches in Chapters 4 and 5.

found in Table 3.2 below. I now turn to provide a bit of context about District A and its

coaching structure.

Table 3.2
Teacher Information

Teacher	Demographics	Current Grade Level	Years Taught	Previous Teaching Experience
Michelle	White female	3rd	17	Taught 2nd, 3rd, and 5th grade
Mackenzie	White female	4th	23	Previously taught kindergarten
Cathy	White female	5th	11	Taught 3rd and 5th grade
Caroline	White female	1st	9	Taught 1st and 2nd grade
Cecilia	White female	4th	10	Previously taught kindergarten, 1st and 3rd grade

District A's Coaching Structure

This study was situated in District A, which enrolled more than 10,000 students in 18

schools from grades pre-kindergarten through 12. When District A initially implemented a

coaching program years ago, coaches were also full-time classroom teachers. In her baseline

interview, Patti – the district-level administrator who supported the instructional coaches – said

this was challenging because "…it was like having a full-time job and then having this other job

on top of what you were doing." The model changed with a new wave of administration and

District A adopted literacy coaches who were not housed in the schools, but rather in district

sponsored buildings. However, the model changed yet again as the administration changed once

more. Every school building was given their own coach who was to be used half of the time as

an interventionist and the other half of the time as a literacy coach. Due to scheduling

challenges, this new model proved to be tricky. According to Patti, "If I had 3rd grade reading

group and this was the reading block time where I needed to pull them, but it was also second

grade's collaboration or planning time, I never got into 2nd grade." Thus, when a new

superintendent was hired, the model shifted one last time to its current model, in which every

school has its own instructional coach.

The specific coaching structure utilized in District A is called Teacher's Choice. According to this structure, coaches are not allowed to approach individual teachers to provide one-on-one support, but instead they must wait to be approached for assistance by the teacher. As Coach Meg described in her baseline interview, "They need to come to me in District A. I can't really seek them out and say you need to do a coaching cycle. They need to come to me." When discussing the Teacher's Choice structure with Patti, while she acknowledged that coaches truly grappled with the model, she provided the following rationale for its implementation:

> We just felt like it's better to start where people want, with people who want to be there…as opposed to saying everybody has to be in a coaching cycle. Then you put coaches in a position where people are potentially wasting the coaches' time and expertise because they're really not in it to create shifts. We'd rather have that be more ground up, natural. It's definitely a struggle.

Hence, from Patti's perspective, she thought the benefits of the Teacher's Choice model outweighed any drawbacks.

The coaches in District A consistently participated in professional development. They met once a month for three hours with Patti to discuss coaching issues. According to Patti, her goal during those meetings was to "keep them up to snuff in terms of, like, coaching. And then also try to keep them on the edge of whatever content." Additionally, the coaches met once a month with their building principals for three hours at the District Office, and four times a year with their principles and interventionists. Patti reflected on her own role in relation to the coaches: "Anything that has to do with how to support them, that's really why I'm here. And advocate for them. That kind of stuff. But, I don't evaluate them. I don't. I mean, their principal is their boss."

Given the Teacher's Choice structure, I could not predict or influence the specific activities that coaches would undertake with teachers during the Fall 2016 semester in which I collected data. So, I remained flexible and pursued relevant opportunities that presented themselves, while trying to juggle multiple school sites. In general, I adhered to the following process while collecting data. Meg and Claire emailed me if a teacher wanted them to either model or co-teach during mathematics instruction and the teacher felt comfortable allowing me to observe their cycle. Next, I went to the school site and attended one of the planning meetings that took place at the beginning of the cycle to introduce myself to the teacher, ask her to sign the IRB consent form, and pass out the passive consent forms to students. I then created an observation schedule based on my availability, as well as the coach's and teacher's schedules. I now describe how I primarily positioned myself as an observer throughout the course of this study.

My Positionality

Bogdan and Biklen (2011) describe the participant observer continuum. At one end is the complete observer. In this role, the researcher refrains from participating in any activities and only observes the scene. At the other end of the spectrum is complete involvement, where the researcher fully participates in the activities and no detectable difference can be found between the researcher and participants. I primarily took on the role of observer in the context of this study as I did not participate in any of the activities. As a former school administrator where my core responsibility was to support teachers and help them improve their instruction, I anticipated this would be a significant challenge for me. At times, this proved to be difficult as I sometimes disagreed with how the coach supported the teacher or what I saw taking place during a lesson. During these moments, I wanted to interject my opinion and make my presence known.

However, I truly tried to adhere to my role as an outside observer, always seeking to understand what I saw going on around me. In the following section, I describe my data collection methods.

Methods of Data Collection

Primary data collection methods included: (1) classroom data; and (2) semi-structured interviews. Table 3.3 below summarizes the data collected for the five coach-teacher pairs. See Table B.1 in Appendix B for a detailed timeline of all data collected.

Table 3.3
Classroom and Interview Data for All Coach-teacher Pairs

	Modeling		Co-teaching		
Coach	Meg		Claire		
Teacher	Michelle	Mackenzie	Caroline	Cecilia	Cathy
Grade Level	3rd	4th	1st	4th	5th
Focus	Calendar Math	Calendar Math	Guided Math	Guided Math	Guided Math
Lessons Observed	7	6	4	3	3
Planning Meetings	1	1	2	4	3
Reflection Meetings	0	0	2	1	1
Interviews[9]	4	4	4	4	4

Classroom Data

To answer the question, "***How do the coaches and teachers engage in modeling or co-teaching cycles?***", I drew upon several data sources. First, I used field notes generated from observations of the modeling and co-teaching cycles, which encompassed planning and reflection meetings, as well as the modeled or co-taught lessons. Second, I utilized transcripts

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[9] As a reminder, I additionally completed baseline and exit interviews with each coach, as well as interviews with each principal and one district-level administrator.

generated from audio recordings of the full modeling and co-teaching cycles. I now describe my methods for generating field notes, and then discuss the audio recordings.

Field notes. During each observation, I recorded jottings (Emerson, Fretz & Shaw, 2011), which at a later time I expanded into full field notes (Bogdan & Biklen, 2011). My field notes were typed, in chronological order, and reflected the two-column structure (Bogdan & Biklen, 2011; Sunstein & Chiseri-Strater, 2012) where one column contained descriptive notes and the other had reflective notes where I provided my own impressions and interpretations. As the classrooms were very busy places, I knew it would be difficult to capture everything and that it would be necessary to focus my observations. Thus, while writing field notes, my focus was on the interactions between the instructional coach and the classroom teacher.

Audio recordings. In addition, I audio recorded all parts of the modeled and co-taught cycles. During the planning and reflection meetings, I used an audio recorder that was typically placed on the table between the coach and teacher. I used a uni-directional microphone during the classroom observations per the district superintendent's request. During the modeled lessons, only the coach wore the uni-directional microphone, while during the co-taught lessons, both the coach and teacher wore the uni-directional microphones. Although the intent of the uni-directional microphone was to only pick up the coaches' and teachers' voices, it did – at times – pick up the students' voices, too. However, I strictly focused on analyzing only the interactions between the coach and teacher. If either the coach or teacher engaged with a student, I did not analyze what the student said, and instead maintained my focus on the coach and teacher.

I now turn to discuss my data collection methods for the semi-structured interviews.

Interviews

I conducted a total of 27 semi-structured interviews (Kvale & Brinkmann, 2009) with two coaches, five teachers, two principals, and one district-level administrator to answer research questions one, three and four: ***(1) Why did the coaches and teachers choose to engage in the modeling or co-teaching cycles?; (3) What are the perceived benefits of participating in the modeling or co-teaching cycles?; and (4) What are the emergent challenges, as well as conditions that could potentially address these challenges, of enacting modeling or co-teaching cycles?*** Semi-structured interviews were a natural choice for this study as I wanted to have the flexibility to follow up on interesting topics that emerged throughout the interview, but I also had a general idea about the topics I wanted to cover with sample questions. I consistently strove to develop what Weiss (1995) refers to as the interviewing relationship, which describes the research partnership I created with my participants. As part of this partnership, I respected the coaches' and teachers' integrity, only asked questions that were useful to my dissertation and not out of sheer curiosity, and treated my participants' participation as confidential. During each interview, I kept a hard copy of the interview questions with me and jotted down brief notes to myself. I used an audio recorder to record all interviews, typically placing the recorder on the table between the interviewee and myself.

I interviewed the coaches and classroom teachers before and after they jointly engaged in the modeling or co-teaching cycles. In addition, I completed baseline, as well as exit, interviews with each coach at the beginning and end of the semester. Furthermore, I interviewed the principals at their schools, as well as the district-level administrator in-charge of providing professional development for all instructional coaches in the district. I utilized different interview guides (Weiss, 1995) for the coaches, teachers, principals, and district-level administrator (see Appendix C). Each guide contained a list of topics I intended to cover with

questions aligned to each topic. For the pre- and post-cycle interviews with the coaches and

teachers, I primarily asked them about their motivation to engage in the cycle as well as the

perceived benefits and challenges, along with conditions that needed to be in place to address the

emergent challenges. In the baseline interviews with the coaches and principals, I wanted to

better understand how they worked together to support teachers at their school sites, as well as

general challenges they encountered. For the interview with the distict-level administrator, I

primarily asked about the history of the coaching program, as well as professional development

opportunities for the coaches. In the exit interviews with the coaches, I chiefly reflected with the

coaches about the cycles and asked follow-up and/or clarifying questions. I now turn to discuss

my process for analyzing both sets of data, starting with the classroom-level data.

Data Analysis

In this section, I describe my data analysis process for the two different sets of data. I

begin with the classroom-level data, which illustrated how the coaches and teachers engaged in

the modeling and co-teaching cycles, and then I turn to the interview data, which provided

insight into the participants' motivations, perceived benefits, challenges and conditions. As the

classroom-level data was significantly richer and more complex than the interview data, more

space will be given to describing how the classroom-level data were analyzed. To help guide the

reader, Table 3.4 organizes the different sets of codes according to the data source, along with

other information that will be discussed in this sizable section.

Table 3.4
Data Analysis Table

Data Source	General Code	Specific Codes	Unit of Analysis	IRR
RQ2: *How do the coaches and teachers engage in modeling or co-teaching cycles?*				

- Classroom Data
   - Planning Meetings
   - Reflection Meetings
   - Modeled Lessons
   - Co-Taught Lessons
	Direct Engagement	- Level-1 Parent Codes
		- Level-2 Codes
		- Level-3 Sub-Codes
		- *See Appendix E*
			-Planning and Reflection Meetings: **Segments**
			
			- Modeled and Co-Taught Lessons: **Exchange**
				- Level-1 Parent Codes: n/a
				
				- Level-2 Codes
				- Planning/Reflection Meetings: Agreed on **79%** of codes assigned to 56 segments
				- Modeled/Co-Taught Lessons: Agreed on **86%** of codes assigned to 50 exchanges
				
				- Level-3 Codes: Agreed on **90%** of codes assigned to 50 segments

	Mathematics Indicator	n/a	-Planning and Reflection Meetings: **Assigned at sentence level** - Modeled and Co-Taught Lessons: **Assigned at exchange level**	- Planning/Reflection Meetings: - Agreed on **99%** of codes assigned to 56 segments - Modeled/Co-Taught Lessons: Agreed on **88%** of codes assigned to 50 exchanges
	Depth	- Low - Medium - High - *See Appendix F*	-Planning and Reflection Meetings: **Segments** - Modeled and Co-Taught Lessons: **Exchange**	- n/a for most Level-2 Codes and Level-3 Sub-Codes - For Mathematics, agreed on **86%** of codes assigned to 29 segments

- Classroom Data
   - Modeled Lessons
   - Co-Taught Lessons
	Indirect Engagement	- Classroom Management
		- Helping Students Learn Mathematics
			- Modeled and Co-Taught Lessons: **Exchange**	- Agreed on **89%** of codes assigned to 50 exchanges

Table 3.4
Data Analysis Table

		- Other - *See Appendix G*		
- Classroom Data - Modeled Lessons	Teacher's Role	- Observe - Take Notes - Interact with Students - Participate in Lesson - Assist with Classroom Management - Help Manage Materials - Engage in Off-Task Behavior - *See Appendix H*	n/a	n/a
- Classroom Data - Co-Taught Lessons	Co-Teaching Model	- One Teach, One Observe - One Teach, One Assist - Parallel Teaching - Station Teaching - Alternative Teaching - Team Teaching - Beginning of Lesson - End of Lesson - *See Appendix I*	- Co-Taught Lessons: **Segments**	- Agreed on **85%** of codes assigned to 40% of co-teaching segments
RQ1: Why did the coaches and teachers choose to engage in the modeling or co-teaching cycles?; *RQ3: What are the perceived benefits of participating in the modeling or co-teaching cycles?;* *RQ4: What are the emergent challenges, as well as conditions that could potentially address these challenges, of enacting modeling or co-teaching cycles?*				
- Interview Data	Motivation - *See Appendix J*	- Interview Data	- Segments	n/a
	Perceived Benefits - *See Appendix K*	- Interview Data	- Segments	n/a
	Challenges - *See Appendix L*	- Interview Data	- Segments	n/a
	Conditions - *See Appendix M*	- Interview Data	- Segments	n/a

Data Analysis: Classroom Data

To answer the research question regarding how the coaches and teachers engaged in the modeled or co-taught cycles, I first discuss how I prepared the data for analysis, and then describe how I engaged in the process of code development. Last, I discuss my process for coding and analyzing the data. As the classroom-level data (discussed here) was significantly richer and more complex than the interview data (discussed in the subsequent section), this called for more elaborate analysis plans. Hence, more attention and space will be given to illustrate how I analyzed the classroom data.

Data preparation: Classroom data. Before beginning analysis, I prepared the data from the planning conversations, classroom lessons and reflection conversations[10].

Planning conversations. I transcribed all audio from the planning conversations using InqScribe software (used for all transcripts in this study). Pseudonyms were used for all individuals in an effort to protect their identity. To fully attend to what my participants said, I transcribed utterances such as "ummm," "hmmm," etc.

Lessons. I transcribed all audio from the modeled and co-taught lessons. For the modeled lessons, as only the coach wore a uni-directional microphone, transcribing was a fairly straightforward endeavor. Transcribing the co-taught lessons was more complex, as the coach and teacher both wore uni-directional microphones. To create the transcripts, as well as for timing purposes, I always started with the classroom teacher's audio as it was generally more complete than the coach's. This is due to the fact that when I arrived to the classroom, the teacher was already there with her students, and so I put the microphone on her first. Then the coach arrived, sometimes on time and at other times a little late, and I put the microphone on her

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[10] I consider the planning and reflection conversations to be part of the classroom-level data as these generally happened in the teacher's classroom.

second. Furthermore, at the end of the lesson, the coach typically had to leave rather immediately for another commitment such as meeting with the principal or assistant principal, or leading a grade-level team meeting. So, I usually took off the microphone from the coach first, stopping her audio, and then did the same for the classroom teacher. As requested by the district's superintendent and documented in my IRB, the transcripts do not focus on students' responses. For example, when a student responded to the teacher's and/or coach's questions, I wrote, "Student said I did five multiplied by three which got me 15."

After I transcribed all modeled and co-taught lessons, to develop a complete picture of each lesson and document, in particular, non-verbal interactions between the coach and teacher, I created a two-column document that fused my field notes with transcripts. The left column contained the transcript of the lesson and the right column incorporated my field notes. For example, as I wrote my field notes, I tried to consistently track what the teacher said and did in relation to what the coach said. To illustrate, one excerpt from my field notes from the first observed modeled lesson for the coach-teacher pairing of Meg and Michelle was as follows: "Meg moved onto the money portion of the lesson. Michelle took the fake money from the side table and went to the back of the room. She is looking for something in her desk." Hence, in the part of the transcript when Meg asked students to represent the Number of the Day in change and dollars, I knew that Michelle was in the back of the classroom searching for a clip to keep all of the fake money together. See Table 3.5 below for an example of the fused field notes and transcripts. Given that I did not get permission to video-record the modeled and co-taught lessons, it was important for me to fuse together my transcripts and field notes to paint a fuller picture of how the coach and teacher engaged with one another during the lessons.

Table 3.5
Sample Fused Transcript and Field Notes

Transcript	Description
Meg: So the first thing I want you to be thinking of, okay, we have, somebody tell me a coin, a coin, the value of a coin, any coin, give me a coin, give a coin any coin. *Juana:* A quarter. *Meg*: A quarter. The way that Miss Meg does this, and it can be done a lot of different ways, but I usually put a circle with a q in it for quarter, okay? So, give me another coin, any coin.	Michelle took the fake money from the side table and went to the back of the room. She is looking for something in her desk.

Next, as I sought to examine how the coach and teacher engaged with one another during the modeled and co-taught lessons, I wanted to identify instances when the coach and teacher directly and indirectly interacted with one another during the lessons.

Direct Engagement. After completing full depictions of each lesson by fusing together transcripts and field notes, I went through and carefully searched for places where the coach and teacher directly engaged with one another, typically through conversations where both individuals contributed to the exchange, or singular comments one made to the other without being met by a verbal response. This also included comments of validation, although rare, such as "Mmm hmm" and "Yep" that one teacher made after the other said something to the class. I first highlighted these instances of Direct Engagement in the word document, and then copied and pasted them into excel files, along with other identifying information such as the coach-teacher pairing, lesson number, transcript page, etc.

Indirect Engagement. During the modeled and co-taught lessons, the individual who was not charged with facilitating whole group instruction often indirectly supported the facilitator by providing feedback to students. Hence, I thought it was important to capture these moments of Indirect Engagement as they illustrated how the coach and teacher worked together during the

modeled and co-taught lessons. To clarify, I did not code every instance when the coach or teacher provided feedback to students, as the purpose of this study was not to analyze the ways the coach and teacher individually taught math to students, but rather to understand how the coach and teacher interacted with and supported one another during the modeled and co-taught lessons. It was easy to pick out these moments during the modeled lessons, as, based on the fact that the coach was modeling, it was clear that the coach always had responsibility for facilitating whole group instruction. Therefore, I operated under the assumption that every comment and conversation initiated by the classroom teacher to students were in an effort to indirectly support the coach as she modeled whole group instruction.

It was slightly more complex identifying instances of Indirect Engagement during the co-taught lessons as the coach and teacher continuously shifted responsibility for providing whole group instruction. Thus, I created a set of rules to determine whether or not to code for instances of Indirect Engagement. Furthermore, I acknowledge that it was, at times, a hard call in terms of where and how to draw the line when making decisions to code or not to code for instances of Indirect Engagement.

- o At the beginning of class, there was a period of time in all co-taught classrooms where the coach and teacher got students ready for the lesson (Beginning of Lesson). I did not code for instances of Indirect Engagement during this time because I could not consistently tease out across the 10 observed co-taught lessons whether the coach or teacher was taking the lead during this segment of time. Given that instruction of mathematics content had not yet begun and I am more interested in understanding how the coach and teacher engage with students during content instruction, I felt this was an acceptable adjustment to make. Instances of Direct Engagement between the

coach and teacher, which were clear and easy to tease out, were still coded at this time.

o   After content instruction had ended, at the end of most co-taught lessons the classroom teacher typically requested all students' attention and gave them instructions to close out class (End of Lesson). I did not code instances of Indirect Engagement during this time because, similar to the beginning of class, I could not consistently tease out whether the coach or teacher was taking the lead during this segment of time as it often felt like a shared responsibility. Examples of Direct Engagement between the coach and teacher were still coded at this time.

o   There were times when the coach and teacher enacted One Teach, One Assist/Observe and then told students to complete a particular task in a certain amount of time while they circulated (Circulation). For example, "So I want everybody to solve that problem and when you are done solving it I want you to put your hand on top of your head so one of us can come and check your answer." During Circulation, the coach and teacher shared responsibility for checking in on students and providing them with feedback. Although one of them may have set the agenda for that time, the coach and teacher worked together and truly shared responsibility for assisting students during this time. Thus, I did not code for instances of Indirect Engagement during Circulation as one individual was not tasked with lead teaching. I still coded for instances of Direct Engagement between the coach and teacher.

o   During periods of Transition, the coach and teacher shared responsibility for getting materials ready for small groups, calling groups over to the back table, etc. Given

that one individual was not in charge of facilitating whole group instruction during these segments of time, I did not code instances of Indirect Engagement, but I still coded examples of Direct Engagement.

- o During Station Teaching, the coach and teacher worked with separate groups of students in different places in the room while the rest of the class worked through a list of activities at their desks or on the carpet. I did not code instances of Indirect Engagement during Station Teaching as one individual was not lead teaching. I still coded for Direct Engagement during this time.

- o During Team Teaching, the coach and teacher shared responsibility for providing whole group instruction. During these segments, I did not code instances of Indirect Engagement, but continued to code for Direct Engagement.

- o During Alternative Teaching, one individual was responsible for working with the whole group of students while the other individual supported a small group of students at the back table. During these segments, it felt as though the individual working with the whole group of students was the one providing lead instruction. So, the Indirect Engagement code was most commonly used as the teacher working at the small table with her group of students made comments to students who were in the whole group setting. If the teacher working with the whole group of students made a comment to a student working in the small group, which was extremely rare, this was not coded. Instance of Direct Engagement continued to be coded during this time.

Similar to the instances of Direct Engagement, I first highlighted, and then copied and pasted all examples of Indirect Engagement into excel files, along with relevant identifying information (coach-teacher pair, lesson number, transcript page, etc.).

Reflection conversations. Across all modeling and co-teaching cycles, I was only invited to observe one formal reflection conversation. This was transcribed in a similar way to the planning conversations described above. Regarding informal reflection conversations, while reading the co-taught lesson transcripts[11], I noticed that sometimes at the end of the lesson, the coach and teachers informally reflected on the lesson. If these conversations were related to the cycle and lasted longer than three minutes[12], they were separated from the classroom transcripts and instead viewed as an informal reflection conversation. It is worth noting that during some of the informal reflection conversations, the coach and teachers continued to partially engage with students as they still had to manage the classroom.

In the following section, I discuss my process for code development for the research question regarding how the coaches and teachers engaged in the modeling and co-teaching cycles, and then describe how I engaged in data analysis.

Code development: Classroom data. To provide a brief overview of this lengthy section, I used five different sets of codes while coding the classroom-level data to address the question about how the coaches and teachers participated in modeling or co-teaching together. Direct Engagement, Indirect Engagement, and Depth codes were used on both the modeling and co-teaching data. The Teacher's Role codes were exclusively used on the modeling data, and captured some of the nonverbal roles embodied by the classroom teacher that weren't reflected in

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[11] The coach and teachers did not appear to have informal reflection conversations at the end of the modeled lessons.

[12] Three minutes is, admittedly, arbitrary, but it seemed a reasonable demarcation between a casual post-lesson exchange that commonly occurred as the coach packed up and departed, versus a more focused, substantive conversation.

the verbal Direct and Indirect Engagement codes. Furthermore, the Co-Teaching Model[13] codes were restricted to the co-teaching data to provide an overview of the various co-teaching models enacted by the coach and teachers, which wouldn't have been captured in the Direct and Indirect Engagement codes.

In this section, I begin by discussing development of the Direct Engagement, Depth, and Indirect Engagement codes; followed by Co-Teaching Model codes; and ending with the Teacher's Role codes. Later, I turn to the coding related to the remaining three questions about motivation, perceived benefits, challenges and conditions.

Direct Engagement. To make comparisons across the three different sets of classroom data (planning conversations, modeled or co-taught lessons, reflection conversations), it was important to have a set of common codes to reflect the substance of instances when the coach and teacher directly engaged with one another. Prior to data analysis, I began with some predetermined codes that were informed by the literature (see Table D.2 in Appendix D). For example, current research states that effective professional development must focus on the content (Desimone 2009; Desimone & Pak, 2017). Hence, Mathematics was one of my pre-determined codes as I expected to hear the coaches and teachers discuss the mathematics content during various phases of the modeled and co-taught cycles. Furthermore, current research on high-quality mathematics instruction promotes general pedagogical teacher moves such as focusing on student thinking, orchestrating a whole group discussion, and implementing mathematical tasks (Martin, 2007; NCTM, 2014). Thus, an additional pre-determined code was Pedagogy as I expected to hear the coaches and teachers engaged in pedagogical discussions. In

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[13] Here, the word "model" is not to be confused with the practice of modeling. Rather, it is being used to describe various models or structures that can be used while co-teaching, such as One Teach, One Assist; Team Teaching; Station Teaching; etc.

addition to these pre-determined codes, I used emergent codes to fully attend to what my participants discussed.

To provide a general overview, I developed the following three levels of Direct Engagement codes: (1) Level-1 Parent Codes; (2) Level-2 Codes; and (3) Level-3 Sub-codes. I did not, however, develop them in this order. In the space that follows, I describe my process for first creating Level-2 Codes, then strategically grouping them to develop Level-1 Parent Codes, and last teasing out the Level-2 Codes into Level 3 Sub-codes.

Level-2 code development. As I developed a set of common emergent codes to use across all sets of classroom data, I engaged in the process of open coding as described by Creswell (2013). First, I organized and prepared my data for analysis, which was previously described above. Next, I read through all of my data multiple times to gain a holistic understanding prior to starting the coding process. I started with my modeling data as I found it to be a less complex version of my co-teaching data, and cycled through the planning conversations, then the lessons, and ended with the reflection conversations. While doing so, I recorded notes to myself in the margins about emergent themes or my own thoughts. When I noticed that a particular idea repeated, I created a code. For example, I observed that the coaches and teachers consistently joked around with one another, discussed personal matters such as their families, and shared gossipy moments. Hence, I created a Relationship Building code to capture these exchanges. During Level-2 code development, I continuously debriefed with my advisor and two fellow mathematics education doctoral students to discuss and refine the emergent codes (Lincoln & Guba, 1985). Throughout this process, I created a codebook complete with a description and examples of each code (see Table E.1 in Appendix E).

Level-1 parent code development. While my Level-2 codes enabled me to closely capture what my participants discussed, I acknowledge that having 15 Level-2 codes could potentially cloud the big picture of what was going on in my data by overwhelming the reader with too many, seemingly unconnected, details. Thus, I strategically grouped my Level-2 codes together under the following six broad parent codes: Management, Pedagogy, Content, Planning and Logistics, Contextual Factors, and Other (see Table E.1 in Appendix E).

Level-3 sub-code development. As a last step in the code development process, I created sub-codes only for the Level-2 codes that had a high volume of data. This included the following Level-2 codes: Assessment; Curriculum, Activities and Materials; General Pedagogy, and Grouping. I applied a similar open coding approach (Creswell, 2013) as described above for the Level-2 codes. All Level 3 sub-codes can be found in Table E.1 in Appendix E. In Table 3.6 below, the hierarchy of Level-1, -2, and -3 codes is displayed to provide a sense of the codes and how they were clustered. Definitions and examples of all codes can be found in Table E.1 in Appendix E.

Table 3.6
Level-1, Level-2, and Level-3 Codes

Level-1 Codes	Level-2 Codes	Level-3 Codes
Management	Classroom Composition and Attendance Classroom Management	
Pedagogy	Grouping	• Pulling Small Groups • Grouping Logistics • Grouping Structures • Creating Groups
	Assessment	• Assessment Logistics • Student Mastery • Data Informing Instruction • Assessment Creation
	General Pedagogy	• Pedagogical Resources • Gradual Release Process • Planning and/or Creating • Differentiation • Pedagogical Principles and Practices

Content	Curriculum, Activities and Materials	• Curriculum and Activities
		   o Timing
		   o What Students in Small Groups Work On
		   o Rigor
		   o Perceptions of the Curriculum
		   o Seeking to Understand and/or Navigate the Curriculum
		• Materials

	Mathematics	
Planning and Logistics	Technology[14] General Plans for Coaching Cycle Facilitator's Role Time and Schedule	
Contextual Factors	Relationship Building External Requirements	
Other	External Individuals Other	

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[14] The participants primarily talked about technology in a logistical way as they discussed how to work the SMART Board, log into a particular interface, etc., instead of conferring about how to leverage technology to help students learn.

Mathematics Indicator. As previously mentioned, one of my pre-determined codes for instances of Direct Engagement was Mathematics. However, as will be discussed in Chapters 4 and 5, the coaches and teachers seldom engaged in conversations about mathematics. While analyzing the data, I noticed that, instead, it was more common that the coaches and teachers used mathematical words and phrases while discussing other topics, such as the curriculum and/or assessment. Although these examples did not reflect conversations focused on mathematical content (as they would have then been coded as Mathematics), I wanted to flag these instances to better understand the place of mathematics in coach-teacher interactions. Hence, I assigned these instances a Mathematics Indicator. It is worth mentioning here, and will also be pointed out in later chapters, that the exchanges coded as Mathematics are not necessarily more substantive than the exchanges that received a Mathematics Indicator. In fact, many of the exchanges coded as Mathematics were quite shallow and not what one would typically think of as a mathematical conversation between a coach and teacher. However, the primary distinction between the Mathematics code and Mathematics Indicator is whether the exchange is about mathematics, or about some other topic. If the exchange is about mathematics and isn't about anything else, it was coded as Mathematics. If the exchange is about the Everyday Mathematics 4 curriculum, for example, but involved the coach and/or teacher using some mathematical words and phrases, it received a Level-2 code of Curriculum, Activities and Materials and was tagged with a Mathematics Indicator.

I created a set of rules to determine whether or not to flag something with a Mathematics Indicator. If a sentence from the planning transcript or exchange from the classroom transcript contained a mathematics term or a number used in a mathematical way, it was assigned a Mathematics Indicator in addition to whatever other Direct Engagement code it was assigned.

The Mathematics Indicator was not used if the term "math" or "mathematics" was simply being used as a course label (e.g. "I said you had to have two notebooks, one for reading and one for *math*."). Furthermore, it was not applied if a mathematical term was used in a non-mathematical context (e.g. "*add* some components of it") or if the number was used in an unrelated way to the mathematics being taught (e.g. "Okay, and then um, once we get rolling it should be within *15* minutes."). Additionally, if a mathematical term was implied but not directly used, a Mathematics Indicator was not assigned (e.g. "He doesn't know to use it [multiplication chart]."). If there were multiple Mathematics Indicators in a single sentence, that sentence was still only counted once ("Is there review of *factors* and *multiples?"*). Last, the Mathematics Indicator was not assigned to data that had already received a Level-2 Mathematics code as the indicator's purpose is to flag mathematics-related talk that was not coded as Mathematics initially.

To be clear, all classroom-level data that reflected instances of Direct Engagement between the coach and teacher was first assigned a Level-2 code. In addition to the Level-2 code, data that met the criteria for the Mathematics Indicator were also flagged as such.

Depth. To better understand the depth of coach-teacher talk, I used Coburn's and Russell's (2008) definitions of low-, medium- and high-depth and carefully mapped my Direct Engagement Level-2 Codes onto these pre-existing categories. Some of the Level-2 Codes closely mapped onto the definitions. For example, Curriculum, Activities and Materials clearly mapped onto the low-depth category as the authors stated that talk about "materials" and "how to use the curriculum" was considered low-depth.

Other Level-2 Codes, such as General Pedagogy, had to first be decomposed into their sub-codes prior to being placed in the appropriate low-, medium-, or high-depth category. For example, data coded as Pedagogical Resources, one of the General Pedagogy sub-codes, was

coded as low-depth as this typically involved the coach talking about books and templates she planned on sharing with the teacher. Pedagogical Principles and Practices, on the other hand, mapped onto the high-depth category as data coded under this sub-code reflected more substantive discussions about general pedagogical principles underlying instructional approaches.

In some cases, I had to make tough calls when mapping my codes and sub-codes onto the three pre-existing categories. For example, according to the pre-existing definitions, "detailed planning for lessons, including why" was considered a medium-depth interaction. Planning and/or Creating, a sub-code of General Pedagogy, encompassed coach-teacher talk that, at times, reflected rather elaborate discussions about lesson planning, but other times reflected lesson planning conversations that were brief and less substantive. In an effort to give the coaches and teachers the benefit of the doubt, when making tough calls such as this, I placed the Level-2 Code or Level-3 Sub-Code in the higher category. For example, in this specific case, I placed Planning and/or Creating in the medium-depth category rather than the low-depth one. Table F.1 in Appendix F illustrates how I mapped my Level-2 Codes and Level-3 Sub-Codes onto the low-, medium- and high-depth categories.

Last, I had to parse all data for only one of the Level-2 codes (Mathematics) into the low, medium, and high-depth categories as the Mathematics code did not contain sub-codes due to the very low volume of data, and according to Coburn and Russell (2008), Mathematics could be placed in multiple depth categories. More specifically, Coburn and Russell state that "doing mathematics problems together with discussion" is a medium-depth interaction, while "talk related to mathematical principles or concepts" is a high-depth interaction. They do not mention anything about mathematics in their low-depth definitions. Using these descriptions as a starting

point, I read through all data coded as Mathematics to further develop the definitions while engaging in rigorous discussions with my advisor. At the end of this process, we developed an agreed upon set of low-, medium-, and high-depth definitions for the Mathematics data, as shown in Table 3.7.

Table 3.7
Low-, Medium- and High-Depth Mathematics Definitions

	Definition	Example
Low-Depth	The coach or teacher uses mathematical language, rules or procedures without attending to the meaning or the "why" underlying them. This includes instances when the coach or teacher revoices a student's mathematics response, restates or clarifies mathematical language used without explanation, reviews/states a definition without attending to the meaning, reviews simple computation problems, states procedures or rules, or gives incorrect (or at least potentially misleading) mathematical statements.	*Claire:* So, a prime number is any number greater than 1 that has exactly two different factors, one and itself, like 3.
Medium-Depth	Encompasses instances when the teacher and coach do mathematics problems together, and this is accompanied with discussion.	*Claire:* The first box says multiply by 1. *Cecilia:* Where does it say multiply by one? Oh, right there! *Claire:* Yeah. So, your number in. So, your 1… *Cecilia:* Yeah, 1 x 1, 2 x 1… *Claire:* Multiplied by 1. It's coming out 1. So, we could do, like, we could draw this up there, whatever. *Cecilia:* But this doesn't work if we're…Oh, okay. So, no. The box is not correct 'cuz 2 x 1 is not 3. *Claire:* Right. *Cecilia:* Okay. Double the number you put in and subtract 1.

Table 3.7
Low-, Medium- and High-Depth Mathematics Definitions

High-Depth	Coach provides an explanation that could help the teacher make meaning and/or substantive connections across concepts. The coach and teacher may talk about multiple mathematical representations with at least some attention to the representations' meaning or the "why" behind their use. Or the coach and teacher might discuss potential misconceptions about mathematical concepts (again, with at least some attention to meaning or the "why" behind them). Additionally, statements and/or explanations must be mathematically correct to be rated as high-depth.	*Meg:* It's understanding that you're not just carrying over a 1. You're actually carrying over 10. I know that you've heard me say this a lot. What's 5 tens plus 2 tens? Because when you're adding the tens column it's not 5 plus 2.

After developing these agreed upon definitions, my advisor and I separately coded all of the Mathematics data. The Mathematics data had already been parsed into a total of 29 segments. Of the 29 segments, we agreed on 86% of the assigned low, medium, and high depth Mathematics codes. There were four instances in which we initially assigned different depth codes, and all instances involved one individual assigning a medium-depth code while the other assigned something else.

Indirect Engagement. As a reminder, instances of Indirect Engagement reflected times when the coach and teacher interacted with students in support of the individual facilitating whole group instruction. I initially tried to use the same set of Direct Engagement codes described above to code interactions between the coaches/teachers and students. However, this set of data begged for a different set of codes as the substance of the coaches'/teachers' conversations with students was significantly different than the substance of their conversations with one another. Hence, to create a set of Indirect Engagement codes, I engaged in a similar process of open coding as previously mentioned (Creswell, 2013). A complete set of the Indirect

Engagement codes can be found in Table G.1 in Appendix G. It is worth pointing out that it may

seem as though there is a blurry line between the Classroom Management and Helping Students

Learn Mathematics codes. That is, some of the items coded as Helping Students Learn

Mathematics, such as telling students to copy notes, may seem like a better fit for Classroom

Management. However, telling students to copy notes and/or clarifying aspects of the

mathematical task may, from the teacher or coach perspectives, have been in an effort to help

students learn mathematics. Thus, the Helping Students Learn Mathematics code not only

encompasses substantive mathematical discussions between the teachers and students, but it also

includes instances when the teachers help students focus on the mathematical task at hand.

Instances coded as Classroom Management pertained to more general, less academically-focused

interactions.

To clarify, instances of Indirect Engagement were not assigned an additional

Mathematics Indicator as this was only used for examples of Direct Engagement during the

planning conversations and modeled lessons. I made this decision based on the fact that I am

interested in opportunities the coaches and teachers had to discuss mathematics with each other,

(as opposed to analyzing the mathematical nature of their interactions with students), as this is

aligned with my research questions.

Teacher's Role. During my exit interview with the coach who exclusively modeled, I

asked Coach Meg to reflect on her expectations regarding the teacher's role during the modeled

lessons[15]. The coach mentioned five roles she expected the classroom teacher to fulfill: (1)

observe; (2) write notes; (3) have academically-focused interactions with students; (4) assist with

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[15] I asked the coach this question in her exit interview due to the teacher's off-task behaviors I
noticed and was curious to better understand her expectations of the teacher's role while she
modeled. I did not ask the coach who exclusively co-taught this question as all teachers were
directly involved in the co-taught lessons and I did not observe similar off-task behaviors.

behavior management; and (5) participate in the lesson. In reflecting on my careful readings of

the classroom transcripts and field notes, I thought these five roles generally reflected the roles

enacted by the teachers during modeled lessons. However, I added two additional roles I

observed that Meg did not mention. First, the teachers frequently helped the coach manage the

materials in the classroom. This was evident through their direct verbal exchanges (captured in

the transcripts), as well as their nonverbal actions (captured in the field notes). Second, the

teachers commonly engaged in off-task behaviors unrelated to the modeled lessons, which was

documented in my field notes. A complete list of Teacher's Role codes can be found in

Appendix H.

It was important to use these seven roles as a lens to understand the teacher's role during

the modeled lessons for two primary reasons. First, while the Direct and Indirect Engagement

codes described above capture the interactions between the coach and teacher, these seven roles

complimented that by providing a big picture view of what the teacher was doing during the

modeled lessons. Second, it was important to understand the extent to which the teachers met

the coach's expectations of them during the modeled lessons. I acknowledge there is a small

degree of overlap between the Direct and Indirect Engagement codes, and the Teacher's Role

codes. Hence, I contemplated different ways in which I could possibly combine these different

sets of codes. However, after much deliberation I thought it was best to keep them separate

because there were additional components in the Teacher's Role codes that were not captured by

the Direct and Indirect Engagement codes that helped answer the research question about how

the coach and teacher engaged in the modeling cycles.   In the results section, I fully describe and

provide examples of Direct and Indirect Engagement, and then to avoid sounding repetitious,

when talking about the Teacher's Roles, I allude to the Direct and Indirect Engagement codes.

Co-Teaching Model codes. Although the modeled lessons I observed tended to follow a consistent lesson structure, this was not the case for co-taught lessons. As will be described below, I parsed all co-taught lessons based on the co-teaching model enacted. The Co-Teaching Model codes were primarily informed by the literature (Friend, 2016; Treahy & Gurganus, 2010), however I created two additional codes (Beginning of Lesson and End of Lesson) based on my observations (see Appendix I).

In the previous section, I described my process for development of the Direct Engagement, Depth, Indirect Engagement, Teacher's Role, and Co-Teaching Model codes. I now turn to discuss how I coded and analyzed the classroom-level data, which encompassed the planning and reflection conversations, as well as the modeled and co-taught lessons.

Coding process and analysis: Classroom data. Although more details about the specific coding of the planning conversations, lessons, and reflection conversations will be discussed below, I generally engaged in the following steps when coding these data. First, I parsed the transcripts into segments focused on a single idea. These segments were sometimes one sentence, and at other times were lengthier exchanges between the teacher and coach. I then independently coded data using the appropriate set of codes. Next, one mathematics education researcher[16] independently coded a random subset of the data I coded (inter-rater reliability percentages are reported below). Inter-rater reliability was computed with a focus on whether, when given a segment, a second coder would choose the same code for that segment. While it would have been ideal to have two individuals independently code 100% of all data, due to the sheer volume of data and demands this would place on others' time without having funds to compensate them, this was not possible. Last, I met with the coder to reconcile differences, and

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[16] Two doctoral students trained in mathematics education research served as my independent coders and helped me with the reliability process.

further refine the codes if necessary. In instances where the independent coder and I could not agree on the code designation, I made the final decision due to my in-depth knowledge of the codes, data and context. This process was used to assign Level-2 codes, Level 3 sub-codes, as well as the Mathematics Indicator. This process was not needed, however, for the Level-1 codes as each Level-2 code was already attached to one of the parent codes (described above). Furthermore, with the exception of the Level-2 Mathematics code (discussed above). I did not engage in a process of reliability for coding my data as low-, medium-, or high-depth. Rather, my advisor and I decided how to best map each Level-2 code and Level-3 sub-code onto the low-, medium- or high-depth categories based on Coburn's and Russell's (2008) pre-existing definitions. Once we jointly made such decisions, each Level-2 code and Level-3 sub-code was then attached to a low-, medium- or high-depth category. As I had already completed a process of reliability for the Level-2 and Level-3 sub-codes (described below), it was unnecessary to do so again. I now turn to discuss, more specifically, how I coded transcripts for the planning conversations, modeled and co-taught lessons, and formal and informal reflection conversations.

Planning and reflection conversations. A second, independent coder assigned Level-2 codes to 56 segments from the planning and reflection conversation transcripts across all coach-teacher pairs. The independent coder did not assign Level-3 sub-codes during this round to allow for additional modifications to codes and/or sub-codes before completing this step. Level-2 codes were mutually exclusive and assigned at the segment level. The independent coder and I agreed on 79% of the assigned Level-2 codes. Next, the same independent coder went back through the 56 segments and coded for the Mathematics Indicator at the sentence level[17]. After

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[17] For the planning and reflection conversation data, the Mathematics Indicator was assigned at the sentence level. For the lesson-level data (Direct Engagement), the Mathematics Indicator was assigned at the exchange level (see below).

separately coding our assigned transcripts, we agreed on 99% of the sentences that should be assigned a Mathematics Indicator. Last, the same coder assigned Level-3 sub-codes to 50 new segments from the planning and reflection conversation transcripts with a shared understanding of what the Level-2 code was. 50 new segments were needed, rather than re-use the previous set of 56, as when talking through areas of disagreement from the Level-2 codes above, discussions about sub-codes inevitably emerged and it would have given the coder an unfair advantage to simply re-use the old set. Again, Level-3 sub-codes were mutually exclusive and assigned at the segment level. The independent coder and I agreed on 90% of the Level-3 codes. After the coding process was complete, I analyzed the data using NVivo software. As I was interested in better understanding how the coaches and teachers engaged with one another during the planning and reflection conversations, during analysis, I focused on determining the prevalence of the Direct Engagement codes to develop a sense for what they did and did not discuss. Furthermore, I wanted to measure each individual's planning and reflection conversation contributions to understand if one individual tended to dominate the discussions, or if both individuals contributed equally. NVivo software enabled me to complete both of these analyses by generating percentages calculated at the character level.

Lessons. After isolating and organizing instances of Direct and Indirect Engagement (as described above), I coded them using the appropriate set of codes. If a particular exchange contained multiple ideas, then the exchange was further parsed until it reflected only one idea. Codes were mutually exclusive and assigned at the exchange level. An independent coder and I separately coded 50 Direct and 50 Indirect Engagement exchanges for modeling and co-teaching. After we separately coded our assigned exchanges, for instances of Direct Engagement, we agreed on 86% of the Level-2 codes, 90% of the Level-3 sub-codes, and 88% of the exchanges

that should be assigned a Mathematics Indicator. Furthermore, for instances of Indirect

Engagement, we agreed on 89% of the assigned codes. After the coding process was finished, I

analyzed the data. I did not use NVivo with this lesson-level data as it was already organized in

excel files, thus making it fairly easy to analyze. As I wanted to better understand how the

coaches and teachers directly and indirectly engaged with one another during the lessons, I

tabulated frequencies and percentages for all sets of codes (Direct Engagement, Indirect

Engagement, Mathematics Indicator). Unlike the planning and reflection conversation data

where percentages were tabulated at the character-level (with NVivo), for the lesson-level data,

percentages were calculated at the exchange-level. Hence, lengthy exchanges during planning

and reflection data are given more weight, which seems appropriate for capturing the content of

those conversations. However, given the many factors that shaped the length of exchanges

during the lesson, with the most critical being a lack of time, it seemed more appropriate to

capture the percentage of exchanges focused on various issues, as opposed to allowing a

particularly lengthy exchange to dominate the calculations made.

When coding for the teacher's role during the modeled lessons, I used the classroom

transcripts and field notes to determine the presence or absence of each role in all observed

lessons. For some roles, I was able to estimate the *extent* to which the teacher embodied that role

by drawing upon the Direct and Indirect Engagement codes described above. However, as I did

not get permission to video record the modeled lessons, coupled with the fact that it was difficult

to consistently capture – through my field notes – how much time the teacher spent fulfilling

various roles, I focus primarily on the presence or absence of the roles in each modeled lesson. I

acknowledge that it would have been ideal to describe what percentage of the time the teacher

observed, wrote notes, engaged in off-task behavior, etc., but I simply did not have the data to

support such statements. Last, I did not engage in a process of reliability while applying these codes for the teacher's role as it was a rather straightforward endeavor to determine the presence or absence of each role for both teachers during all observed lessons.

Before coding for the co-teaching model (e.g. One Teach, One Assist; Station Teaching; etc.), I parsed all 10 co-taught lesson transcripts into segments based on the co-teaching model enacted. Doing so would help me better understand how the coach and teachers engaged in the co-taught lessons and enable me to make statements about which models they frequently and infrequently enacted, and who typically took on which roles. As parsing the transcripts was a rather complex process, I created a set of rules that guided my work.

- o At the beginning and end of the co-taught lessons, the classroom teacher got her students ready for class and/or closed out class. During these times, although the classroom teacher was typically the one leading this effort as the coach helped, these segments of instruction lacked a content focus and actual instruction was not taking place. Therefore, I did not code these segments using one of the six co-teaching models. Instead, these segments were labeled as either Beginning of Lesson or End of Lesson.

- o Sometimes the coach and teacher had a brief or long exchange that preceded the start of a new type of co-teaching. For example, one might say to the other "Cathy, do you want me to get started while you're doing that?" or "Do you want to do this one?" Exchanges like this often, but not always, precede instances when the coach and teacher either switched into a new type of co-teaching (for example, from One Teach, One Assist to Station Teaching) or switched who was lead teaching within the One

Teach, One Assist model. These exchanges were always coded into the preceding segment.

o There were instances when the coach and teacher were enacting One Teach, One Assist and the individual not providing lead instruction would interject to say something to the whole group of students. These interjections, which were often important and focused on the mathematics content, were captured through the Indirect Engagement code, which will be described in detail below. If they lasted for less than 2 minutes, as they typically did, they were not substantive enough to signal that the teacher providing lead instruction switched and/or that a different type of co-teaching was happening.

o Sometimes as the coach and teacher changed from one co-teaching structure to another – in particular from One Teach, One Assist/Observe to Station Teaching or Alternative Teaching - there was a transition period that lasted anywhere from 18 seconds to five minutes and 23 seconds, where academic instruction had not yet resumed as the coach and/or teacher got materials ready for their new groups, called groups over to a back table, etc. Although academic instruction within the small groups did not technically start yet, this time was still coded as Station Teaching and/or Alternative Teaching, but was marked as Transition within that segment.

- In the case of Station Teaching, where the coach and teacher separately worked with two small groups of students, they did not always begin instruction within their small groups at the same time. I always defaulted to the classroom teacher in marking the stop of Transition time, which was when she began academic instruction in her small group.

- In the case of Alternative Teaching, where one facilitator worked with most students whole group while the other pulled a small group in the back, both facilitators did not always begin academic instruction at the same time. I always defaulted to the individual facilitating small group instruction in marking the stop of Transition time, which was when the other individual began academic whole group instruction. I did this to be consistent in cases where multiple groups were pulled to the back table.

o Sometimes as the coach and teacher enacted One Teach, One Assist/Observe, they told students to complete a particular task in a certain amount of time. For example, "So I want everybody to solve that problem and when you are done solving it I want you to put your hand on top of your head so one of us can come and check your answer." During this time, the coach and teacher either (1) circulated and checked in on students as they worked (Circulation), (2) engaged in conversation with one another (Facilitator Conversation), or (3) enacted a combination of student circulation and adult conversation (Circulation and Facilitator Conversation). Circulation and Facilitator Conversation episodes were generally short and lacked variation in the length of time, taking an average of one minute and 14 seconds and 46 seconds, respectively. There was greater variation for episodes of Circulation and Facilitator Conversation, which lasted anywhere from 22 seconds to 12 minutes and three seconds. Furthermore, these three time segments were not coded independently of other types of co-teaching as Circulation, Facilitator Conversation, and Circulation and Facilitator Conversation could happen during any co-teaching structure. Rather, it was marked under the type of co-teaching during which it occurred.

I, alone, applied these rules to parse all co-teaching transcripts into segments that were then assigned a lesson model code. I felt I was best positioned to determine the segments, as I was present for the lessons and knew the classroom context. Furthermore, as I did not intend to focus on co-teaching models enacted, I did not think it would be the best use of a second coder's time to determine when segments began and ended. I did, however, ask an independent coder to code a random 40% of the co-teaching episodes using one of the Co-Teaching Model codes in Appendix I after I had already parsed them. We achieved reliability of 85%. After I finished coding, I analyzed the data by calculating the amount of time, and determining resulting percentages, that the coaches and teachers spent enacting each co-teaching model. Furthermore, I analyzed patterns to understand whether the coach or teacher tended to take on particular roles within each co-teaching model, or if the roles were fluid.

Last, in Chapters 4 and 5, I provide detailed accounts of the following: (1) one typical modeled lesson; and (2) instructional segments of frequently enacted co-teaching models for each coach-teacher pairing. To select the typical modeled lesson, I excluded unrepresentative lessons, such as the first and last lessons of a cycle, a lesson that was repeatedly interrupted by external individuals such as the interventionist or assistant principal, lessons where there seemed to be tension between the teacher and her students, etc. Instead, I selected a lesson that contained typical amounts and types of Direct and Indirect Engagement, as well as a lesson where the teacher embodied most of the teacher roles referenced above to illustrate the full range of what was possible. To select the instructional segments of frequently enacted co-teaching models, I engaged in the following process for each coach-teacher pairing. First, I calculated how much instructional time was spent on each of the six co-teaching models across all observed co-taught lessons. Second, I identified which co-teaching models were most and least prevalent. Third, I

selected the most prevalent co-teaching model (except for the coach-teacher pairing of Claire and Cecilia[18]), and examined all instances for that coach-teacher pair across all observed co-taught lessons when they enacted that particular co-teaching model. In selecting a typical segment, I applied most of the same logic (with the exception of the teacher's role) as articulated above for the modeled lesson.

In the previous section, I described how I coded and analyzed the classroom-level data, including coach-teacher engagement during the lessons, as well as in planning and reflection conversations. I now turn to discuss my process for analyzing the interview data.

Data Analysis: Interviews

To attempt to answer my first, third and fourth research questions about the coaches' and teachers' motivation, as well as perceived benefits, challenges, and conditions, I primarily drew upon interview data. As previously mentioned, I completed a total of 27 semi-structured interviews with the two coaches, five teachers, two principals, and one district-level administrator who participated in this study. In this section, I first describe how I prepared the data for analysis. Then, I discuss code development and my process for analyzing the data.

Data preparation: Interviews. I began by transcribing all of the interviews, using pseudonyms for all individuals. To capture the full essence of what my participants said, I transcribed utterances such as "ummm," "hmmm," etc.

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[18] The most prevalent co-teaching models enacted by Claire and Cecilia were One Teach, One Assist, and Alternative Teaching. However, the former was also the most common model enacted by Claire and Cathy, while the latter was the most frequently enacted model for Claire and Caroline. Furthermore, the way in which Claire and Cecilia implemented these two models did not significantly differ from the other two coach-teacher pairings. Hence, to avoid being repetitious, for Claire and Cecilia, I described how they enacted Team Teaching, as they were the only coach-teacher pairing to enact this particular co-teaching model, thus making my selection all the more important.

Last, I parsed all transcripts into segments that corresponded to my first (motivation), third (perceived benefits) and fourth (challenges and conditions) research questions. This was a fairly straightforward process as, for the most part, the interview questions mapped directly onto my overarching research questions. There were instances, however, when I asked the participant a question about emergent challenges, for example, but they discussed conditions they wished were in place during the cycle. When this happened, I used that information to help answer the conditions question. As an additional example, during the baseline interview with the coaches, I asked them to generally describe how they supported the teachers at their school sites. In responding, the coaches often discussed emergent challenges and/or benefits. Hence, these data were used to answer the research questions on emergent challenges and benefits. Furthermore, in the pre-cycle interviews, I asked the coaches and teachers how they hoped to benefit from the cycle, and in the post-cycle interviews, I asked them how they actually benefitted. I followed the same pattern for questions about challenges, asking participants to predict challenges they may encounter in the pre-cycle interview, and to describe actual emergent challenges in the post-interview. Next, I created tables for perceived benefits and challenges and indicated when something was only mentioned in the pre-cycle interview, only mentioned in the post-cycle interview, and mentioned in both the pre- and post-cycle interviews. Then, I searched for patterns. For example, I wanted to see if several teachers referenced a perceived benefit or challenge in the pre-cycle interview that was not mentioned in the post-cycle interview (or vice versa), as this would be an interesting trend. However, I did not find any such patterns. Hence, I restricted analysis for benefits and challenges to data only mentioned in the post-cycle interviews, as they were best positioned to discuss these after gaining experience with the cycle. After transcribing and parsing the data, I engaged in the process of code development.

Code development: Interviews. To provide an overview, I developed the following sets of codes for my interview data:

- Motivation codes.

- Perceived Benefits codes.

- Challenges codes

- Conditions codes

Prior to analysis, I had an idea about several predetermined codes that were grounded in the literature (see Appendix D for all pre-determined codes). To illustrate, for my first research question regarding the coaches' and teachers' motivation to engage in the modeled or co-taught cycles, prior studies primarily pointed to reasons related to pedagogy (Bean et al., 2010; Feiman-Nemser, 2001; Poglinco et al., 2003; West & Staub, 2003). While pedagogical reasons were mentioned by some participants, in addition, they reflected on other reasons not discussed in prior studies, such as wanting to be in good standing with the evaluation process and completing a district requirement called the Evaluation Tool (ET) as a measure of coach and teacher effectiveness. As an additional example, for my fourth research question regarding the conditions that needed to be in place to address the emergent challenges, prior studies identified various aspects of the coach-teacher relationship, including having open communication (Eick et al., 2003; Murphy & Beggs, 2005; Scantlebury et al., 2008), developing a sense of co-responsibility (Scantlebury et al., 2008) through establishing equal roles (Murphy & Beggs, 2005), and fostering co-respect (Scantlebury et al., 2008). While nearly all participants in my study mentioned a trusting coach-teacher relationship as an integral condition to ensure a successful cycle, they reflected on additional conditions not mentioned in prior studies. For

example, in one co-teaching cycle, the coach and teacher both discussed the importance of letting students and parents know up-front about the upcoming cycle.

Hence, to fully attend to what my participants said in their interviews, I closely attended to my participants' language and engaged in a process of open coding (Creswell, 2013) as described above to generate separate sets of codes for motivation, perceived benefits, challenges, and conditions. I started by reading through each set of parsed data to develop a holistic sense. While reading, I generated notes to myself in the margins, and from there I developed codes. Throughout the process, I created separate codebooks for each set of codes (see Appendices J, K, L, and M). In Chapter 6, I discus the extent to which my emergent codes mapped back onto the pre-determined codes. Next, I engaged in the coding and analysis processes, which will be described below.

Coding process and analysis: Interviews. In the classroom-level data previously described above, I coded everything in an effort to better understand the prevalence of various topics discussed during all aspects of the modeled or co-taught cycles. Taking a similar approach for the interview data was unnecessary as it ultimately would not help me answer my research questions. Instead, I coded for the presence or absence of each code for each coach-teacher pairing. By using this approach, I was able to understand what did and did not motivate, for example, each individual to engage in the modeled or co-taught cycle, and it also allowed me to make comparisons across multiple coach-teacher pairings. I did not attempt to establish reliability with an independent coder because the process of identifying whether the coach or teacher mentioned a particular motivation, benefit, challenge or condition was relatively straight-forward. Additionally, I include quotes to support claims regarding the presence of the major themes in Chapters 4 and 5, thereby allowing readers to judge the validity of such claims.

Finally, during analysis, I mapped these codes onto the Level-1 Parent codes described above to facilitate comparisons across the interview and classroom-level data.

Cross-Cutting Data Analysis

During data analysis, I was interested in exploring several patterns across the entire data set. First, I wanted to examine if patterns differed for those engaged in modeling versus co-teaching. For example, did the coach-teacher pairs tend to engage in pedagogical conversations more frequently when co-teaching rather than modeling? Additionally, did certain challenges seem to get mentioned only during the modeling cycles as opposed to co-teaching? Furthermore, did modeling or co-teaching seem to produce more low- or high-depth interactions? Second, I was interested to see if teachers with a particular motivation had a greater prevalence of talk related to that motivation during their cycle. For example, if a teacher was motivated to engage in her modeling cycle to gain exposure to grade-level math content, would the coach-teacher talk during that cycle center more on mathematics? Last, I wanted to compare the focus of coach-teacher talk to the perceived benefits. In other words, if the coach and/or teacher frequently discussed pedagogical benefits, I was curious to see if there was a high frequency of pedagogical talk during the cycles. I now turn to discuss how I engaged my participants in member checking, and then provide a summary of this chapter.

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Member Checking

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The primary way in which I engaged my participants in member checking was by asking them for clarification on the meaning of certain examples of Direct Engagement when I was unsure and needed additional context. For example, when coding instances of Direct Engagement from Claire and Cathy's first co-taught lesson, I was unsure of the meaning behind the following exchange:

Cathy: We can do this part right here.
Claire: Okay. (1st lesson, 9/1/16)

So, I asked Claire about this exchange and what was meant by it. She clarified for me that she

and Cathy were talking about something in the Everyday Mathematics 4 curriculum that they

wanted students to complete. Thus, when I was unsure of the meaning of certain instances of

Direct Engagement, I typically asked the coach for more information to appropriately code the

exchange.

Additionally, at the end of the semester when I was concluding data collection, I viewed

the exit interviews with the coaches as an opportunity to follow up on emergent themes to gain

the coaches' perspectives. For example, as will be discussed in Chapters 4 and 5, I noticed that

many of the instances of Direct Engagement tended to focus on surface-level items such as the

curriculum and materials. Thus, I wanted to better understand, from the coaches' perspectives,

what they consciously tried to focus on when interacting with the teachers during the modeled

and co-taught lessons. As an additional example, as will be discussed in Chapter 4, I noticed that

both teachers engaged in off-task behavior during the modeled lessons and the coach did not

directly address the off-task behavior. Hence, in the exit interview, I asked both coaches to

discuss their expectations of the teacher's role during the modeled and co-taught lessons, how

they developed aligned expectations with the teachers regarding the teacher's role, and what they

did if and when they noticed that expectations were not aligned.

Summary

In this chapter, I began by describing my process for finding coaches with whom I could

partner for this study and providing context about District A's coaching program. Then, I

outlined my data collection methods, as well as process for engaging in data analysis. In the

following two chapters, I present my findings. In Chapter 4, I describe how Coach Meg modeled

Calendar Math for Teachers Michelle and Mackenzie. Then, in Chapter 5, I turn to discuss how

Coach Claire implemented various aspects of guided mathematics in her co-teaching cycles with

Teachers Cathy, Caroline and Cecilia. In Chapter 6, the final chapter, I discuss three major

stories that cut across the modeling and co-teaching data, along with limitations and then

implications for both research and practice.

CHAPTER 4:

MODELING RESULTS

The purpose of this study was to examine how two instructional coaches, Meg and Claire, provided one-on-one professional development for five elementary teachers across two schools using the practices of modeling and co-teaching. From the perspectives of these coaches and teachers, I sought to better understand what *motivated* them to engage in modeling and/or co-teaching cycles, *how* they jointly participated in the modeled and/or co-taught lesson cycles, what was *beneficial* as well as *challenging* about participating in the modeling and/or co-teaching cycles, and the *conditions* that needed to be in place to help alleviate some of the challenges. To answer these questions, I conducted semi-structured interviews with each coach and teacher before and after each modeled and/or co-taught lesson cycle, and also observed the full cycle for each coach-teacher pairing, which included planning and reflection conversations as well as the enacted modeled or co-taught lessons.

The results are presented in two distinct chapters. Chapter 4 describes Coach Meg and how she engaged in modeling cycles with two elementary teachers, Michelle and Mackenzie, to implement Calendar Math. Chapter 5 features Coach Claire and describes how she participated in co-teaching cycles with Cathy, Caroline and Cecilia, three elementary teachers, to incorporate various aspects of guided mathematics instruction into their teaching. At the end of each chapter, I summarize the results, briefly discuss the depth (Coburn, 2003) of coach-teacher talk and present a synthesis of the trends across each coach-teacher pairing to highlight what was typical, as well as unique. In the last chapter, Discussion, I map the results from Chapters 4 and 5 back onto the literature and shed light on how this research informs our understanding of how instructional coaches can effectively engage in modeling and co-teaching cycles with elementary

teachers to help them improve their mathematics instruction. In the subsequent section, I introduce Coach Meg and describe her vision of high-quality mathematics teaching.

An Introduction to Coach Meg, Her Context, and Her Conception of High-Quality

Mathematics Instruction

An Introduction to Coach Meg

Prior to becoming an instructional coach, Meg taught kindergarten through fifth grade for 21 years. At the time of the study, she was in her second year as an instructional coach. She received her first Master's degree in STEM education, and was working on her second Master's degree in Administration and Supervision. After earning her second Master's degree, Meg hopes to pursue a doctorate in education as well as a job as a school principal.

In her baseline interview, Meg described how she perceived herself as having a strong mathematics background:

> My background is very, very strong in mathematics and in the science and in the social
> studies and the technology. Now, I have obviously background in literacy, but I wouldn't
> say that that's my strongest area. Which is okay as a coach 'cuz you usually have
> interventionists in the school that are solely focused on literacy and are a great resource.

Due to this perceived strength, Meg hoped that teachers would seek her help to improve their mathematics instruction.

Meg was very passionate about Calendar Math, which involves asking students to solve or create computation problems using numbers related to the day's date ("The Calendar Math, as you know, is kind of a passion project of mine because I believe it is a very effective strategy.") and she hoped that the principal would eventually allow her to implement it in other classrooms

across the school: "Mr. Smith is going to come in and observe me. And my hope is that he likes it enough that he'll let me demonstrate for some other classrooms."

Coach Meg's Context

In her baseline interview, I asked Meg to describe how she supported individual teachers at her school. Overall, she stated "I'm a whatever they need kind of person, you know?" Specifically, she shared the following:

> [I] try to establish what their goals are and then…how I can support their goals whether it be modeling and co-teaching, whether it be observation and feedback and reflection…providing resources or materials. I've even been another instructor in classrooms that have needed me for small group work.

Thus, when providing one-on-one professional development for teachers, Meg first sought to understand the teacher's goals, and then modeled; co-taught; engaged in the observation-feedback-reflection cycle; provided resources; or worked with students in the context of small groups.

Furthermore, I asked Meg how she decided which strategy to use when supporting individual teachers. She stated that teachers had to self-identify the type of support they wanted.

> As a coach, I have to be able to…learn their styles so that I can support them in the way that they are comfortable teaching. I can't really come in and take over and say this is how I would do it because…they have to have that comfort level on their own, you know? So, it's more or less guiding them through their own teaching and…having them identify areas that they might want support.

Letting teachers select their own goals and guiding teachers through the process of instructional improvement was somewhat challenging for Meg: "I want to be a fixer and I have to switch that

role to a guider." Generally-speaking, however, Meg tried to avoid exclusively modeling for teachers ("Modeling in isolation…I've tried to avoid that."), but instead used modeling and co-teaching in combination:

> We start with me modeling. Then we co-teach where we…establish certain parts we'll be responsible for. And then…they kind of take over more and more and more until I'm more of a resource. And then…[I'm] just kind of observing a little bit at the end and then…we come back together to reflect.

Thus, instead of solely modeling, Meg preferred to use modeling and co-teaching as part of a continuum with the ultimate goal of having the classroom teacher provide instruction on his or her own.

Last, Meg discussed what it was like working with Mr. Smith, her principal. Meg said that, overall, she and Mr. Smith related well to one another: "We have a really good, like, personal relationship." Their professional relationship was marked by open and continuous communication ("I would say that he and I are in…constant contact about…the daily runnings of the school.") and trust ("He's [Mr. Smith] open to my ideas and he's like, yeah, go ahead and run with it.") as Meg helped Mr. Smith implement his instructional vision for the school: "He inevitably is the instructional leader and I'm the coach…he's the one that says this is what we want to do, and I'm the one to help make that happen." Meg stated that she and Mr. Smith supported teachers in the following ways: "We interpret data together. We talk about…what's going on with the PDs, how we're seeing it implemented in the classrooms...what might certain grade levels benefit from." In addition to using teacher- and student-level data to inform their professional development decisions for the school, Mr. Smith added that he and Meg co-planned and co-facilitated the grade level meetings referred to as "collabs": "So, we'll plan…overarching

concepts for the whole year and then we'll actually plan the dates and then we'll co-plan agendas with the grade level facilitator week-by-week." Hence, according to Meg, she had a positive, collaborative relationship with her principal. I now discuss Meg's view of high-quality mathematics teaching.

Coach Meg's Conception of High-Quality Mathematics Instruction

When probed about her vision of high-quality mathematics instruction in the baseline interview, Meg described some teaching methods that would be aligned with what research describes as best practices that lead to enhanced student understanding of mathematics. First, according to Meg, high-quality mathematics instruction should help students build conceptual understanding as well as procedural fluency. Meg gave the following example with multiplication: "It's not just teaching them how to multiply. It's not just basic rote. They have to understand…that six times two is two groups of six or six groups of two…that they understand the process, not just the answer." Second, Meg discussed the type of discourse she liked to promote in the classroom: "Having them explain to each other, that's something that's lost a lot in math is the turn and talk and the hey, you help with this person." Thus, Meg expected to see students discuss the mathematical content with one another by, for example, participating in a turn and talk where one question is posed to the whole group and then students turn to a partner and discuss their thoughts. Third, Meg reflected on the importance of incorporating project-based learning into mathematics instruction. She gave the following example of having students create posters to describe a mathematical process: "Here's what a math poster looks like to describe math division. Now you make a poster to describe…a math concept step by step by step."

In the rest of the chapter, I start by providing an illustration of a characteristic Calendar Math lesson modeled by Mackenzie. Then, I answer my four research questions for each coach-teacher pairing separately, before synthesizing the results at the end and talking about the depth of coach-teacher talk.

A Typical Lesson

I now provide a rich description of a typical Calendar Math lesson[19] that Meg implemented in Michelle's third grade classroom. In selecting a typical lesson, I excluded lessons that were clearly atypical (e.g., the first lesson of each cycle, a post-fieldtrip lesson in which there was pre-existing tension between the teacher and children, a lesson in which the teacher removed a child from the classroom due to behavioral issues, etc.), and instead selected a lesson that was typical in terms of the amount and type of direct and indirect coach-teacher engagement, as well as a lesson that demonstrated the wide range of roles embodied by the classroom teacher. Furthermore, I chose a lesson that occurred later in the modeling cycle, as Calendar Math routines were well established. I now turn to describe the fifth, of seven total, observed Calendar Math lesson Meg modeled in Michelle's classroom.

Although the time periodically changed, Meg typically taught Calendar Math in Michelle's classroom at 9:00 AM every morning. The lessons were meant to be short, and lasted between 20 and 30 minutes. When Meg entered the classroom, Michelle was usually sitting at a table on the side of the room as students worked on something independently. At this point, Michelle helped Meg transition students from their desks to the floor in the front of the classroom where all Calendar Math instruction took place. Students were always required to

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[19] While an official Calendar Math curricula does exist, I did not observe Meg use one. Rather, when modeling Calendar Math, she seemed to draw upon her extensive experience as a classroom teacher implementing Calendar Math.

bring pencils and their Calendar Math notebooks and to sit on their bottoms. To help facilitate this transition, Michelle gave directions to the class ("Get your journals, let's go!"), as well as to individual students ("Martha, I have a whole bunch of pencils sharpened. You don't need to sharpen it. Jamie, find your journal please, quickly."). All of the Calendar Math instructional materials hung on the front wall, including a laminated calendar and calendar pieces, laminated white posters where Meg recorded students' responses, and an organizer that held paper money. As Calendar Math was not part of the district provided curriculum, Meg purchased all of these materials herself from eBay.

Meg began Calendar Math instruction by writing the date on the board using numbers, "9-21-2016." As was common in most lessons, while either sitting at a table on the side of the room or standing behind students with her arms crossed, Michelle continued to help with behavior management even after instruction began with comments to individual students such as, "Sit. No. We're not doing this. You're smart, beautiful. Let's not do this. Sit in your spot, but for now we're not going to have a problem with this. Thank you. I appreciate that." After writing the date, Meg enlisted students' help in determining the Number of the Day. On the very first day of Calendar Math, the Number of the Day was calculated by adding together the number of days that students had been in school and the numerical day of the month (the Number of the Day was 19 because they had been in school for 13 days and it was the 6th day of the month). After the first day of Calendar Math, the Number of the Day was calculated by simply adding the previous day's Number of the Day and the total number of days they had been in school. For this particular lesson, the previous day's Number of the Day was 129, and they had been in school for 22 days. Therefore, students were asked to add 129 and 22 in their notebooks. Meg required all students to solve for the Number of the Day, and then randomly called on one

student using popsicle sticks to share the answer. During this segment of instruction, Meg

usually stressed place value concepts[20]. For example, she provided the following explanation for

students regarding the Number of the Day calculation (129 + 22 = 151):

> We don't put the 11 there, do we? We put the one and carry the 10. So one 10 plus two
>
> 10's is three 10's, plus two more is five 10's. And then we carry down the one. So our
>
> number for today is 151.

Next, Meg directed students to develop two addition and two subtraction facts that

equaled the Number of the Day (151). Students recorded the four facts in their notebooks. Meg

then called on four students to share their facts. Up to this point in the lesson, as was typical of

most observed modeled lessons, Michelle stayed at the side table, glancing back and forth

between Meg's instruction and her laptop, occasionally interjecting to make comments to and/or

engage in brief conversations with students and/or Meg. At this time during the lesson, Meg

stopped instruction to ask Michelle to work one-on-one with a student: "Michelle, we may need

to have somebody working with Mr. Saad again since he's deciding not to participate." Michelle

responded, "Yeah, I have another friend that's doing the same thing. Saad…" and promptly

came out from behind the table to work with Saad. In her exit interview, Meg said that she asked

Michelle to work with students if she sensed that Michelle was engaging in off task behavior.

During this particular lesson, prior to asking Michelle to work with Saad, Michelle was working

on her laptop on the side of the classroom instead of paying attention to instruction.

Next, Meg called on three different students to express the Number of the Day in

expanded, written and standard forms. As Meg discussed expanded form with students, she

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[20] As the pacing for Calendar Math was quick, it was not typical that Meg consistently stressed place value concepts every time students completed an addition or subtraction problem. If Meg did stress place value concepts, it was typically for the Number of the Day calculation, as demonstrated above.

made big motions with her hands to signal that she was expanding something, and said to students "Do this with your hands, ok? 'Cuz its gonna help you. When you take the expanded form, you're taking this number and you are expanding it." Michelle participated in the lesson by moving her hands and arms like Meg in reference to expanded form. Additionally, although Michelle continued working with Saad by leaning over him while he was sitting at a desk, she also helped manage behaviors in the classroom ("Rob, bottom on the carpet. No moving around.").

Last, Meg ended with two money exercises. First, she asked students to record two different pictorial representations of the Number of the Day in change, representing a penny as a capital P with a circle around it, a nickel as a capital N with a circle around it, etc. Given that the Number of the Day was 151, she asked students to record two different ways of making $1.51, and called on three students to share their solutions. As students worked, Meg and Michelle had a brief conversation where they praised a particular student's efforts.

Michelle: Deno, he is so on it. He is just…
Meg: I know. I'm so impressed with him right now.
Michelle: This one, he's getting…
Meg: I know. (*To Deno)* Thank you so much.
Michelle: He came up with a really neat subtraction all by himself.

Meg then enlisted students' help representing the Number of the Day with her teacher's set of cut out money by asking them "How many tens am I adding today? Show me with your hands. How many tens am I adding today?" In response, Michelle held up five fingers in the background, participating as a student would. Michelle also continued to help with behavior management, occasionally referring to her system of requiring misbehaving students to stand next to the wall at recess: "Chris, if I see it again, you're going to be on the wall for a while. Not following directions."

At the end of most Calendar Math lessons, as was true in this one, after cycling through the series of activities described above, Meg randomly pulled two students' names and checked their notebooks to see if they had all of their notes from that day written. If the students had complete notes, as the two students from this class did, they selected a prize from Meg's Treasure Chest. Meg then worked with Michelle to have students return their Calendar Math notebooks to a storage place in the classroom and go back to their desks. As the class came to a close, Meg and Michelle often engaged in brief conversations before Meg left. During this particular lesson, they had the following exchange about Michelle's upcoming absence and plans for the substitute.

Michelle: Um, I'm putting it in that you're coming in…
Meg: Tomorrow?
Michelle: Tomorrow. Since I won't be here.
Meg: Yeah, put it in from 9:00 – 9:30 just to give me enough time. 'Cuz I know I'm going over a little bit.
Michelle: And they'll go straight to the library.

After the lesson ended, Meg left the classroom, either to return to her office or attend meetings, and Michelle resumed her instructional responsibilities and carried on with the day.

Although not part of this lesson, Meg occasionally asked students to share their solutions with a partner. For example, during the sixth observed modeled lesson in Michelle's room, after asking students to write down the expanded form for the Number of the Day, Meg engaged students in a turn and talk: "In about 10 seconds, I'm going to have you turn and talk to a neighbor and see if you have the same thing for your expanded form." After students completed their turn and talk, Meg brought students back together as a whole group and went over the answer. Granting much could be said about the students' opportunities to learn and engage with mathematics in this lesson, the focus of this dissertation is the engagement of the teacher and coach.

Meg's Expectations of the Teacher Role During Modeling

During her exit interview, I asked Meg to describe her expectations regarding the teacher's role during modeled lessons, and she discussed five primary roles.

> Ideally, I mean, in a perfect world, the teacher would be obviously observing. Possibly interacting with the kids. In my dream world, the teacher would be down there with the kid, encouraging them to write this down or put that down or whatever. Kind of acting as a participant in the calendar process. You know? Um, I think the teacher, inevitably, I would have liked to see some kind of notes or ideas or thoughts being recorded somewhere so that I can um debrief with them on what's going.

Here, Meg explained four of the five roles. First, the teacher should be an observer. Second, the teacher should write down notes about what she is observing that could be used later in a debrief session. Third, she expected the classroom teacher to have academically-focused interactions with students during the lesson about the Calendar Math. Fourth, Meg wanted the teacher to participate in Calendar Math. To elaborate on what she meant regarding being a participant, Meg shared the following example:

> It cracked me up the other day, Mackenzie. You know I do this thing with the money. You know, and I'm always pretending like I forgot how much we had. I'm like, oh wait, how many hundreds did we have? It's a way that I do it. You know? So, I'm sitting there and I've just gone through and counted all of the money out and I'm going through it and I'm like, okay, I think I have one thousand. And I'm like, how many hundreds did we have? And Mackenzie's like, we had six! We had six! I'm like, no. I just started laughing. I'm like, 'cuz the kids even knew that's what I do. You know? But she was so into watching the lesson that she just jumped out and told me the answer. You know?

And I was like, oh my gosh that's hysterical! So, yeah, I'd love to see kind of an

evolution of starting out more observing and then becoming more integrated and

participatory.

In other words, Meg hoped to see the classroom teacher participate in Calendar Math in the same

way that a student would. Last, as the fifth role, Meg hoped to see the classroom teacher help

with behavior management:

I'd also like the teacher to help with behavior issues, maybe try to um separate it off from

the group so it doesn't interfere with the flow of what we're doing. Again, it's a real short

time to establish real quick expectations of the kids. And any support from the teacher

would be good.

As was described in Chapter 3, I used the five roles outlined by Meg as a lens to examine

the teacher's role during the modeled lessons. Generally speaking, these five roles adequately

captured the roles each teacher embodied across all observed modeled lessons. However, I

created two additional categories to capture additional teacher roles I observed. First, I included

the category, Engage in Off-Task Behavior, as I noticed that each teacher exhibited behaviors

unrelated to the modeled lesson. Second, I added the category, Help Manage Materials, as each

classroom teacher assisted Meg with Calendar Math materials.

Meg also described roles the teacher should take on outside of the modeled lesson,

including reflecting with her about how things were going, putting accountability measures in

place (such as a pre- and post-assessment) to determine the effectiveness of the intervention, and

continuing to implement the intervention after the cycle ended. When asked if she expected the

teacher's role to change throughout the modeling cycle, she said that she hoped to see the teacher

become more active:

I'd love to see kind of an evolution of starting out more observing and then becoming

more integrated and participatory. No, I don't expect the roles to change. I just expect

them to kind of go from more observing to more um participating through the course. So,

in the beginning when I'm modeling, yeah, watch. As it gets more on, like I said, I'd love

to see them interacting with the kids and their notebook.

In other words, Meg hoped that the teacher would observe more at the beginning of the cycle,

and that the teacher's role would progress into interacting with students and participating in the

lesson as they got further into the cycle.

Meg acknowledged that tensions could arise in regard to teachers' perceptions of their

role: "We're not just in there to teach for 20 to 30 minutes while you get to sit there and catch up

on emails…this is something you should be actively engaged in." In other words, teachers may

have different expectations regarding what their role should be during the modeled lesson and,

take it as an opportunity to catch up on school-related or personal tasks instead of focusing on

the lesson. A lack of aligned expectations regarding the teacher's role during the modeled lesson

could put a strain on the cycle and create tension between the teacher and coach. To help create

aligned expectations between the teacher and coach, Meg described a number of strategies she

employed. First, she had planning meetings with each teacher prior to the start of the cycle, and

according to Meg, "then through the spirit of discussion, because obviously I'm a talker, um, you

know, those expectations come out, you know? Okay, so I will do, how about you, you know?"

It is worth noting, however, that during observed planning meetings with Michelle and the

second teacher, Mackenzie (which will be discussed in detail below), explicit conversations

about the teacher's role never surfaced. Second, Meg mentioned that, if necessary, she would

direct the teachers during the modeled lesson to help the teachers better understand Meg's

expectations of them. This is something she only did with Michelle: "I had to, um, request more out of Michelle. Like, hey, can you work with this kiddo or hey can you help with that? But then she did it very readily. So it was almost like I had to coach and guide more. But um, yeah. I mean, I saw it from both of 'em."

It is worth mentioning that during Michelle's pre-cycle interview, I asked her what she thought her role should be as Meg modeled Calendar Math. She thought her primary responsibility was to assist with behavior management. This included redirecting students' behaviors ("Calling out the behaviors since she doesn't know the names of the students") and praising students for good behavior ("Praising when…I see something that I think is awesomeness in one of the kids and stuff"). It is useful to understand Michelle's conception of her own role during the modeled lessons as this helps explain why she placed such a heavy emphasis on management, which will be illustrated below.

I now examine Meg's work with Michelle, the first of the two teachers featured in this chapter. I begin by briefly introducing Michelle and providing a short overview of her modeling cycle with Coach Meg before explicitly addressing the four research questions for this coach-teacher pairing.

<center>**Coach-teacher Pair: Meg and Michelle**</center>

An Introduction to Teacher Michelle

Michelle had been an educator for the past 17 years. She began her teaching career as a substitute teacher, but after a few years she secured a full-time teaching position at her current school. Michelle had taught 2nd, 3rd, and 5th grades during the past 13 years. At the time of the study, Michelle taught 3rd grade and, as required by her principal, was also on an improvement plan due to unsatisfactory evaluation scores. The previous school year, Meg worked with

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Michelle on several things in her classroom, but nothing as extended as this six-week modeling cycle. Thus, Meg and Michelle had already established a working relationship through prior cycles.

Modeling Cycle Overview

Michelle's modeling cycle began soon after the 2016-2017 school year started. Before Meg launched Calendar Math, she had a brief (16-minute) planning meeting with Michelle to discuss the upcoming cycle. Roughly two weeks after their planning meeting, Meg began modeling Calendar Math in Michelle's classroom. There was a delay because Meg had to wait for the Calendar Math materials to arrive from her purchase on Ebay, and she also needed time to set the materials up in Michelle's classroom. Once Meg started, she came in most mornings around 9 AM for six weeks, with each lesson lasting between 20 and 30 minutes. For this study, I observed seven lessons that took place across the beginning, middle and end of the cycle. Despite my efforts to be included, I was never invited to observe a reflection conversation.

Next, I present the results for my four research questions, which I used as a lens to explore the data. As a reminder from Chapter 2, my research questions are as follows: (1) For what reasons might the coach and teachers decide to engage in the modeling cycle?; (2) How do the coach and teachers enact the modeling cycle?; (3) From the perspectives of the coach and teachers, what are the perceived benefits of participating in the modeling cycle; and (4) From the perspectives of the coach and teachers, what are the challenges of engaging in the modeling cycle and what conditions can be put in place to help alleviate these challenges? As explained in Chapter 3, all of the transcripts from the interviews and modeled lessons were coded to reflect the main themes. Furthermore, as an additional reminder from Chapter 3, it should be noted that not all research questions necessarily received equal emphasis. That is, the data gathered for my

second question regarding how the coach and teachers engaged in the modeling cycle was significantly more rich and complex than the interview data used to answer questions one, three and four. As such, more attention and space were given to fully exploring the results to research question two.

Research Question One: Modeling Cycle Motivation for Meg and Michelle

Table 4.1
Modeling Cycle Motivation for Meg and Michelle

	Meg	Michelle
Pedagogy		
Wanted to Implement Strategy	x	x
Contextual Factors		
Completed Evaluation Tool	x	
Teacher Was on Improvement Plan		x

In their pre-cycle interviews, Meg and Michelle stated that they were motivated to engage in the modeling cycle by the shared reason of wanting to implement Calendar Math (see Table 4.1). Michelle said, "She [Meg] had used this in her [own] classroom and she was telling me about it. And I thought this would be a wonderful way for them to have a different experience with math than just normal math lessons." This is consistent with what Meg shared, as she wanted to provide "a math intervention for a group that identified with MAP scores as being severely in need of numeracy and number sense concepts, but then also providing a sustainable year long, hopefully, intervention type thing with the calendar."

In addition to wanting to implement Calendar Math, there were also other external motivating factors (see Table 4.1). As previously mentioned, Michelle stated that she was on an official improvement plan, as mandated by her principal, Mr. Smith. Therefore, Michelle viewed the coaching cycle as an opportunity for professional development that would help improve not only her practice ("I've been going to her [Meg] to help me improve myself"), but also her

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evaluation scores ("...hopefully I will get proficiency on my evaluations. Her [Meg], she's helping me with that"). This was corroborated by Meg in her pre-cycle interview as she shared, "I know in the past she [Michelle] struggled a little bit with things in her room. So I'm really… trying to push in and…help her with maintaining a good standing with the evaluation process."

Furthermore, Meg would be completing her own Evaluation Tool (ET) with this group of students. The ET was a new district evaluation requirement for coaches and teachers in which pre and post student assessment data was gathered to determine student growth. Meg explained, "I'm also doing my ET on this group. So, they did take a pre-assessment on Friday and then they'll take it again at the end of the six-week period." Michelle was aware that the modeling cycle would enable Meg to complete her ET: "This is gonna be for her Evaluation Tool…so this is kind of helping her with that part, too."

Hence, Michelle and Meg were jointly motivated to participate in the cycle as they wanted to implement Calendar Math. They were also motivated by different external factors as Michelle was on an improvement plan and Meg was completing her ET.

Research Question Two: How Meg and Michelle Engaged in the Modeling Cycle

To better understand how Meg and Michelle engaged in the modeling cycle, I focus on data gathered from three parts of the modeling cycle (planning conversations, modeled lessons, reflection conversations) separately. In the space that follows, I address the substance of the planning conversation. Next, I turn to the seven observed modeled lessons, first drawing attention to the various roles embodied by Michelle. Furthermore, I describe the ways in which Meg and Michelle directly and indirectly engaged with one another during the lessons, as well as the substance of those interactions. Last, I address the reflection conversation.

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Planning conversation. As explained in Chapter 3, I coded all planning conversations with a set of twelve codes. A content analysis of Meg's and Michelle's planning conversation revealed that they addressed three main topics: (1) Curriculum, Activities and Materials (CAM) (26%); (2) Time and Schedule (21%); and (3) Assessment (19%) (see Table 4.2). Each topic is described in detail below.

Table 4.2
Planning Conversation Substance Codes for Meg and Michelle

Substance Code	Percent Coverage[21]
Curriculum, Activities and Materials	26%
Time and Schedule	21%
Assessment	19%
Other	14%
General Pedagogy	10%
General Plans for Coaching Cycle	9%
Facilitator's Role	2%
Classroom Composition and Attendance	0%
Classroom Management	0%
External Requirements	0%
Mathematics	0%
Relationship Building	0%

Meg and Michelle planning conversation theme 1: Curriculum, Activities and Materials. The most prevalent theme was the Calendar Math curriculum, activities and materials (26%). Specifically, while engaged in CAM talk, the coach and teacher most commonly discussed the materials (47%) or curriculum (44%) (see Table N.1 in Appendix N). When talking about the materials, Meg and Michelle often discussed logistics related to the number line ("And what we'll have to do is um we'll have to get your number line going"), the calendar

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[21] As a reminder from Chapter 3, NVIVO calculates the percent coverage at the character level. To help the reader make sense of these percentages, this entire planning conversation transcript contained 12,522 characters, or the equivalent of roughly 10 double spaced pages (or about 2500 words).

("And I did move the calendar over closer to the door so we have that space"), and required

student notebooks:

Meg:	Did you set aside a um a notebook for them?
Michelle:	Yes, I'm gonna um ask them for those notebooks. I said you had to have two notebooks, one for reading and one for math. So I will collect those and make sure we've got labels.
Meg:	Okay, excellent. Excellent.

In addition to talking about the materials, Meg and Michelle discussed different aspects

of the Calendar Math and Everyday Mathematics 4 curricula. While Everyday Mathematics was

used for daily mathematics instruction, Calendar Math was an add-on to the district-provided

curriculum. For example, Meg explained to Michelle the extensions embedded within the

Calendar Math curriculum:

Meg:	And once you have determined, or we, if you want me to come in, have determined mastery of a certain area there are extensions to that.
Michelle:	Perfect.
Meg:	So, for example, when they're doing the change, like the 26 cents. You know, come up with three different ways, and eventually it will get to dollars.
Michelle:	Right, of course.
Meg:	But then there's also a thing that they can buy stuff. Like it'll say shoes and how much the shoes are, or a ball. And they have to come up with how much it costs and how to make the change. So that's like an extension of that so they're adding.
Michelle:	Because that's something that comes on later, but not necessarily now when they can…
Meg:	Right. And they can also incorporate measurement concepts, too, as well as graphing. So, we, it covers, it's a one stop shop. You're going to love it.

Furthermore, they discussed the district-provided mathematics curriculum, Everyday

Mathematics 4 (EDM4):

Meg:	Do they have, um, with Everyday Math or EDM4, do they have printables that go with it or workbooks that go with it? Or are they mostly just working out of the book?
Michelle:	Most of their work is in the journal, the workbook. They have a resource book that they use to go along with the journal. And they do have math masters, different masters that I can pull from for different lessons.

Meg and Michelle planning conversation theme 2: Time and Schedule*. Time and

schedule was the second most commonly discussed theme (21%). Meg and Michelle

coordinated not only the time of day at which Calendar Math would take place, but also the

length of each individual Calendar Math lesson.

Meg: What time have you scheduled us to do this? Let me clarify. I'm sorry. In the
           beginning, we are going to need a little bit more time to establish the expectations
           and the routines and all of that. So...
Michelle: I was thinking we could do it during like 8:00-8:15 or 8:00-8:30. Going during
           the literacy time 'cuz then I can always bring it back. You know, use whatever I
           used up in literacy until they get that routine. And then I can change it up as to
           when we're going to do it.
Meg: So we will start at 8:00 AM?
Michelle: Yes.
Meg: Okay. And then, um, once we get rolling it should be within 15 minutes.

Furthermore, Meg and Michelle negotiated the modeling start date as well as a specific plan for

gradual release[22] of the cycle.

Meg: Okay, so how long do you want me to model this?
Michelle: Um, maybe three to five days I think would, I mean, we could...
Meg: Yeah, why don't we plan on me doing like a solid week and we can reevaluate on
           that Friday and see if you think I need to do it more or okay.
Michelle: Sounds good.
Meg: So, I will do it for a week and then um reevaluate. And then um and then um I'd
           say we do it together. We do the co-teaching for at least a week, too.
Michelle: Okay. And then me teaching, you observe for a week. Sounds good.
Meg: And all of this is subject to, if we feel we need more time here or there…
Michelle: Right. I do want to let you know that if we, let's see, the 31st I'm not going to be
           here…
Meg: Which day is it?
Michelle: It's a Wednesday, the 31st.
Meg: Well, let's shoot for this, um, because we need time to get it in. We need time to
           get it set up.
Michelle: Right.

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[22] Throughout Chapters 4 and 5, the topic of gradual release is referred to in two distinct ways.
It is used to describe the process by which the coach ultimately shifts teaching responsibility to
the classroom teacher. It is also used to reflect how the teacher shifts responsibility to students
so they can ultimately complete a task independently.

Meg:	Maybe we should hypothetically shoot for September 1st, which is a Thursday. And we can take it from there. So that's two days. So if you want me to do the next week, too, you know we can take it from there.
Michelle:	We can talk about it once we see how it goes.
Meg:	So why don't we just plan on starting it on September 1st.
Michelle:	Sounds great.

In summary, Meg agreed to start modeling Calendar Math in Michelle's room on September 1st at 8:00 AM, with each lesson taking about 15 minutes. They also agreed that Meg would model for one week, Meg and Michelle would co-teach for one week, and Michelle would teach on her own for one week while Meg observed and provided feedback.

Regarding their specific plans for gradual release, it is worth noting that this topic came up at multiple points throughout the modeling cycle. Gradual release plans first surfaced during Meg's baseline interview:

I'm going to model first. I'm doing the gradual release. I want to model for enough time that the kids are, you know, getting into the habit, you know. And since this is new for Michelle, you know, I'm going to stay in there and co-teach with her for a while. And then I'm going to, you know, let her go on her own while I just kind of observe and be there in case.

Next, plans for gradual release came up again during the planning meeting, which was already described above. Last, Meg talked about their plan for gradual release to students during the seventh observed modeled lesson, which occurred on the final day of their six-week coaching period.

Nahla said, wait, I thought this was your last day. No, it's not. I'm going to be in here next week and then the following week Michelle is gonna start coming up here and doing this and I'm just gonna kind of hang out for a while and then eventually Michelle is gonna take this over. Okay? And I'll be in. I'll be spot checking coming in, okay?

Although Meg and Michelle spent a considerable amount of time discussing their plans for gradual release, on the last day of their six-week coaching period, Meg was still modeling and they had not yet started to co-teach.

   Meg and Michelle planning conversation theme 3: Assessment. Assessment was the third most prevalent theme (19%) during Meg and Michelle's planning conversation. When discussing assessment, they primarily talked about assessment logistics (58%) and student learning[23] (35%) (see Table N.2 in Appendix N). Regarding assessment logistics, the exchange below illustrates how Meg and Michelle coordinated the pre-assessment for students before Calendar Math instruction began:

Meg:	Did you want to do a pre-assessment on the skills that we're going to be...
Michelle:	I did a pre-assessment at the beginning of the year. A beginning year assessment, um, which has some elapsed time some and stuff. You can take a look at it and see. If you don't think that's enough or you know we could do another one.
Meg:	I want to say that the resource guide that I ordered us will have a pre-assessment thing in it.
Michelle:	Let's look at that and then we can go from there. You can, we can look at what I gave them today and then add that to it or add some components of it if it doesn't cover or just the whole thing.
Meg:	Because we want to be able to show student growth. Like, for example what I was explaining to Stephanie is when we say okay the number's 26. Give me an addition problem, and they all put 25 + 1. We want to see them by the end of the thing coming up with different ones other than plus or minus one. So even showing that amount of growth, you know, could and then maybe I'll take a look, we'll take a look at 'em. But even structuring it as the exact skills and concepts that we are addressing might be good, too. So we will look at the one you already gave and then also in the resource when I get it.
Michelle:	Okay.

In selecting the pre-assessment, Meg and Michelle would consider not only the one Michelle gave at the beginning of the year, but also the pre-assessment included in the Calendar Math materials Meg ordered from eBay.

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[23] As a reminder from Chapter 3, Assessment is a Level-2 code with the following sub-codes: (1) assessment logistics; (3) monitoring student learning; (4) using data to inform instruction; and (5) assessment creation.

In addition to engaging in logistical assessment discussions, Meg and Michelle sometimes discussed student learning of the content and/or curriculum. For example, Michelle shared the following:

> That, and because we're doing this, it's going to hit on it sooner so they're gonna be more exposed to it and be ready when it comes into our curriculum. They're going to be a little bit more exposed to it, which I think is great. Because there's, some of 'em are not getting the elapsed time and some of 'em are not getting two-digit addition and things like that.

According to Michelle, her students struggled with elapsed time and two-digit addition, and she hoped they would gain more exposure, through Calendar Math, to these concepts before seeing them again in the normal mathematics curriculum. I now turn to provide an analysis of the seven observed modeled lessons.

Modeled lessons. To describe how Meg and Michelle engaged with one another during the modeled lessons, I first describe the various roles enacted by Michelle while Meg modeled. Then, I turn to examine instances of Direct and Indirect Coach-teacher Engagement.

Teacher role. As was previously described above and in Chapter 3, I used the five roles outlined by Meg, in combination with the two additional roles I observed, as a lens to study the teacher's role during the modeled lessons. Table 4.3, which will be explained in detail below, reflects whether or not Michelle embodied each role across the seven observed modeled lessons.

Table 4.3
Michelle's Roles Across Seven Observed Model Lessons

Lesson Number	1	2	3	4	5	6	7
Observe	x	x	x	x	x	x	x
Take Notes							
Interact with Students			x		x		x
Participate in Lesson					x		
Assist with Classroom Management	x	x	x	x	x	x	x
Help Manage Materials	x	x	x	x	x	x	
Engage in Off-Task Behavior		x	x	x	x	x	x

Michelle enacted four out of the five roles envisioned by Meg. First, Michelle took on the role of observer across all seven lessons. While observing, Michelle typically either sat on the side of the classroom at a table, or stood behind the students with crossed her arms. The extent to which Michelle took on the observer role changed over time. For example, in the first observed lesson, one of the primary roles taken on by Michelle was observer as she watched how Meg implemented Calendar Math. By the last observed lesson, she not only observed, but also employed additional roles.

Second, Michelle had academically-focused interactions with students about Calendar Math, which is captured by the Helping Students Learn Mathematics code described in detail below. As will be discussed, most of the time Michelle either asked students to revoice their response, revoiced a student's response on her own, or told students to copy notes. Although Michelle also made comments and asked students questions about the content, this was rare. The extent to which Michelle took on this role changed over time as in the first observed modeled lesson, there was only one example of her providing students with academically-focused feedback. However, by the seventh observed modeled lesson, there were seven instances of this. Meg often prompted Michelle's academically-focused interactions with students. Specifically, towards the end of the third observed lesson, Meg asked Michelle to work with a particular student who needed additional support: "Michelle, can you come up here for a second, please? I'm feeling that one of my friends may need a little help 'cuz he's not really writing the things down in his notebook, so maybe you could help him?" After this request for help, Michelle stopped what she was doing and worked with the student for the rest of Calendar Math. Additionally, at the beginning of the fifth observed lesson, Meg made a similar request

("Michelle, we may need to have somebody working with Juan again since he's deciding not to participate"), which then prompted Michelle to work with this student individually.

Third, Michelle participated as a student would in Calendar Math. For example, during the fifth observed lesson, as Meg talked about expanded form to students, she moved her arms and hands outward to show she was expanding them: "K, do this with your hands. Okay? 'Cuz it's gonna help you. When you take the expanded form, you're taking this number and you are expanding it. See what I mean?" As Meg gestured her arms and hands in this way, Michelle participated by mimicking Meg's movements for students. Additionally, during the same lesson, Meg asked students to show on their fingers, how many tens they were adding: "How many tens am I adding today? Show me with your hands. How many tens am I adding today?" Michelle participated with her students by holding up five fingers.

Fourth, as is captured by the Management code described in detail below, Michelle consistently assisted Meg with behavior management across all seven lessons. When engaging with students about management issues, Meg typically controlled the noise level, facilitated seating, requested students engage in a particular way with their materials, etc.

Of the five expected roles articulated by Meg, the only role that Michelle did not embody was to take notes as she observed Meg model Calendar Math.

Additionally, Michelle took on the two additional roles not mentioned by the coach, but that were added based on my observations and field notes. First, in six out of the seven observed modeled lessons, Michelle helped Meg manage the Calendar Math materials. This included managing the storage of notebooks, cutting out money, providing Meg with wet wipes and sticky chart paper, and preparing popsicle sticks to elicit student participation. This role was typically accompanied by short interactions between Meg and Michelle, such as the following:

Meg:	Did you get the money cut out?
Michelle:	Yes, I got the money cut out.
Meg:	Awesome. (1st lesson, 11/17/16)

Second, Michelle participated in apparent off-task behaviors[24] starting in the second observed lesson, and continuing in all subsequent observed modeled lessons. This behavior primarily took two forms as she either engaged with technology or organized her classroom. For example, regarding Michelle's technology use, during the second observed modeled lesson, Michelle sat at a table on the side of her classroom and worked on her laptop on and off for the entire duration of Calendar Math. At the beginning of the lesson, Meg asked students if the Number of the Day was odd or even:

Meg:	Is our number for today going to be an odd number or an even number?
Students:	Even!
Meg:	Even. Because we are going to be putting a 14 up there, so it's going to be on pink. How did you know that that was going to be an even number? Go ahead and tell me. (2nd lesson, 9/7/16)

An excerpt from my field notes provides insight into what Michelle was doing at this time: "Michelle is continuing to sit at the table on the side. At some points, she seems to be more focused on her laptop than the lesson." Later on, during that same lesson, Meg asked students to express the Number of the Day in written, expanded and word forms: "Okay, now we're going to write it in words. The words are twenty-six. Does anyone here know how to spell the word twenty? Let's sound it out together, okay?" The following field note excerpt describes Michelle's actions at that time: "Michelle has stayed at the side table the entire time, glued to her laptop."

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[24] I cannot be 100% sure that Michelle's computer use was off-task. However, if Michelle were indeed taking notes on her laptop about Meg's modeling, I would have expected to see her continuously glancing back and forth between Calendar Math instruction and her laptop, and yet this was not the case. Furthermore, Meg perceived that the computer use was off-task.

Michelle also participated in off-task behavior by organizing her classroom. For example, during the third observed modeled lesson, Meg asked students to calculate the Number of the Day: "Okay, so yesterday we ended with 26. So now we're going to put 26 plus eight equals. Go ahead and figure that out for me." The following excerpt from my field notes describes Michelle's actions at this time: "Michelle takes a stack of post-it notes and walks to the back of the room…She is writing her students' names on the post its and placing them on the laptops." Next, I examine instances of Direct and Indirect coach-teacher engagement to further illustrate how the coach and teacher engaged with one another during the modeled lessons.

Coach-teacher engagement. As explained in Chapter 3, I initially coded all instances of coach and teacher engagement during the modeled lessons as either Direct or Indirect. Instances of Direct Engagement reflected times when the coach and teacher spoke to one another through quick comments and conversations. Indirect Engagement captured instances when Michelle interacted with students in support of Meg, who facilitated whole group instruction. Across all seven observed modeled lessons, the most prevalent Coach-teacher Engagement code was Indirect Engagement (see Table 4.4). When examining each observed modeled lesson independently, this trend was maintained. I now examine instances of Direct and then Indirect Engagement, exploring the substance of those interactions.

Table 4.4

Coach-teacher Engagement Codes for Meg and Michelle

Lesson Number	Overall	1	2	3	4	5	6	7
n	250	26	39	29	25	54	27	50
Direct Engagement	34%	46%	46%	28%	20%	32%	37%	28%
Indirect Engagement	66%	54%	54%	72%	80%	69%	63%	72%

Similar to the planning conversation, all examples of Direct Engagement were assigned one of twelve codes. A content analysis revealed that the three most prevalent themes were

Classroom Management (25%); Curriculum, Activities and Materials (CAM) (19%); and

Classroom Composition and Attendance (15%) (see Table 4.5).

Table 4.5
Direct Engagement Substance Codes for Meg and Michelle

Lesson Number	Overall	1	2	3	4	5	6	7
n	84	12	18	8	5	17	10	14
Classroom Management	25%	8%	11%	25%	40%	24%	70%	21%
Curriculum, Activities and Materials	19%	58%	11%	25%	20%	18%	10%	0%
Classroom Composition and Attendance	15%	0%	50%	25%	0%	0%	10%	7%
Assessment	12%	0%	0%	13%	0%	18%	10%	36%
Other	7%	0%	6%	0%	0%	24%	0%	7%
Time and Schedule	6%	17%	0%	0%	20%	6%	0%	7%
Relationship Building	5%	17%	6%	0%	0%	0%	0%	7%
Facilitator's Role	5%	0%	0%	13%	20%	12%	0%	0%
External Requirements	4%	0%	17%	0%	0%	0%	0%	0%
Mathematics	2%	0%	0%	0%	0%	0%	0%	14%
General Pedagogy	0%	0%	0%	0%	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%	0%	0%	0%	0%

Meg and Michelle Direct Engagement theme 1: Classroom Management. Regarding

Classroom Management, the most prevalent theme (25%), Meg and Michelle either praised

students, discussed classroom incentives, or talked about challenging students. The public

exchange below reflects how Meg and Michelle praised students as they worked on developing

two addition and two subtraction facts that equaled their Number of the Day, 26.

Michelle: Such hard workers, Meg!
Meg: Look at this! I know, I love it! (2nd lesson, 9/7/16)

In addition to praise, Meg and Michelle also discussed classroom incentives and the extent to

which students were earning them. As illustrated in the following exchange, Meg publically told

Michelle that students had indeed earned their incentive for that day:

Meg: Michelle, I can honestly say that once everybody got focused and centered in
          here, they earned it today.
Michelle: Good. (6th lesson, 9/23/16)

Last, Meg and Michelle discussed challenging students. Below, Michelle told Meg that she

might need to remove a disruptive student if she continued to refuse to follow instructions:

Michelle: Meg, I'm going to have to take her to the office if she won't do what she needs to
               do.
Meg: That's perfectly fine. I understand. I understand. (2nd lesson, 9/7/16)

Meg and Michelle Direct Engagement theme 2: Curriculum, Activities and Materials.

Curriculum, Activities and Materials was the second most prevalent theme (19%). All instances

of Direct Engagement coded as CAM reflected conversations between Meg and Michelle about

the materials needed for Calendar Math (see Table N.3 in Appendix N). For example, one of the

longest exchanges across all seven observed modeled lessons was about the materials:

Meg: Michelle, if I forget in the morning, can you remind me I gotta make new things
               here?
Michelle: [Inaudible.]
Meg: Thank you.
Michelle: But I'll leave them up so the parents tonight can kind of see…
Meg: Well, you know how to laminate, don't you? If I gave you, um, new ones of
               these, we could even fill 'em in and laminate 'em before tonight?
Michelle: Okay.
Meg: Cuz I have 'em already copied, so okay.
Michelle: And at some point can I get copies so I can have it, too? (4th lesson, 9/20/16)

Meg and Michelle Direct Engagement theme 3: Classroom Composition and Attendance.

Classroom Composition and Attendance was the third most prevalent theme for instances of

Direct Engagement (15%). As Meg used popsicle sticks with students' names written on them to

elicit participation, she often turned to Michelle after pulling a stick from the can to check on the

pronunciation of student's name and/or to ask if that student was present. In the following

exchange, Meg asked Michelle about her pronunciation for a student's name:

Meg: My next victim. Chuy, did I say it right?
Michelle: Yes, you did.
Meg: Yay! Yay me! It's taken me three weeks. (6th lesson, 9/23/16)

In the following section, I turn to examine the substance of examples of Indirect Engagement.

Last, Meg and Michelle discussed challenging students. Below, Michelle told Meg that she

might need to remove a disruptive student if she continued to refuse to follow instructions:

Michelle: Meg, I'm going to have to take her to the office if she won't do what she needs to
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Meg: Well, you know how to laminate, don't you? If I gave you, um, new ones of
               these, we could even fill 'em in and laminate 'em before tonight?
Michelle: Okay.
Meg: Cuz I have 'em already copied, so okay.
Michelle: And at some point can I get copies so I can have it, too? (4th lesson, 9/20/16)

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pronunciation of student's name and/or to ask if that student was present. In the following

exchange, Meg asked Michelle about her pronunciation for a student's name:

Meg: My next victim. Chuy, did I say it right?
Michelle: Yes, you did.
Meg: Yay! Yay me! It's taken me three weeks. (6th lesson, 9/23/16)

In the following section, I turn to examine the substance of examples of Indirect Engagement.

Meg and Michelle Indirect Engagement theme 1: Classroom Management. As discussed in Chapter 3, instances of Indirect Engagement were assigned one of three codes. The most prevalent substance code was Classroom Management (78%) (see Table 4.6).

Table 4.6
Indirect Engagement Substance Codes for Meg and Michelle

Lesson Number	Overall	1	2	3	4	5	6	7
n	166	14	21	21	20	37	17	36
Classroom Management	78%	93%	57%	91%	80%	78%	71%	78%
Helping Students Learn Mathematics	18%	7%	33%	10%	10%	19%	24%	19%
Other	4%	0%	10%	0%	10%	3%	6%	3%

To elaborate, as Michelle engaged with students in support of Meg, she either discussed incentives ("Remember what you boys and girls are trying to earn also"), used kind words and praise ("Zaz, that's awesome! Way to go!"), requested that a student engage in a particular way with his/her materials ("Let's put 'em in our cubbies so we know exactly where they're at and they won't get lost"), controlled talking and the noise level ("Don't yell out. Remember, we always raise our hands"), and managed seating ("Sit. Sit. I told you to go to your seat").

Meg and Michelle Indirect Engagement theme 2: Helping Students Learn Mathematics. Helping Students Learn Mathematics, the second most prevalent substance code (18%), was meant to capture instances where Michelle enacted teacher moves to help students stay focused on their assigned mathematical work or content. She either asked a student to revoice his/her answer ("Say that again, Mimi"), revoiced a student's answer herself ("One dollar and ninety-eight cents"), told students to copy notes ("So, write these down the way she has them on the board"), made a statement about the content ("There's no way of splitting it in half"), or asked students a question about the content ("How many are we adding?). In comparison to the first three categories, Michelle rarely enacted the last two teacher moves (making a statement and

asking students a question about the content). In the next section, I discuss the reflection conversation.

Reflection conversation. In her exit interview, Meg described how, in general, she had both formal and informal reflection conversations with teachers during a coaching cycle:

> There's a ton that we have because a lot of times it's very informal. Like, you know, um, passing each other in the hall. Or, you know, how do you think it went today at the end of the lesson? Or um, you know, do you, we, have an actual scheduled one? Well, I had one with Michelle. I have another one here with Michelle. I'm going to get her to do another cycle with me, which is what I just talked to you about. Um, and um, you know. It kind of, I'll plan one with Mackenzie after I get our data. But a lot of times it's more before or after the lesson. Or you know, other times, kind of more when we stop and talk to each other.

According to Meg, although she scheduled formal reflection conversations with teachers during a coaching cycle, reflection most often took on the form of informal conversations in the hall or before or after lessons.

Regarding her cycle with Michelle, at the beginning of data collection, I told Meg—both verbally and via email—that I would like to be present for formal reflection conversations. Unfortunately, I was never invited to observe a formal reflection conversation, such as the one referenced above, with Michelle. Regarding informal reflection conversations that occurred before or after lessons or in the hall, I never witnessed any between Meg and Michelle during the times I was present. Although it is possible that these informal conversations did occur when I was not there, and this will be noted as a limitation to the study, Meg and Michelle never referenced specific informal conversations during their post-cycle interviews.

In summary, Meg and Michelle primarily discussed the Calendar Math curriculum and materials during their one observed planning meeting, and their engagement during the seven observed lessons tended to focus on issues related to classroom management and logistics. Their interactions, although primarily focused on implementation nuts-and-bolts, were aligned with their shared desire to implement Calendar Math in addition to the district-provided curriculum. Next, I illustrate how Meg and Michelle perceived the modeling cycle to be beneficial.

Research Question Three: Modeling Cycle Perceived Benefits for Meg and Michelle

Table 4.7
Modeling Cycle Perceived Benefits for Meg and Michelle

	Meg	Michelle
Content		
Students Improved Understanding of Mathematics		x
Pedagogy		
Coach Deepened Understanding of Assessment	x	
Coach Deepened Understanding of Student Goal Setting	x	
Teacher Gained a Different Vision of Instruction		x
Teacher Improved Questioning Strategies	x	x
Other		
Coach Got Back Into Classroom	x	

Both Meg and Michelle perceived that Michelle learned new questioning strategies as a result of participating in the modeling cycle (see Table 4.7). Meg stated the following:

One of the things I have seen as a benefit, because I have consistently been in there and as you have observed, the way that I teach, I have actually seen some of that transfer to Michelle, and she has developed some of my questioning style…you know, a little bit more deeper questioning than just on the surface, not just get the right answer.

According to Meg, over time, Michelle not only asked students for the answer to a mathematics problem, but took her questioning to a deeper level by also asking students to explain their thinking and/or strategy. This is something that Meg consistently modeled for Michelle. For

instance, during the second observed modeled lesson, Meg asked students to share two addition

and two subtraction facts that equaled the Number of the Day, which was 26. The following

excerpt highlights an exchange with one student, Kathryn.

Kathryn: 30 minus four equals 26.
Meg: 30 minus four equals 26. Hey, can you tell me how you got that answer?
Kathryn: I knew that four plus six equals ten. So I took away the four from the ten and it
     equals six.
Meg: Did you guys hear that? She knew that four plus six is 10. So she just took the
     four, or um added the four to it and got 30.

Meg first asked Kathryn to explain how she developed her subtraction fact and then revoiced

Kathryn's explanation for the rest of the class to ensure they heard and understood her response.

According to Meg, when she observed Michelle's instruction outside of Calendar Math, she

noticed that Michelle took this particular questioning strategy on and transferred it into other

parts of her teaching. This is consistent with Michelle's perspective as she described how she

incorporated these new techniques during an observation with her principal Mr. Smith: "And I

also had them, during my observation, I told them to tell me their thinking, just with those simple

addition and subtraction problems. Tell me your thinking. How did you come up with this?"

Additionally, Meg and Michelle each mentioned different perceived benefits. Meg

described the following three ways in which she, herself, benefitted: (1) Meg returned to the

classroom ("I miss teaching, you know?...it [the cycle] had a lot of rewards for me...the biggest

being is I got to connect with the kids."); (2) she deepened her knowledge of assessment by

creating her own pre-/post- assessments for the Evaluation Tool (ET) ("I did design my own

assessment for my ET. So that took me to a whole 'nother level in my teaching."); and (3) Meg

deepened her understanding of student goal setting ("They [students] did goal setting, which was

something that I learned, too.").

Michelle, on the other hand, shared that watching someone else teach provided her with a different vision of instruction: "Just seeing how somebody else implements something and their excitement for it and stuff. And how she got the kids excited and stuff." Furthermore, Michelle talked extensively about her perception that students improved their understanding of the mathematics content related to Calendar Math: "Just the complexity of their addition and subtraction facts. And the money, you know, different combinations of money and things like that. Just how they're expanding on that." Michelle elaborated on what she meant regarding the complexity of their addition and subtraction facts:

> Meaning that it's not like, the number plus four. You know, it's like, we're doing a number, they're going into the hundreds, some are going into the thousands and using those numbers to like, yesterday 200 was our number of the day, and they said 1,500 minus 1,300 is 200. You know, they were doing those kinds of, and it was more than just my high, high kids that were coming up with those. So it was kind of neat to see.

Thus, Michelle described how students' addition and subtraction facts became more complex over time, drawing upon greater place values, such as hundreds and thousands, to develop their facts. In summary, Meg and Michelle primarily described pedagogical benefits to the coach and teacher.

Research Question Four: Challenges and Conditions for Meg and Michelle

In this section, I begin by discussing emergent challenges from the modeling cycle. Then, I describe conditions mentioned by Meg and Michelle that, from their perspectives, would possibly help alleviate some of these challenges.

Challenges.

Table 4.8
Modeling Cycle Challenges for Meg and Michelle

	Meg	Michelle
Content		
Getting Calendar Math Up and Running		x
Planning and Logistics		
Coordinating Schedules		x
Other		
Lack of Teacher Engagement	x	
Ensuring Teacher Follow Through	x	x
Releasing Calendar Math	x	

In the post-cycle interview I asked Meg and Michelle to reflect on emergent challenges during the cycle. They both discussed the issue of follow through and conveyed their concerns that Michelle would not continue to implement Calendar Math to the same level of fidelity as demonstrated by Meg during the cycle (see Table 4.8). According to Michelle:

> She [Meg] did a great job modeling because she got the kids, she introduced it, got the kids excited about it, got them involved, set expectations, set goals…that part was just awesome and it's just me continuing with it and I am really trying to keep with it.

Similarly, Meg shared her concerns that Michelle would not consistently follow through with the Calendar Math after the cycle ended:

> My biggest fear, and this is kind of a long running thing with her, is that you go in and you do all this work and get all of this stuff set up, and you release it and it goes away. That will be a hard conversation for me to have. I have laid such good groundwork and these kids are moving and it would be a shame to see that not progress.

Thus, given how successful the cycle was from Meg's perspective, she was reluctant to give up control and release the cycle to Michelle.

Furthermore, Michelle and Meg each mentioned additional challenges. Michelle talked about difficulties associated with scheduling ("Finding the time in schedules…so that all of my

students were there or that…it would work with her [Meg] or would work with me. Scheduling was the hardest"), as well as difficulties related to getting Calendar Math ready ("Just getting it up and running. You know, having all of the elements that are needed and stuff").

Meg, on the other hand, discussed her hesitation to let Michelle be the lead Calendar Math teacher because her own ET was tied to the cycle and so she wanted to get the best data possible: "This is my ET so I am responsible for the scores…so that is something that I want to make sure she's got a very firm grasp on the process before I release it." Additionally, Meg talked about the recurring lack of teacher engagement during the modeling cycle: "There were many, many times that I would come in and she would get on her computer, and that's not the purpose of why I was in there." This lack of engagement was observed in five out of the seven modeled lessons as Michelle used her laptop, organized student laptops and filled out behavioral referral paperwork. In response to this lack of engagement, one strategy Meg adopted was to request help from Michelle during her instruction in an attempt to draw her into the lesson:

> I asked her if she could help me by moving around and checking kids' notebooks to make
> sure that they are on task and then, you know, there's a couple behavior issues where I
> was like, hey could you just kind of hang out at the desk behind so and so? So, I tried not
> to come out and say don't get on your computer when I come in here 'cuz that's not why
> I'm here. I just came up with ways I could suggest she help me, which would also then
> make her more engaged in this situation. That was a challenge.

In summary, the coach and teacher primarily reflected on different modeling cycle challenges. On the one hand, Meg was chiefly concerned about releasing the cycle back to Michelle and the – at times – lack of teacher engagement. On the other hand, Michelle was worried about coordinating schedules with Meg and getting all Calendar Math materials in place.

Conditions. In the post-cycle interview, I asked both the coach and teacher to reflect on the conditions that needed to be in place to ensure a successful modeling cycle. As will be elaborated below, Meg and Michelle focused on strikingly different conditions (see Table 4.9), some of which were related to the challenges described above.

Table 4.9
Modeling Cycle Conditions for Meg and Michelle

	Meg	Michelle
Content		
Calendar Math Materials Needed to be in Place		x
Teacher Needed Background Knowledge About Calendar Math		x
Management		
Behavior Management System Needed to be in Place	x	
Other		
Teacher Accountability System Needed to be in Place	x	

Michelle described two conditions that contributed to the success of the modeling cycle. First, all of the Calendar Math materials needed to be in place prior to the start of the cycle, including the laminated calendar, calendar pieces, cut out money, student notebooks, etc.: "Everyone having exactly what they needed. Having all the elements of the Calendar Math ready and up and going. And just having all of the pieces that are supposed to be starting off, there." Second, Michelle said she needed adequate background knowledge about Calendar Math prior to the start of the cycle.

> I mean, she's giving it, you know, parts of it to me. But I'd kind of like to have the whole thing so I know exactly what it's all...'cuz I'm just going by what she's told me and not necessarily what the full implementation is and seeing what everything is that I could also be adding into it.

Both of these conditions are related to the challenge Michelle described above about getting Calendar Math ready and possibly helped to alleviate this challenge.

Meg, on the other hand, mentioned two conditions that needed to be set prior to the start of the modeling cycle. First, it was essential that the classroom teacher had a behavior management system in place before any coaching cycle started so that Meg could come in and successfully engage with the teacher and students. Meg expressed that this was initially lacking in Michelle's classroom, and it became so problematic that she had to stop halfway through her modeling cycle to implement a behavior management system with incentives:

> Obviously for any cycle when you are a new person coming into an established classroom, it doesn't matter if you're coming in to teach them a one day lesson on something in science, there has to already be a strong behavior management thing in place. It is not the coach's job to create that in the classroom, and that is my biggest thing right now 'cuz I felt like I had to create that in there.

One aspect of the behavior management system instituted by Meg was a system of incentives as part of a token economy. Every day, each student received one "Meg Buck," a fake dollar bill with a picture of Meg's face on it, if they displayed appropriate behavior. Once a week, students could use their "Meg Bucks" to purchase something from Meg's treasure chest, which had pencils, candy, erasers, etc. that she purchased from the Oriental Trading Company. Additionally, once a week, Meg randomly pulled two students' names from a bag and if their Calendar Math notebooks were up-to-date with all of the notes from the week, they could choose a prize from her treasure chest. This condition is related to the challenge Michelle described above about difficulties managing classroom behaviors.

Second, Meg stated that an accountability system needed to be in place at the start of the cycle to ensure that the teacher would continue to implement the intervention after the cycle ended and the coach left:

The second condition is that I want, and I didn't do it with this so I can't ask her, I want some accountability piece involved. So, I did a pre- and post-assessment. My thoughts are, in the future if I do this again with calendar, when I'm done and this person takes over, I want a pre- and a post- to see, too, because with that accountability piece, not only are you gathering data, which we want to do formative assessment is right there, but also that holds your feet to the fire to continue with it.

Here, Meg described one accountability measure she wished she implemented, which would have been to require that Michelle give additional assessments after the cycle ended. This condition possibly could have helped alleviate the challenges Meg described above related to a lack of teacher engagement, ensuring teacher follow through, and releasing Calendar Math.

Thus, Meg and Michelle reflected on different conditions that could help alleviate emergent challenges. While Meg discussed teacher accountability measures and behavior management systems, Michelle reflected on Calendar Math materials and background knowledge.

Summary

Overall, Meg and Michelle were motivated to participate in the modeling cycle by the shared reason of wanting to implement Calendar Math, as well as external factors, including that Michelle was on an improvement plan while Meg was using the cycle to complete her ET. Their interactions during the planning conversations and modeled lessons tended to focus on the Calendar Math curriculum and materials, as well as logistical issues related to timing, scheduling and classroom management. Although Meg and Michelle seldom engaged in pedagogical or mathematical conversations, they both seemed to agree that primary benefits of the cycle were that Michelle enhanced her questioning strategies and students improved their understanding of

the Calendar Math content. In the section that follows, I turn to the coach-teacher pairing of Meg and Mackenzie to discuss their Calendar Math modeling cycle, before taking stock of similarities and differences in both modeling pairs, and discussing the depth of coach-teacher talk.

<div align="center">

Coach-teacher Pairing: Meg and Mackenzie

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In the following section, I begin by introducing Teacher Mackenzie, and then provide a brief overview of her modeling cycle with Coach Meg.

An Introduction to Teacher Mackenzie

Mackenzie had been an elementary school teacher for the past 23 years. After completing her undergraduate degree, Mackenzie taught kindergarten for 10 years in the South, and then got married and moved to the Midwest. Mackenzie has been teaching at her current school for the past 12 years. During the 2006 - 2007 academic school year, she received Reading Recovery training and was the Reading Recovery literacy teacher for three years before returning to the classroom as a primary teacher. Going into her 13th year of teaching at her current elementary school, Mackenzie moved to the intermediate grades and, at the time of the study, was completing her first year as a 4th grade teacher. The principal asked her to move to the intermediate grades as the student data showed that 4th graders were struggling with literacy. Due to Mackenzie's strong background in literacy, he felt she would be able to support the 4th graders in this way. Mackenzie has master's degrees in both Education Organization and Leadership, and in Curriculum and Instruction with a concentration in Reading. In the future, she is interested in pursuing school administration.

The previous year, Mackenzie engaged with Meg in a coaching cycle. They worked on implementing one aspect of the Everyday Mathematics 4 curriculum, Open Response and

Reengagement[25], with Mackenzie's first graders and Mackenzie found it to be highly beneficial. This is reflected in the following exchange that took place during their planning conversation, which will be described in detail below:

Meg: We did something in her, she moved from first to fourth this year. And we worked on open-ended responses in math last year together.
Mackenzie: Oh gosh. It was awesome! Awesome!

Therefore, Meg and Mackenzie already had a positive working relationship due to their previous coaching cycle.

Modeling Cycle Overview

Mackenzie's modeling cycle started about one month before winter break, roughly halfway through the 2016-2017 school year. Before Meg began modeling Calendar Math, she and Mackenzie had a planning meeting, which will be discussed below, to talk about their forthcoming cycle. Lasting for about 27 minutes, the planning meeting took place in Mackenzie's classroom as Meg and Mackenzie sat at a table in the back. Exactly one week after the initial planning conversation, Meg began modeling Calendar Math in Mackenzie's classroom. She typically came in every day around 12:15 PM and each lesson lasted no more than 30 minutes. Meg and Mackenzie agreed that Meg would model Calendar Math for four-and-a-half weeks until winter break, and that when school resumed in January, Meg would continue to model. For this study, I observed six modeled lessons that took place at the beginning, middle and end of the four-and-a-half week window before winter break.

Research Question One: Modeling Cycle Motivation for Meg and Mackenzie

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[25] Open Response and Reengagement was part of the Everyday Mathematics 4 curriculum. Students were first given a mathematical task to complete, and then the teacher analyzed the tasks to plan future instruction.

Table 4.10
Modeling Cycle Motivation for Meg and Mackenzie

	Meg	Mackenzie
Content		
Teacher Gained Exposure to Grade-level Content		x
Increased Students' Mathematics Confidence		x
Pedagogy		
Wanted to Implement Strategy	x	x
Other		
Coach Learned More About Working with Different Teachers		x
Played to Coach's Strengths	x	

Both Meg and Mackenzie were motivated to engage in the modeling cycle to implement the intervention of Calendar Math to target students' mathematical needs (see Table 4.10). In her pre-cycle interview, Mackenzie described her process of examining student data with her fourth grade team and then discussing how the Calendar Math intervention would target students' needs:

There is a significant data showing that these kids are missing something. So, um, during our collaboration with the principal, Mr. Smith, and Meg, they were mentioning they had done this in Michelle's room and I said hey I'd be really interested in taking a look. So I spent one of my plan periods down there, got to see how it worked. Those students had been mine in kindergarten, so it was really interesting to see the gains that they made in a six-week program…You know, at some point you just have to say data speaks volumes and these kids are missing something, so where are they missing it and how can we help 'em? I've been at this so long that I just sit there thinking, it's not about me, it's about they're missing something, and how can I be a better teacher and support them. And that's where Meg came into play.

After witnessing the growth that Michelle's third graders made, coupled with the fact that Mackenzie believed Calendar Math would target her students' needs as evidenced by the data,

she enlisted Meg's help to implement this intervention. Meg also discussed wanting to provide support implementing the Calendar Math intervention as a primary motivating reason for her engagement in the cycle. She described a similar process of examining student data and concluding that Calendar Math would address students' needs:

> So one of the things that Mackenzie identified is that she's got some struggles in there with some kiddos that may need um either some extra intervention support or some extra remedial support. So she had brought that up at um a collab[26] that we were in and I had mentioned to her, I just got done working in a similar situation with Michelle and I'd love for her to come and watch and see. So, she, you know, it's hard to not be impressed with the Calendar Math when you see it in action. So, she wanted to do it with me.

Hence, both Meg and Mackenzie agreed that it was their shared desire to implement Calendar Math that initiated the cycle.

Mackenzie described three additional motivating factors in her pre-cycle interview. First, Mackenzie expected that her students' mathematical confidence would increase as a result of participating in Calendar Math:

> I'm really hoping that by them feeling strong and confident in the basic skills and breaking it down and seeing that there are other ways of analyzing their information, you know, um, just watching it in Michelle's room, they get to use the Number Line, and then the Number Line goes with the Number of the Day and then it goes into money, and I'm hoping that they're gonna see in the grand scheme of things it all ties together, and that this will at least get them started to say, oh, I already know this, and the concepts will come easily. And the confidence will come more.

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[26] "Collabs" were grade-level meetings attended by the teachers, coach, and principal.

Second, she wanted to gain exposure to fourth grade mathematical concepts:

> Working with Meg will give me some math concepts that I can bring into 4th grade. As you can see, I have anchor charts around my room…That's not gonna help 'em…Her having the background, already teaching it in the 3rd grade with Michelle, going to these extra PDs that I don't get to go to, she gets to bring that knowledge in my classroom.

As previously mentioned, Mackenzie spent the past 12 years teaching primary before moving up to the intermediate grades. Hence, she hoped to better understand fourth grade mathematics. In her pre- and post-cycle interviews, Coach Meg confirmed that she wanted to support Mackenzie as she transitioned from first to fourth grade: "Mackenzie moved from first to fourth, her first year teaching at that level. So I think she reached out for me as to kind of, you know, guide her in this process of providing these kids what they need." Last, Mackenzie hoped the cycle would help Meg learn to work with different teachers in her role as a coach: "I think that's beneficial for her, too, because then she's learning to work with the dynamics of different teachers. Every teacher is different, just like the students are different, so I think that that'll help."

In addition to her motivations related specifically to Calendar Math, Meg was also happy to have the opportunity to do another cycle focusing on mathematics, as she felt this was an area of strength for her:

> Now, as far as me, as I've explained before, math and sciences are kind of my thing...So, for me it's more of being able to get out there into the rooms and doing my strengths to kind of help, you know, model and show, you know, some ways to teach math.

Hence, like Mackenzie, Meg was very interested in implementing Calendar Math in Mackenzie's classroom, both because she felt this would meet students' needs, and because she felt especially comfortable coaching teachers in math.

Research Question Two: How Meg and Mackenzie Engaged in the Modeling Cycle

Similar to above with Meg and Michelle, in addressing the research question regarding *how* the coach and teacher engaged in the modeling cycle, I start with examining their interactions during the planning conversation, then move to the modeled lessons, and end with the reflection conversation.

Planning conversation. A content analysis of Meg's and Mackenzie's planning conversation revealed that they most commonly discussed Curriculum, Activities and Materials (26%) and Assessment (22%). In the space that follows, I discuss each of these themes.

Table 4.11
Planning Conversation Substance Codes for Meg and Mackenzie

Substance Code	Percent Coverage[27]
Curriculum, Activities and Materials	26%
Assessment	22%
Other	11%
Time and Schedule	11%
Mathematics	7%
Relationship Building	7%
General Pedagogy	4%
General Plans for Coaching Cycle	5%
Classroom Management	4%
Classroom Composition and Attendance	1%
External Requirements	1%
Facilitator's Role	1%

Meg and Mackenzie planning conversation theme 1: Curriculum, Activities and Materials. While engaged in CAM talk, Meg and Mackenzie primarily discussed the Calendar Math materials (96%) (see Table N.4.1 in Appendix N). This included conversations about the calendar, calendar pieces, money, vis-a-vie markers, popsicle sticks that would be used to elicit student participation, notebooks, making copies of materials, and laminating materials. The

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[27] This planning conversation transcript contained 20,029 characters, or roughly 16 double-spaced pages (about 4,000 words).

following illustrates a typical exchange between Meg and Mackenzie about the materials during

their planning meeting:

Meg:	Can I use the wall next to the calendar when I put stuff up?
Mackenzie:	Absolutely.
Meg:	'Cuz we're going to have things like the depositor record. The stuff you saw on Michelle's thing. Here, I didn't even think about this. I've got paper copies of all of 'em. I'll just give you paper copies of all of 'em so you'll have every month. That way you'll have copies of every month. So this is January. If you wanna, just to put up my working things and the money things.
Mackenzie:	Absolutely.
Meg:	I've got a lot of money already xeroxed here on green for you. I always recruit child labor to cut it out. You get a group of 'em and they'll get it done.

Here, Meg and Mackenzie discussed where in the classroom Meg would set up her Calendar

Math materials, as well as the Calendar Math money.

Meg and Mackenzie planning conversation theme 2: Assessment. Assessment was the

second most prevalent discussed theme during the planning meeting, and there were two

emergent sub-themes: (1) Assessment Logistics (42%) and (2) Using Data to Inform Instruction

(36%) (see Table N.4.2 in Appendix N). Each sub-theme is discussed below.

Assessment sub-theme 1: Assessment Logistics. While engaged in assessment talk, Meg

and Mackenzie primarily coordinated the pre-assessment that students would take at the

beginning of the cycle. In the following excerpt, Meg discussed the pre-assessment she created:

So, I put together this. It's got a column of multiplication, a column of division. Very cut

and dry. We can get a good baseline out of that when we give it to them. For addition

and subtraction. Addition. Subtraction. Figured we could do this to get a baseline out of

them as well.

Hence, Meg created four separate pre-assessments for addition, subtraction, multiplication and

division that included many problems. Meg and Mackenzie also talked about when students

would take these pre-assessments and how long they would take:

Meg:	'Cuz the addition and the multiplication can be done at any time.
Mackenzie:	These two can be?
Meg:	Well, I mean, yeah. Unless you want to do a beginning baseline and an end baseline. It's completely up to you.
Mackenzie:	I mean, we switch for almost, they come in at 11:15 and we don't switch back until 12:35.
Meg:	That should be enough time to get 'em all in.
Mackenzie:	So I could get all three in.
Meg:	That should be enough time to get 'em all in.
Mackenzie:	Yeah, we'll get 'em all three in and I'll have Jay start looking at some and I'll start grading some as they're in here.

Assessment sub-theme 2: Data Informing Instruction. As described in Chapter 3, coach-teacher interactions were coded as *Data Informing Instruction* when either the coach or teacher drew upon concrete data or their general impressions of student performance to plan subsequent instruction. The following excerpt illustrates the second sub-theme as Mackenzie discussed how she felt her students needed continued pictorial representations of fractions.

Mackenzie:	After today, introducing it, I really think we're gonna have to, they're gonna need the visual even though it's only…
Meg:	They're gonna need the visual?
Mackenzie:	Yes.

Thus, based on her informal observations of students, Mackenzie would keep integrating fractions visuals to be responsive to her students' needs.

It is worth noting that Meg and Mackenzie had additional planning meetings throughout their cycle. However, I was not invited to observe despite my efforts to be included. In her post-cycle interview, Mackenzie described these additional planning meetings she had with Meg:

We then met, created a pre-assessment, noticed that the 4th grade pre-assessment that we

created was still too difficult. So we then gave her the 3rd grade pre-assessment she had

done and we saw where some of the holes were. And from there we have created centers.

So I would say that we've met at least four other times away from the pre-conference.

We've met four times to talk about different stations that we could be doing after

Calendar that would support the Calendar Math and the exposure to it and just some more

hands-on activities with that. Um, and then we met to discuss how those were going and

what other things we could put in so they weren't getting bored, like to cycle 'em out.

Um, and then we'll meet today to talk about our post-test, which we'll give tomorrow.

In addition to the planning conversation that took place at the beginning of the cycle that was

described in detail above, Meg and Mackenzie met four additional times to plan stations that

would be used outside of Calendar Math that would support mathematical concepts addressed

during Calendar Math.

In summary, during Michelle's and Mackenzie's planning conversation, they heavily

discussed the Calendar Math materials, as well as logistical assessment items. I now turn to

examine the six modeled lessons I observed over the course of the four-and-a-half week

coaching period.

Modeled lessons. To examine how Meg and Mackenzie engaged with one another across

the six observed modeled lessons, I first examine the numerous roles embodied by Mackenzie

while Meg modeled. Then, I turn to explore instances of Coach-teacher Engagement during the

lessons.

Teacher role. Table 4.12 reflects the extent to which Mackenzie embodied all seven

teacher roles, which were previously described above, across the six observed modeled lessons.

Table 4.12
Mackenzie's Roles Across Six Observed Model Lessons

Lesson Number	1	2	3	4	5	6
Observe	x	x	x	x	x	x
Take Notes	x	x				
Interact with Students		x			x	
Participate in Lesson		x		x		
Assist with Behavior Management	x	x	x	x	x	x
Help Manage Materials	x	x	x	x	x	
Off-Task Behavior				x	x	x

Regarding the five roles Meg expected to see teachers take on while she modeled, Mackenzie enacted all of them. First, Mackenzie not only observed while Meg modeled Calendar Math, but she also took notes while observing. This, however, evolved over time. During the first and second observed modeled lessons, Mackenzie positioned herself close to the front of the room where Calendar Math instruction took place and recorded notes in a notebook. This changed over time as Mackenzie took on additional roles and perhaps grew more comfortable with Calendar Math. During the remaining four observed modeled lessons, Mackenzie continued to take on the observer role, but instead of sitting and taking notes, she periodically stopped what she was doing to get up and look at students, at times standing on the side of the room.

Second, Mackenzie had academically-focused interactions with students about Calendar Math, which is reflected in the Helping Students Learn Mathematics code described in detail below. Mackenzie had six academically-focused interactions with students total, and this occurred in three out of the six observed modeled lessons, with the most occurring during the second lesson. Mackenzie's academically-focused interactions with students were, by far, less prevalent in comparison to interactions she had with students that were related to management.

Third, Mackenzie participated in Calendar Math as a student would, but this did not start until the second observed modeled lesson as she responded to questions Meg posed to students. For example, during the fourth observed lesson Meg asked students to give her thumbs up if they understood how to correctly say the number 196 in word form:

> …So when you say a number correctly, first of all remember you never put the word and in there and you always have to, if you say one ninety-six or one ninety-nine, that could

be money, that could be decimals, that could be anything, right? To clarify, you have to say one hundred ninety-nine. Got it? Thumbs up if you got it? If you understand. Perfect. Thank you.

As students put their thumbs up, Mackenzie also participated by giving thumbs up.

Fourth, Mackenzie consistently helped with behavior management across all six observed modeled lessons, with comments, such as "Pay attention." and "You're being disrespectful.", as reflected in the Management code described in detail below. The second and fifth observed modeled lessons reflected the greatest number instances of Indirect Engagement that received a Management code, while the first and sixth had the least.

In addition to embodying the five roles outlined by Meg, Mackenzie also enacted the two supplementary roles I created based on my observations and field notes. First, Mackenzie helped Meg manage the Calendar Math materials in all observed modeled lessons except the last. This was evident through their verbal exchanges, which will be described below as instances of Direct Engagement, and also through Mackenzie's actions, which were captured in field notes. For example, a very typical exchange about the Calendar Math materials took place at the beginning of the second observed lesson. Meg turned to Mackenzie and said, "Hey, you know what I had forgotten to ask for? Can I get a wipe to wipe that down and then…" Mackenzie did not verbally respond, but instead went to get Meg a wet wipe to clean the laminated sheets at the front of the room so that she could write new notes for that day's Calendar Math lesson.

Second, Mackenzie also engaged in off-task behavior. This did not begin until the third observed modeled lesson and, similar to Michelle, took on one of two forms as Mackenzie either engaged with technology or organized her classroom. Mackenzie engaged with technology in her classroom during the third, fifth and sixth observed modeled lessons as she worked on her

laptop and/or desktop computers, or used her cell phone. For example, at the beginning of the third observed modeled lesson, Meg asked students to come up with two addition and two subtraction facts that equaled the Number of the Day, 119: "Our number for today is 119. So, please come up with some addition and subtraction problems." Up to this point in the lesson, Mackenzie had been sitting on a stool, observing instruction. Here is a field notes excerpt describing what Mackenzie did next:

> Mackenzie gets up from her stool in the front to go and get something from the back of the room. Mackenzie is at the back table typing up something on her laptop and also texting. Mackenzie brings her laptop over closer to the front. She is also doing something on her phone.[28]

In addition to engaging with technology, Mackenzie organized her classroom during the third and fifth observed modeled lessons as she cleaned off a table in the back of her classroom, organized various piles of paper, and collected and put away materials from students' desks. For example, during the third observed modeled lesson, Meg asked students for two subtraction facts that equaled the Number of the Day: "No, we're in subtraction now. Look, we got this, we got this. Now we got, we have two addition, two subtraction, ok?" At this time, Mackenzie started to organize her classroom, which is reflected in the field notes excerpt:

> Mackenzie takes a pile of papers from the front of the room and brings it to the back table. She is taking piles of paper from different tables and placing them on a different table in the back. It seems that Mackenzie is organizing things a bit.

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[28] Similar to above, I cannot be 100% sure that Mackenzie's engagement with technology was off-task. However, if she were using the computer or cell phone to take notes on Meg's modeling, it seems that Mackenzie would have been consistently glancing back and forth between instruction and her screen. This, however, was not the case.

Despite the fact that Mackenzie, like Michelle, did participate in off-task behaviors, I never observed Meg try to engage Mackenzie more in the modeled lessons by asking her to work with particular students or help with certain aspects of the Calendar Math instruction like she did with Michelle. In the following section, I explore instances of Direct and Indirect Coach-teacher Engagement.

Coach-teacher engagement. Across the six observed modeled lessons, when there were examples of Coach-teacher Engagement, half of the time Meg and Mackenzie engaged directly through conversation with each other, while for the other half, Mackenzie gave feedback to students in support of Meg as she provided lead instruction (see Table 4.13). I now examine the substance of instances of Direct and Indirect Engagement.

Table 4.13
Teacher-Coach Engagement Codes for Meg and Mackenzie

Lesson Number	Overall	1	2	3	4	5	6
n	135	14	34	25	28	22	12
Direct Engagement	50%	50%	44%	60%	71%	14%	58%
Indirect Engagement	50%	50%	56%	40%	29%	86%	42%

A content analysis of instances of Direct Engagement revealed the three most prevalent discussed themes were Curriculum, Activities and Materials (28%); Relationship Building (25%); and Classroom Management (19%) (see Table 4.14). I discuss each theme below, examining emergent sub-themes and providing examples.

Table 4.14

Direct Engagement Substance Codes for Meg and Mackenzie

Lesson Number	Overall	1	2	3	4	5	6
n	67	7	15	15	20	3	7
Curriculum, Activities and Materials	28%	0%	47%	27%	35%	33%	0%
Relationship Building	25%	43%	7%	20%	30%	33%	43%
Classroom Management	19%	43%	20%	20%	5%	0%	43%
Classroom Composition and Attendance	10%	14%	13%	7%	15%	0%	0%
Time and Schedule	6%	0%	0%	20%	0%	33%	0%
Facilitator's Role	3%	0%	0%	7%	5%	0%	0%
Mathematics	3%	0%	7%	0%	5%	0%	0%
Assessment	1%	0%	7%	0%	0%	0%	0%
Other	1%	0%	0%	0%	0%	0%	14%
Pedagogy	1%	0%	0%	0%	5%	0%	0%

Meg and Mackenzie Direct Engagement theme 1: Curriculum, Activities and Materials.

CAM, the most prevalent theme, reflected quick conversations and comments between Meg and

Mackenzie mostly about the *materials* needed to enact Calendar Math (89%) (see Table N.3 in

Appendix N). This included the Calendar Math money, wipes for the dry erase boards up front,

dry erase and vis-a-vie markers, Calendar Math notebooks, popsicle sticks used by Meg to elicit

student participation, and multiplication charts. The following exchange is a typical one

regarding the materials as Meg and Mackenzie discussed a multiplication chart:

Meg: What happened to the one we had up?
Mackenzie: It's over here.
Meg: Oh, okay.
Mackenzie: But I heard, somebody said they didn't have one. (3rd lesson, 11/21/16)

Meg and Michelle Direct Engagement theme 2: Classroom Management. Classroom

Management was the second most prevalent theme reflected in instances of Direct Engagement.

Meg and Mackenzie either praised students, discussed classroom incentives, reflected on

challenging students, and/or talked about classroom routines/procedures. For example, the coach

and teacher discussed the classroom incentive system, which involved Meg Bucks, randomly

pulling students' names, and allowing them to take a prize from a Treasure Chest if their notebooks were up-to-date. The following comment was about the incentive system:

> And um, Mackenzie, I'm gonna start um drawing some names here. Um, I'm not here tomorrow, I'm at science. But starting Thursday, and we can spot check notebooks to come down for prizes, ok? I finally got my prizes set up. Ok? (6th lesson, 12/6/16)

In addition to discussing the classroom incentive system, Meg and Mackenzie reflected on students who were considered to be behavior problems. For example, Meg and Mackenzie talked about a challenging student who wouldn't stop interrupting the Calendar Math lesson and was also intentionally breaking Mackenzie's pencils.

Meg:	What?
Mackenzie:	Nothing.
Meg:	Oh okay.
Mackenzie:	I'm talking to her so she stops interrupting the math lesson.
Meg:	Yeah, why are you moving around so much?
Mackenzie:	Broke my pencil on purpose again. (6th lesson, 12/6/16)

Meg and Michelle Direct Engagement theme 3: Relationship Building. Relationship Building was the third most prevalent theme and encompassed interactions where Meg and Mackenzie expressed kind words to one another ("Thank you so much for the Aleve and water"), shared gossipy moments ("That seems like very dramatic for that"), and/or commiserated about classroom happenings ("They driving you crazy?").

Meg and Mackenzie Indirect Engagement theme 1: Classroom Management. In examining the substance of instances of Indirect Engagement, by far, the most prevalent code was Classroom Management (91%) (see Table 4.15). As Mackenzie engaged with students in support of Meg while she modeled Calendar Math, she talked about incentives with students ("Then you can save it for the next week"), used kind words and praise ("Gloriana, thank you for ignoring him"), requested that students engage in a particular way with their materials ("Sharpen

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it quickly"), facilitated seating ("Don't sit here anymore then. Go sit over there"), and controlled

the noise level in the room ("Shhh! What did she say?").

Table 4.15
Indirect Engagement Substance Codes for Meg and Mackenzie

Lesson Number	Overall	1	2	3	4	5	6
n	68	7	19	10	8	19	5
Classroom Management	91%	100%	79%	90%	100%	95%	100%
Helping Students Learn Mathematics	9%	0%	21%	10%	0%	5%	0%
Other	0%	0%	0%	0%	0%	0%	0%

Meg and Mackenzie Indirect Engagement theme 2: Helping Students Learn Mathematics.

The second most prevalent substance code for instances of Indirect Engagement, Helping

Students Learn Mathematics, was by far less common (9%). In particular, there were only six

instances of Indirect Engagement across the six observed modeled lessons that reflected times

when Mackenzie engaged with students to help them stay focused on the assigned mathematical

work or content. On more of a superficial level, Mackenzie either requested that students copy

notes ("Stephanie. Stephanie. She needs you to write it down. In your notebook") or revoiced

or verbally agreed with something that Meg said (e.g., repeating "Two quarters, four dimes, eight

pennies" after Meg said this). In addition, Mackenzie asked students questions about the

content. During the fifth observed lesson, Meg asked students how many one dollar bills they

would be adding that day and a student responded, "We're adding four." To prompt the student

to state the units, Mackenzie asked the student: "Four?" The student corrected himself by saying

"Four one-dollar bills."

Reflection conversation. As previously mentioned, I was never invited to observe a

formal reflection conversation between Meg and Mackenzie. Furthermore, I never observed an

informal reflection conversation between the coach and teacher before and/or after the modeled

lessons, for example. However, Meg did describe one informal reflection conversation that she had with Mackenzie in her exit interview:

> Mackenzie was so excited yesterday with those tests the kids took and they saw all of those turn arounds on there and she was about out of her skin. So, of course she was like calling down here, like come here, come here, come here. You know, so I try to make myself as available as I can for that because that is, you know, seriously embracing the moment. I'm excited, these are my kids' tests, come look at 'em. Okay? You know, because whether or not you have…well it's not our appointment. Why don't you bring it at 8:10 on Friday? No! Go down! That's the whole purpose of the thing.

Thus, Meg and Mackenzie had an impromptu meeting to celebrate the substantial growth Mackenzie's students made on a test.

Furthermore, during her post-cycle interview, Meg described one additional informal reflection conversation she engaged in with Mackenzie:

> She was so proud of herself yesterday. 'Cuz I got wrapped up, I had to be administrator here for four hours and was dealing with behaviors, so I didn't make it in there. And she called me down later and she was all excited 'cuz she had done it all by herself and she took pictures on her phone and all of this. It was the cutest thing.

In other words, Mackenzie initiated an informal reflection conversation with Meg to share how things went when she taught Calendar Math on her own.

In summary, during the one observed planning meeting and six observed modeled lessons, Meg and Mackenzie primarily discussed the Calendar Math materials. Although both Meg and Mackenzie were motivated to engage in the cycle by the shared reason of wanting to implement Calendar Math, Mackenzie was also motivated by content-related reasons (she

wanted to gain exposure to fourth grade mathematics concepts and hoped her students would

become more confident in mathematics). The coach's and teacher's primary focus on materials

does not seem aligned with these motivating reasons. In the next section, I discuss the perceived

benefits.

Research Question Three: Modeling Cycle Perceived Benefits for Meg and Mackenzie

Table 4.16
Modeling Cycle Perceived Benefits for Meg and Mackenzie

	Meg	Mackenzie
Content		
Increased Students' Mathematics Confidence	x	
Students Improved Understanding of Mathematics	x	x
Pedagogy		
Teacher Gained Exposure to Faster or Slower Pacing	x	
Teacher Improved Questioning Strategies	x	
Other		
Coach Broadened Impact	x	

Meg and Mackenzie both perceived that students improved their understanding of the

Calendar Math content (see Table 4.16 above). According to Mackenzie, her students learned

the following: (1) new mathematical words and giving correct examples of them; and (2) how to

represent the same number in multiple ways. Mackenzie talked about the former in her pre- and

post-cycle interviews, referencing recent assessment data from her Evaluation Tool (ET) that

demonstrated how her students learned about factors and factor pairs: "So 25 students, not one of

them could fill it out before. All of them had factor pairs this time. So, I think that really came

from the coaching cycle because that's something we did in Calendar Math." Regarding factors

and factor pairs, Meg introduced this concept in the second observed modeled lesson:

Okay, so if we're taking the eight, does anybody know two factors that you can multiply

together to get the product of eight? Does anybody know what words I just used there?

Anybody ever heard those words before? Ok, factors are the um the numbers that you

multiply together, ok? So if you're doing, it'll be factor times factor equals product. Ok?

Product is the answer. So, a good way that I always remember it is factories make

products. Right? So factor times factor equals product, ok? So, who can tell me two

factors that would equal the product if she chose the eight.

Here, Meg shared the definition of a factor with students and provided them with a factory

analogy to help them remember the difference between factors and products. As an additional

example, Mackenzie discussed how her students learned about prime and composite numbers:

"Or that they knew the prime and composites because we had done it on the number line."

Hence, Mackenzie found it beneficial that through Calendar Math, her students learned new

mathematical terms and were able to correctly provide examples on an assessment.

As an example of the latter, in an interview, Mackenzie talked about her perception that

students learned to represent the Number of the Day in written, expanded and word forms:

Being able to say, okay, we have the written form, what's the expanded form, what's the

word form? And having them, you know, I think that somewhere along the way, they've

missed that. And, you know, spelling hundred or writing it out.

To illustrate, Meg introduced the concepts of standard, word, and expanded forms in the second

observed modeled lesson: "K, there are three ways on how to write a number. There is the

standard way, the word way, and the expanded form way."

Meg, too, discussed how students deepened their understanding of mathematics and then

transferred that knowledge to an assessment. For example, similar to what Mackenzie described

above, Meg talked about how students developed their understanding of factors and turn around

facts through Calendar Math, and then transferred that knowledge to the post-assessment for

Mackenzie's ET:

So it showed that transfer of knowledge. So when they were doing factors, she was seeing turn around facts like we do in Calendar from students who were extremely struggling. So there was that direct, okay, they're taking the skills they're learning in this Calendar, and the same thing happened with Michelle, too.

Thus, both Meg and Mackenzie perceived that students improved their understanding of the Calendar Math content.

Furthermore, Meg perceived additional benefits not stated by Mackenzie, including the following: (1) Calendar Math positively impacted students' confidence in mathematics ("They're going in there with a sense of confidence, with a sense of 'I know what I'm doing'"); (2) Mackenzie found her questioning strategies helpful ("I think the questioning techniques she got a lot out of, you know?"); (3) Mackenzie gained exposure to faster pacing ("I think the pacing she got a lot out of, 'cuz as you've seen…it's a lot in a short period of time"); and (4) Meg broadened her impact ("What I've started here and the data that we've collected here has taken notice on a district level").

In summary, Meg and Mackenzie agreed that students improved their understanding of the Calendar Math content. Furthermore, Meg mentioned additional pedagogical benefits related to teacher questioning and pacing, and she was also happy to expand her influence.

Research Question Four: Modeling Cycle Challenges and Conditions for Meg and Mackenzie

Similar to above, I begin this section by describing emergent challenges during Meg's and Mackenzie's modeling cycle. Then, I discuss conditions mentioned by both the coach and teacher that could have helped alleviate some of these challenges.

Challenges.

Table 4.17
Modeling Cycle Challenges for Meg and Mackenzie

	Meg	Mackenzie
Content		
Using Materials Not Provided by District	x	
Management		
Establishing Relationships with Students	x	
Planning and Logistics		
Coordinating Schedules	x	x
Other		
Releasing Calendar Math	x	

Meg and Mackenzie both noted that scheduling was a challenge during their modeling cycle (see Table 4.17). While Mackenzie shared that "Even in our one month coaching cycle, five out of those days she [Meg] was out of the building," Meg stated the following:

Scheduling is always hard with me because like, yesterday, 10'o'clock, both of our admins were gone and all of the sudden I was admin, you know? I was in charge of the building, so I'm like I can't go and yeah. So scheduling is always hard for coaching cycles.

Scheduling challenges were concerning to Meg because, in her eyes, this ultimately could impact the fidelity of her coaching cycle as she wanted to consistently be in the classroom.

Furthermore, Meg discussed three additional challenges not mentioned by Mackenzie. First, Meg discussed challenges associated with using materials that had not been provided by the district: "I think that any time that you try to use something that is not necessarily district provided, you have some challenges." Second, establishing relationships with the students in Mackenzie's classroom in such a short period of time was difficult: "I think um establishing, 'cuz you only get x number of hours with a coaching cycle, so establishing those routines and things with the kids, the relationships with the kids, has to go at a much faster pace." Last, and

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arguably most important, similar to her cycle with Michelle, it was problematic for Meg to release the Calendar Math to Mackenzie:

> My biggest challenge with both situations has been, alright you guys, time for you to do it now. You know, um, because they're [Michelle and Mackenzie] both very happy letting me get up there to do it. So, I think also me being somewhat of a control freak, 'cuz I am, prevents me from releasing. So it's one of those things where it's kind of a happy medium. I have to be able to say, okay, take it and go, and they have to be able to say, okay, I'm ready to take it and go.

Releasing the modeling cycle was challenging as Mackenzie was content to let Meg be in charge and model the Calendar Math, and Meg also enjoyed being in control. Additionally, Meg hypothesized that some teachers may be hesitant to take on the teaching while the coach observed because they feared being evaluated and judged:

> I believe that the observational part is still somewhat being misconstrued as evaluative if you think about it. Any time you have somebody watch you, unless you have the right mindset, but anytime you have somebody watch or observe, somewhere in the back of your mind you think, okay they're judging me, they're evaluating me. I mean, everybody thinks that. It's human nature. So that, again, is another challenge going back to that, is to kind of reset that mindset that if I'm observing, I'm not judging. I'm not evaluating. I'm just kind of observing. And it's hard. That delineation is hard and I think that's one of the hardest things to transfer from modeling to that release is to eliminate that evaluative mindset. That, okay, if I'm not doing it exactly as good as she did that, am I going to get critiqued? And I truly believe that's a big part of it, is that people think that coaches become evaluative once they stop the modeling.

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Thus, while both the coach and teacher were concerned about scheduling, Meg described

additional challenges related to using materials not sponsored by the district, classroom

management, and releasing the cycle.

Conditions. Meg and Mackenzie each emphasized different conditions that needed to be

in place so the modeling cycle could be a success (see Table 4.18).

Table 4.18
Modeling Cycle Conditions for Meg and Mackenzie

	Meg	Mackenzie
Content		
Calendar Math Materials Needed to be in Place		x
Coach Needed Background Knowledge about Calendar Math		x
Management		
Behavior Management System Needed to be in Place		x
Planning and Logistics		
Teacher and Coach Had Consistent Expectations		x
Teacher and Coach Scheduled Planning Time		x
Contextual Factors		
Teacher and Coach Had Trusting Relationship	x	
Other		
Teacher Committed to Continue with Intervention	x	
Teacher Motivated by Right Reasons	x	

Mackenzie described five conditions that would promote a successful modeling cycle.

First, Meg had all of the Calendar Math materials and ensured everything was set up in

Mackenzie's classroom prior to starting the intervention:

> She had the manipulatives and all of the resources that we were gonna need and we had
>
> to meet and set up the room prior to us being ready to go. So, the charts that we used,
>
> those are things that people will need to have in order for it to work.

Second, it was integral that Meg already had extensive background knowledge about Calendar

Math: "Luckily, she's been coached on it, and so she was able to bring back any knowledge that

she had." Thus, the coach not only needed background knowledge about the intervention, but

she also had to provide materials that would be required to enact the intervention. These two conditions helped alleviate the challenge mentioned above by Meg about using materials not provided by the district.

Third, Mackenzie avoided challenges related to behavior management as she already had a management system in place prior to the start of the cycle:

I wouldn't say we had any challenge with students because we did the coaching cycle later in the year so the routines and schedules were already kind of set in place and the expectations of how math group went with my kids.

Fourth, Mackenzie talked about how it was essential that she and Meg had consistent expectations regarding Calendar Math to ensure that the intervention was being implemented with students in the exact same way:

I think both for the coach and for the teacher that's on the coaching cycle, there has to be a lot of communication to make sure you both are implementing it the way that you want it to go. The same expectations so that, like, yesterday she was unable to be here. So I knew exactly how the things flowed and what the expectations were for the kids and what the notebooks should look like. So, you just have to be on the same page.

This condition is related to the challenge associated with scheduling Mackenzie described above. From her perspective, scheduling did not end up being a problem as she and Meg were on the same page and had consistent expectations so that on the days Meg was absent, Mackenzie seamlessly continued with Calendar Math as the lead instructor.

Last, it was necessary that Meg and Mackenzie scheduled planning time outside of Calendar Math: "Luckily her [Meg's] schedule is so flexible that we were able to meet. But

that's one condition that's gonna need to be thought out, too, 'cuz there's going to be planning time between that teacher and the coach."

Meg, on the other hand, emphasized three different conditions not mentioned by Mackenzie. First, she described a trusting relationship that needed to be in place so that Mackenzie did not view the coaching cycle as evaluative or punitive: "Having that relationship between the teacher and the coach. You know, that it's not an evaluative thing. It's more like I'm excited to get in there, do this with your kiddos." Second, Meg stated that the Mackenzie needed to be committed to continue with the intervention even after the cycle had ended: "So that it's one of those things where it's not just you come in and teach my class for 20 minutes a day and I'll sit back here. Um, a commitment to keep trying it or doing it." This condition could help alleviate the challenge Meg described above about releasing Calendar Math back to the teacher. Last, Meg talked about Mackenzie's motivation to engage in the coaching cycle. Specifically, Meg described how Mackenzie needed to sincerely want her in there for the cycle:

> They have to really want you there….I'm not a fan of Teacher's Choice…But again, you
> know, if the teacher wants you there and wants to, I mean Mackenzie sincerely wants to
> learn how to do these better. You know?

Meg contrasted this by describing a hypothetical teacher who did not enter a coaching cycle for the right reasons: "As opposed to a teacher who's just like I have to do this. Put it on my evaluation. That, at that point, is already a wall because they're not there for the right reasons."

Hence, Mackenzie tended to focus on conditions related to materials, management and scheduling while Meg described conditions associated with the teacher's motivation and commitment, as well as her relationship with the teacher.

Summary

Overall, Meg and Mackenzie were motivated to participate in the modeling cycle by the shared reason of wanting to implement Calendar Math. Additionally, Mackenzie hoped to gain exposure to fourth-grade mathematical concepts. These motivating factors, however, did not seem to strongly influence the substance of Meg's and Mackenzie's conversations during the modeling cycle. Across the one observed planning meeting and six observed modeled lessons, the coach and teacher most frequently talked about the curriculum, activities, and materials – with a heavy emphasis on the logistics surrounding the materials. Furthermore, the perceived benefits seemed misaligned with the coach-teacher talk during the modeled lessons as Meg and Mackenzie primarily mentioned pedagogical benefits to the teacher, or content-related benefits to students. Last, the coach and teacher both reflected on scheduling-related challenges, and mentioned different conditions that could alleviate the emergent challenges. I now turn to summarize similarities and differences across both coach-teacher pairings, and discuss the depth of the coach-teacher talk, in the last section of this chapter.

Summative Analysis of the Two Pairs

As described above, Meg participated in two separate modeling cycles, initiated by teachers Michelle and Mackenzie, to implement Calendar Math in their classrooms. Meg modeled Calendar Math for six weeks in Michelle's classroom, and four and a half weeks in Mackenzie's classroom before Winter Break began (after which I did not conduct further observations). I now turn to discuss what was common and unique for the two coach-teacher pairs for each research question investigated in this study. Furthermore, while discussing how the coach and teachers engaged in the modeling cycles (Research Question Two), I examine the depth of coach-teacher talk.

Research Question One: Modeling Cycle Motivation

To answer my first research question, I drew upon pre- and post-cycle interview data to better understand what motivated the coach and teachers to engage in the modeling cycles. Table 4.19 synthesizes the motivating reasons provided by Meg, Michelle and Mackenzie.

Table 4.19
Modeling Cycle Motivation

	Meg-Michelle Cycle		Meg-Mackenzie Cycle	
	Michelle	Meg	Mackenzie	Meg
Content				
Gained Exposure to Grade-level Content			x	
Increased Students' Math Confidence			x	
Pedagogy				
Wanted to Implement Strategy[29]	x	x	x	x
Contextual Factors				
Completed Evaluation Tool		x		
Teacher Was on Improvement Plan	x			
Other				
Coach Learned About Different Teachers			x	
Played to Coach's Strengths				x

Overall, pedagogical reasons motivated all individuals to engage in the modeling cycle as Meg, Michelle, and Mackenzie wanted to implement Calendar Math. One aspect unique to Meg and Michelle was that external factors further motivated each of them to participate in the modeling cycle. Michelle was on an official improvement plan as mandated by her principal, and she hoped that completing the modeling cycle with Meg would help improve her teaching and keep her in good standing with the evaluation process. Meanwhile, Meg wanted to complete her Evaluation Tool (ET), which was a new measure of teacher and coach effectiveness being implemented by the school district that year.

While pedagogical reasons were a strong motivating factor for Meg, Michelle and Mackenzie, there are other reasons I would have expected to surface based on the literature, that ultimately did not. Current research on effective professional development reflects a consensus

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[29] Highlighted rows contain a factor mentioned across both pairs.

that there must be a focus on content (Desimone 2009; Desimone & Pak, 2017). Furthermore, current literature on high-quality mathematics instruction states that teachers must possess a deep understanding of the mathematics they teach (Martin, 2007; NCTM, 2014). Thus, I anticipated that the teachers, with the coach's support, might be more interested in enhancing their mathematics content knowledge. While Mackenzie did reference content as a motivating factor for her participation in the cycle, it was more that she wanted to gain exposure to grade-level content rather than deepen her understanding of the mathematics concepts. Overall, however, this was not a prevalent motivating factor for Meg, Michelle or Mackenzie. Additionally, current research on effective mathematics teaching promotes general pedagogical moves, such as fostering discursive communities, implementing mathematical tasks, and focusing on student thinking (Martin, 2007; NCTM, 2014). Hence, I expected that the teachers and coach would be motivated to participate in the modeling cycle to implement some of these general pedagogical teacher moves, but this was not the case.

Research Question Two: How the Coach and Teachers Engaged in the Modeling Cycle

I used transcripts and field notes generated from observations of both coach-teacher planning conversations and modeled lessons to answer my second research question regarding how the coach and teachers engaged in all aspects of the modeling cycle. Below, I begin by discussing the nature of coach-teacher talk during the planning conversations, then I move to the modeled lessons. Last, I explore the depth of all coach-teacher talk during both modeling cycles.

Planning conversation. I was invited to observe one planning conversation for each coach-teacher pairing that took place at the beginning of the modeling cycles. Across both planning conversations, Coach Meg talked more, contributing to 60% of her planning conversation with Michelle, and 62% of her planning conversation with Mackenzie. Table 4.20

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reflects the prevalence for all substance codes from the planning conversation for each pair, and

there are three trends worth highlighting.

Table 4.20
Prevalence of Substance Codes from Planning Conversations

	Meg-Michelle Cycle		Meg-Mackenzie Cycle	
	Percent Coverage [30]	Math Indicator	Percent Coverage	Math Indicator
Content				
Curriculum, Activities and Materials[31]	26%	21%[32] (6%)	26%	31% (8%)
Mathematics	0%	n/a	7%	n/a
Total	26%	23% (6%)	33%	39% (8%)
Pedagogy				
Assessment	19%	21% (4%)	22%	15% (3%)
General Pedagogy	10%	11% (1%)	4%	22% (1%)
Total	29%	17% (5%)	26%	15% (4%)
Management				
Classroom Composition and Attendance	0%	0% (0%)	1%	0% (0%)
Classroom Management	0%	0% (0%)	4%	0% (0%)
Total	0%	0% (0%)	5%	0% (0%)
Planning and Logistics				
Facilitator's Role	2%	0% (0%)	1%	89% (1%)
General Plans for Coaching Cycle	9%	32% (3%)	5%	15% (1%)
Time and Schedule	21%	0% (0%)	11%	0% (0%)
Total	32%	9% (3%)	17%	12% (2%)
Contextual Factors				
Relationship Building	0%	0% (0%)	7%	0% (0%)
External Requirements	0%	0% (0%)	1%	0% (0%)
Total	0%	0% (0%)	8%	0% (0%)
Other	14%	0% (0%)	11%	0% (0%)
Other	14%	0% (0%)	11%	0% (0%)
Total	14%	0% (0%)	11%	0% (0%)

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[30] As a reminder, Michelle's planning conversation transcript had 12,522 characters (roughly 10 pages), while Mackenzie's had 20,029 characters (roughly 16 pages).

[31] Highlighted rows contain a code that was mentioned in, on average, 10% or more of the average daily planning conversation talk for the two cycles.

[32] In the Mathematics Indicator column, the first percent represents the percent of conversation assigned the code on the left that was tagged with a Mathematics Indicator. The second percent, in parentheses, represents the percent of all conversations. This notation is consistent across both Chapters.

Planning conversation trend 1: A focus on Curriculum, Activities and Materials. First, the topic most often discussed during both coach-teacher planning conversations was Curriculum, Activities and Materials, surfacing in 26% of each conversation. However, instead of having conversations about the Calendar Math *curriculum* and/or *activities*, most (47-96%) of the planning conversation talk coded as CAM focused on the *materials* needed to enact Calendar Math (see Table N.4.1 in Appendix N).

Planning conversation trend 2: Where's the math? Second, conversations that focused primarily on mathematics content were rare, emerging in 0% of Meg's and Michelle's planning conversation, and only 7% of Meg's and Mackenzie's planning conversation (see Table 4.20 above). This seems to contrast with recommendations from current research that effective professional development should focus on content (Desimone, 2009; Desimone & Pak, 2017), and that to enact a high-quality vision of mathematics instruction, teachers should possess in-depth mathematics content knowledge (Martin, 2007; NCTM, 2014).

As previously discussed in Chapter 3, all coach-teacher talk coded as Mathematics was parsed into Coburn and Russell's (2008) low-, medium- and high-depth categories. To recall, low-depth mathematical talk primarily reflected instances when the coach and teacher used mathematical language, rules or procedures without attending to the meaning or the "why" underlying them. Medium-depth mathematical talk encompassed exchanges where the coach and teacher worked through mathematics problems together. Last, high-depth mathematical exchanges promoted meaning-making and/or substantive connections across concepts, as well as conversations about potential student misconceptions with attention to meaning. Table 4.21 reflects the depth of coach-teacher mathematical talk during the modeling planning meetings.

Table 4.21
Depth of Mathematical Talk During Modeling Planning Meetings

	Low	Medium	High
n (Segments)	3	0	3
n (Characters)	502	0	945
Overall Percentage (Character-level)	35%	0%	65%
Meg-Michelle	n/a[33]	n/a	n/a
Meg-Mackenzie	34%	0%	66%

A total of six segments were coded as Mathematics (total of 1,447 characters, or roughly 250 words). Of these segments, three of them were of high-depth, while three were of low-depth. However, the high-depth segments were lengthier than those of low depth, and so the majority (65%) of the total talk coded as Mathematics fell into the high-depth category. The three segments coded as high depth were from Meg and Mackenzie's planning conversation. To provide one example of high-depth coach-teacher talk, in the following segment, Meg talked about her desire to strengthen the connection to place value concepts when adding whole numbers:

It's place value. It's understanding that you're not just carrying over a one. You're actually carrying over 10. I know that you've heard me say this a lot. What's five tens plus two tens? Because when you're adding the tens column, it's not five plus two.

As an additional example, in the following high-depth segment, Meg hoped to strengthen the connection between repeated addition and multiplication: "Understand repeated addition for multiplication facts. Before they even, you know, count by threes or know how to go three plus three is six, plus three is nine." In both of these segments, Meg made connections across mathematical concepts in a way that could help Mackenzie make meaning, potentially providing the teacher with an opportunity to think more deeply about the mathematics she teaches.

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[33] Not applicable (n/a) means that mathematical discussions did not take place during Meg and Michelle's planning meeting.

To provide one example of a low-depth mathematical interaction, in the following exchange, Meg and Mackenzie discussed mathematical vocabulary such as "addition," but they did not attend to the meaning or definition, or explain why students must use the vocabulary word "addition" instead of "plus."

Meg: You know, like I talked about. It's not plus and minus. It's addition. But that's an easy thing for people to…

Mackenzie: You do. You fall into the habit of it or what's going to be easiest.

Overall, planning discussions that focused on mathematical meaning were rare in the modeling cycles, but did occur for one of the pairs. I now turn to discuss other ways in which math talk emerged during the modeling planning conversations.

     Mathematics Indicator. As described in Chapter 3, given the dearth of conversation that focused specifically on mathematics, I looked to see if mathematics was present in other ways. I found that Meg, Michelle, and Mackenzie sometimes used mathematical words and phrases while focusing on other issues, such as materials or assessment. These instances were coded with a Mathematics Indicator to acknowledge that a mathematical word or phrase was used, but it did not warrant being coded as Mathematics as it did not reflect a conversation specifically about content.[34] To illustrate, the following exchange was coded as General Plans for the Coaching Cycle as Meg and Michelle discussed their goals for the modeling cycle:

Meg: So what are some of your goals for this?

Michelle: That they are going to be able to see different ways of doing math. <u>Different ways of change.</u> <u>Patterns.</u> Yeah, just kind of broadening their horizons as far as math just besides the curriculum that is done during the math time.

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[34] To clarify, exchanges coded as Mathematics were not always mathematically more substantive than exchanges flagged with a Mathematics Indicator. As discussed in Chapter 3, the primary distinction between the Mathematics code and the Mathematics Indicator is that exchanges coded as Mathematics were about mathematics, while exchanges that received a Mathematics Indicator were primarily about some other topic (e.g., curriculum) but referred to mathematics (usually—but not exclusively—in cursory ways).

Meg: So more, you know, the repetitive, understanding the concepts, getting to that numeracy.

Michelle: Yes.

In addition to being coded as General Plans for the Coaching Cycle, the underlined sentences were also flagged with the Mathematics Indicator as both Meg and Michelle used mathematical words and phrases while discussing a different topic without examining the mathematical meaning. For example, in describing her goals for students, Meg used the phrase "getting to that numeracy." She did not, however, discuss what she meant by this.

During both planning conversations, the Mathematics Indicator frequently surfaced as Meg, Michelle and Mackenzie discussed the curriculum, activities and materials; assessment; and general plans for the coaching cycle (see Table 4.20 above). While engaged in CAM talk, the Mathematics Indicator most commonly emerged as the coach and teachers listed mathematical words and phrases while discussing the curriculum ("So that's like an extension of that so they're *adding*.") and materials ("Yeah, let's do these for the *vertices* and *angles*."). Regarding assessment conversations, the Mathematics Indicator chiefly surfaced as the coach and teachers listed mathematical topics on a pre-assessment ("I did a pre-assessment at the beginning of the year…which has some *elapsed time* some and stuff.") or named mathematical topics that students did not understand ("Some of 'em are not getting the *elapsed time* and some of 'em are not getting *two-digit addition*."). Last, when the Mathematics Indicator was assigned to excerpts that had already received a primary General Plans for the Coaching Cycle code, the coach and teachers most frequently named mathematical topics that would be targeted through the coaching cycle ("Well, I think what we've already talked about with the *elapsed time* and taking the day of the week and *adding* that *number* is going to be different.").

Planning conversation trend 3: Logistical discussions about Assessment. Third, although Assessment was a commonly discussed topic, the teachers and coach never co-created pre- and post-assessments that were aligned to the Calendar Math content. Instead, when engaged in discussions about Assessment, Meg, Michelle and Mackenzie most frequently discussed logistical assessment topics, such as when to give an assessment, how long it would take students to complete, and discerning which pre-existing assessment to give students (see Table N.4.2 in Appendix N).

Modeled lessons. I was invited to observe seven modeled lessons in Michelle's classroom, and six in Mackenzie's. Next, I discuss similarities and differences regarding the following: (1) how Michelle and Mackenzie enacted the teacher's role during the modeled lessons; and (2) instances of Direct and Indirect Engagement. Then, I examine the depth of all coach-teacher talk during the planning meetings and modeled lessons.

Teacher's role. Michelle and Mackenzie embodied a number of roles across the observed modeled lessons (see Table 4.22 below). Both teachers consistently observed while Meg modeled Calendar Math. However, one key difference is that Mackenzie took notes while observing while Michelle did not. Both teachers had academically-focused interactions with students about Calendar Math. Michelle did so consistently across all seven observed modeled lessons, while Mackenzie did so sporadically, in only half of the six observed modeled lessons. As described above, when the teachers had academically-focused interactions with students, most of the time it was to keep students focused on their assigned mathematical work by telling students to copy notes or revoicing something a student and/or Meg said, instead of helping students focus on the mathematical content by making a statement and/or asking a question about the content. At times, both Michelle and Mackenzie participated in the lesson in the same way

that a student would. Furthermore, Michelle and Mackenzie consistently helped Meg manage

the behaviors and materials in the classroom during Calendar Math instruction. Last, both

teachers participated in off-task behavior, with Michelle doing so more frequently than

Mackenzie, which consisted of engaging with technology and/or cleaning their classrooms.

Table 4.22
Michelle's and Meg's Roles Across All Observed Model Lessons

Lesson Number	1	2	3	4	5	6	7
Observe							
Michelle	x	x	x	x	x	x	x
Mackenzie	x	x	x	x	x	x	n/a
Take Notes							
Michelle							
Mackenzie	x	x					n/a
Have Academically-Focused Interactions with Students							
Michelle	x	x	x	x	x	x	x
Mackenzie		x	x		x		n/a
Participate in Lesson							
Michelle					x		
Mackenzie		x		x			n/a
Assist with Behavior Management							
Michelle	x	x	x	x	x	x	x
Mackenzie	x	x	x	x	x	x	n/a
Help Manage Materials							
Michelle	x	x	x	x	x	x	
Mackenzie	x	x	x	x	x		n/a
Engage in Off-Task Behavior							
Michelle	x	x	x	x	x	x	
Mackenzie			x		x	x	n/a

     Overall Coach-teacher Engagement. Table 4.23 shows the prevalence of instances of

Coach-teacher Engagement across all observed modeled lessons for both teachers. For Meg and

Michelle, the most common form of Coach-teacher Engagement was indirect (66%), specifically

when Michelle engaged with students in support of Meg as she modeled Calendar Math. For

Meg and Mackenzie, there was a 50-50 split between instances of Direct and Indirect

Engagement.

Table 4.23

Overall Coach-teacher Engagement Codes for Meg, Michelle and Mackenzie

	Meg-Michelle	Meg-Mackenzie
n	250	135
Direct Engagement	34%	50%
Indirect Engagement	66%	50%

Direct Engagement. In examining the most prevalent topics during times of Direct

Engagement, Classroom Management (19-25%) and Curriculum, Activities and Materials

(CAM) (19-28%) were in the top three for both coach-teacher pairings (see table 4.24). As with

the planning discussions, most of the CAM conversations were about the *materials* needed to

enact Calendar Math, as opposed to the curriculum and/or activities (see Table N.3 in Appendix

N).

Table 4.24

Substance Codes for Direct and Indirect Engagement of Both Pairs During Modeled Lessons

Lesson Number	Overall	Math Indicator	1	2	3	4	5	6	7
All Coach-Teacher Engagement									
Meg-Michelle	250	n/a	26	39	29	25	54	27	50
Meg-Mackenzie	135	n/a	14	34	25	28	22	12	n/a
Direct Engagement									
Content									
Curriculum, Activities & Materials									
Meg-Michelle	19%	25% (5%)	58%	11%	25%	20%	18%	10%	0%
Meg-Mackenzie	28%	16% (5%)	0%	47%	27%	35%	33%	0%	n/a
Mathematics									
Meg-Michelle	2%	n/a	0%	0%	0%	0%	0%	0%	14%
Meg-Mackenzie	3%	n/a	0%	7%	0%	5%	0%	0%	n/a
Pedagogy									
Assessment									
Meg-Michelle	12%	40% (5%)	0%	0%	13%	0%	18%	10%	36%
Meg-Mackenzie	1%	0% (0%)	0%	7%	0%	0%	0%	0%	n/a
General Pedagogy									
Meg-Michelle	0%	0% (0%)	0%	0%	0%	0%	0%	0%	0%
Meg-Mackenzie	1%	0% (0%)	0%	0%	0%	5%	0%	0%	n/a
Management									
Classroom Composition & Attendance									
Meg-Michelle	15%	0% (0%)	0%	50%	25%	0%	0%	10%	7%
Meg-Mackenzie	10%	0% (0%)	14%	13%	7%	15%	0%	0%	n/a
Classroom Management									
Meg-Michelle	25%	14% (4%)	8%	11%	25%	40%	24%	70%	21%
Meg-Mackenzie	19%	15% (3%)	43%	20%	20%	5%	0%	43%	n/a
Planning and Logistics									
Facilitator's Role									

Table 4.24

Substance Codes for Direct and Indirect Engagement of Both Pairs During Modeled Lessons

Meg-Michelle	5%	0% (0%)	0%	0%	13%	20%	12%	0%	0%
Meg-Mackenzie	3%	0% (0%)	0%	0%	7%	5%	0%	0%	n/a
General Plans for Coaching Cycle									
Meg-Michelle	0%	0% (0%)	0%	0%	0%	0%	0%	0%	0%
Meg-Mackenzie	0%	0% (0%)	0%	0%	0%	0%	0%	0%	0%
Time and Schedule									
Meg-Michelle	6%	0% (0%)	17%	0%	0%	20%	6%	0%	7%
Meg-Mackenzie	6%	0% (0%)	0%	0%	20%	0%	33%	0%	n/a
Contextual Factors									
Relationship Building									
Meg-Michelle	5%	0% (0%)	17%	6%	0%	0%	0%	0%	7%
Meg-Mackenzie	25%	0% (0%)	43%	7%	20%	30%	33%	43%	n/a
External Requirements									
Meg-Michelle	4%	0% (0%)	0%	17%	0%	0%	0%	0%	0%
Meg-Mackenzie	0%	0% (0%)	0%	0%	0%	0%	0%	0%	n/a
Other									
Other									
Meg-Michelle	7%	0% (0%)	0%	6%	0%	0%	24%	0%	7%
Meg-Mackenzie	1%	0% (0%)	0%	0%	0%	0%	0%	14%	n/a
Indirect Engagement									
Classroom Management									
Meg-Michelle	78%	n/a	93%	57%	91%	80%	78%	71%	78%
Meg-Mackenzie	91%	n/a	100%	79%	90%	100%	95%	100%	n/a
Helping Students Learn Math									
Meg-Michelle	18%	n/a	7%	33%	10%	10%	19%	24%	19%
Meg-Mackenzie	9%	n/a	0%	21%	10%	0%	5%	0%	n/a
Other									
Meg-Michelle	4%	n/a	0%	10%	0%	10%	3%	6%	3%
Meg-Mackenzie	0%	n/a	0%	0%	0%	0%	0%	0%	n/a

Direct Engagement: Where's the math? In examining the least prevalent topics during

instances of Direct Engagement, for both coach-teacher pairings, conversations about

mathematics almost never occurred (range of 2-3%) (see Table 4.24 above). Given current

professional development research referenced above, mathematics education scholars might hope

to see more mathematical conversations during the modeled lessons. This trend is similar to that

which emerged in the planning conversations – a high frequency of discussions about

curriculum, activities and materials, with a heavy emphasis on the Calendar Math *materials*, with

conversations about mathematics seldom occurring.

Similar to the planning meetings described above, all coach-teacher talk coded as

Mathematics during the modeled lessons was parsed into Coburn and Russell's (2008) low-,

medium- and high-depth categories (see Table 4.25).

Table 4.25
Depth of Mathematical Talk During Modeled Lessons

	Low	Medium	High
n (Exchanges)	3	0	1
Meg-Michelle	100%	0%	0%
Meg-Mackenzie	50%	0%	50%
Overall	75%	0%	25%

Of the four total exchanges coded as Mathematics (out of 151 total exchanges) for both

teachers across all observed modeled lessons, three of them reflected low-depth discussions

about mathematics. To provide one example of a low-depth mathematical conversation, in the

following exchange Michelle clarified something Meg said as she asked students to add:

Michelle: I thought you said ten tens.
Meg: No, we're adding nine tens.
Michelle: Right, that's what I thought. (7th lesson, 10/14/16)

There was one exchange, however, coded as high-depth that arguably involved more substantive

conversation about mathematics, embedded in a context involving money:

Mackenzie:	Yes, I did it different from you on Monday when you were at your professional development and they were very quick to say no, no. I said, ok.
Meg:	Well, the reason we do it that way, like I said, there's a very particular math language. And when you say one dollar, one dollar could be a dollar bill, it could be four quarters, it could be two half dollars, it could be ten dimes. So when you're specifically handing out change, you need to make sure you understand the difference between the coins and the actual dollar bills. (4th lesson, 9/20/17)

In this case, the coach highlights the fact that one dollar can be represented in different ways. This brief exchange was the most substantive mathematical conversation that occurred during any of the observed modeled lessons.

Mathematics Indicator. Similar to the planning conversations, the Mathematics Indicator was used while coding instances of Direct Engagement to reflect times when Meg, Michelle and Mackenzie used mathematical words and phrases while discussing other topics. The following example was coded as Classroom Management, and the underlined sentence was flagged with the Mathematics Indicator.

Michelle:	Meg, you would be very impressed with Alyssa. <u>The multiplication we were doing, she wrote it down.</u>
Meg:	Rock on girl. Awesome!
Michelle:	See, awesome!
Meg:	She got some HOT thinking going on over there. (5th lesson, 9/21/16)

Here, Meg and Michelle publically praised a student, Alyssa, for writing down a multiplication problem. Michelle used the mathematical word, multiplication, but the focus here was on encouraging the student as opposed to the mathematics involved in her multiplication problem.

For Meg, Michelle and Mackenzie, the Mathematics Indicator most commonly surfaced for instances of Direct Engagement that received a primary code of Curriculum, Activities and Materials; Assessment; and Classroom Management (see Table 4.24 above). The Mathematics Indicator was primarily assigned to CAM talk about the materials as the coach and teachers listed mathematical words and phrases without discussing the meaning: "We're getting close to

needing *hundreds,* Michelle." When the Mathematics Indicator was assigned to exchanges that received a primary Assessment code, the coach and teachers listed mathematical words when describing student understanding of the content: ("They're just manipulating these *numbers* in their heads and it's getting really impressive"). Furthermore, as illustrated with the multiplication example above on page 93, the Mathematics Indicator was primarily assigned to exchanges about Classroom Management when Meg or Michelle named a mathematical word when praising students.

     Indirect engagement. By far, the most prevalent Indirect Engagement code was Classroom Management (78-91%) as Michelle and Mackenzie helped with issues related to general student organization and discipline (see Table 4.24 above). It was far less common, especially for Mackenzie, to engage with students in a way that helped them focus on their assigned mathematical work or content.

     Overall Depth. Above, I discussed the depth of data coded as Mathematics, using Coburn's and Russell's (2008) low-, medium- and high-depth categories. Here, I use Coburn and Russell's depth categories to take stock of all of the data from the planning meetings and modeled lessons, to better understand the learning opportunities available to Teachers Michelle and Mackenzie during their modeling cycles with Coach Meg. As a reminder, according to Coburn and Russell (2008), low-depth conversations focus on surface-level structures and procedures such as the curriculum, materials and pacing, while high-depth discussions center on how students learn mathematics, underlying pedagogical concepts, and the nature of mathematics.

     As shown in Table 4.26 below, the coach and teachers primarily engaged in low-depth interactions during both the planning meetings and lessons (ranging from 81-94%). Low-depth

interactions generally reflected surface-level conversations about the materials ("Do you have a…wet wipe?"), curriculum ("With Every Day Math…do they have printables that go with it or workbooks that go with it?"), assessment logistics ("I'll do the assessments Monday when I have them for math group."), time and schedule ("What time have you scheduled us to do this?"), classroom management ("Meg, I'm going to have to take her to the office if she won't do what she needs to do."), the pronunciation of students' names ("I have no idea how to say this name."), and students who were absent/present ("I have two ladies in the bathroom that are taking way too long.").

High-depth interactions, which are believed to represent rich learning opportunities for teachers, were significantly less prevalent (range of 0-7%). When high-depth interactions did occur, they more frequently surfaced during the planning meetings, rather than modeled lessons. Examples include instances when the coach and teachers engaged in conceptually-driven conversations about mathematics ("It's understanding that you're not just carrying over a 1. You're actually carrying over a 10.") as well as discussions about underlying pedagogical principles ("The more that you can…relate the words to a specific content area, the more they're going to know when to apply them."). The striking lack of depth of the coach-teacher interactions throughout the modeling cycle raises questions about the extent to which this form of intensive, one-on-one professional development – where teachers, themselves, set the agenda – can consistently promote high-depth interactions. More on this will be discussed in Chapter 6.

Table 4.26
Modeling Depth

	Low	Medium	High
Planning Meetings			
Meg-Michelle	83%	9%	7%
Meg-Mackenzie	81%	14%	6%
Modeled Lessons			
Meg-Michelle	89%	11%	0%
Meg-Mackenzie	94%	2%	2%

Research Question Three: Perceived Benefits

For my third research question regarding the benefits of engaging in the modeling cycles, I drew upon pre- and post-cycle interview data with the coach and teachers. Table 4.27 summarizes the benefits mentioned by Meg, Michelle, and Mackenzie.

Table 4.27
Modeling Cycle Perceived Benefits for Meg, Michelle and Mackenzie

	Meg-Michelle Cycle		Meg-Mackenzie Cycle	
	Michelle	Meg	Mackenzie	Meg
Content				
Increased Students' Math Confidence				x
Students Improved Understanding of Math[35]	x		x	x
Pedagogy				
Deepened Understanding of Assessment		x		
Deepened Understanding of Student Goal Setting		x		
Teacher Gained a Different Vision of Instruction	x			
Teacher Gained Exposure to Slower or Faster Pacing				x
Teacher Improved Questioning Strategies	x	x		x
Other				
Coach Got Back Into Classroom		x		
Coach Broadened Impact				x

It seems that, from the perspectives of the coach and teachers, students increased their confidence in mathematics and enhanced their understanding of Calendar Math content. The teachers mainly benefitted in a pedagogical sense by, for example, developing deeper questioning strategies and working on their pacing. Similar to the teachers, the coach also

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[35] Highlighted rows contain a perceived benefit that was mentioned across the two pairs.

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experienced pedagogical benefits, such as learning about assessment design and student goal setting, in addition to other benefits, like returning to the classroom and expanding her influence.

While the coach and teacher discussed numerous perceived benefits from the modeling cycle, one thing they did not mention was enhanced teacher content knowledge. As instructional coaches are lauded for being examples of high-quality professional development (Desimone & Pak, 2017), and one tenet of high-quality professional development is having a content-focus (Desimone, 2009), it was expected that teachers would benefit in this way. However, this should not be surprising given that across both modeling cycles, mathematics was rarely discussed.

Research Question Four: Challenges and Conditions

To answer my last research question regarding emergent challenges and conditions that needed to be in place to help alleviate these emergent challenges, I drew upon post-cycle interview data with Meg, Michelle and Mackenzie. Table 4.28 outlines the modeling cycle challenges described by the coach and teachers. Across both cycles, one commonly cited challenge included coordinating schedules between the coach and teachers. In addition, for both cycles, Meg discussed challenges related to releasing Calendar Math back to the teachers so that they assumed primary responsibility for leading instruction. One curious finding is that Meg only discussed a lack of teacher engagement for her cycle with Michelle, although as described above when talking about the various roles enacted by the teachers during Calendar Math instruction, both teachers engaged in off-task behavior, signaling a lack of engagement.

Table 4.28
Modeling Cycle Challenges for Meg, Michelle and Mackenzie

	Meg-Michelle Cycle		Meg-Mackenzie Cycle	
	Michelle	Meg	Mackenzie	Meg
Content				
Getting Calendar Math Up and Running	x			
Using Materials Not Provided by District				x

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Table 4.28
Modeling Cycle Challenges for Meg, Michelle and Mackenzie

	Michelle	Meg	Mackenzie	Meg
Management				
Establishing Relationships with Students				x
Managing Classroom Behaviors			x	
Planning and Logistics				
Coordinating Schedules[36]	x		x	x
Other				
Lack of Teacher Engagement		x		
Ensuring Teacher Follow Through	x	x		
Releasing Calendar Math		x		x

The coach and teachers discussed significantly different conditions that need to be in place in order to promote the success of the cycle (see Table 4.29). The teachers, on the one hand, talked about very practical considerations, such as making sure the Calendar Math materials were in place and that the teachers and coach had time in their schedules to meet and plan. The coach, on the other hand, primarily talked about conditions related to the teacher, including implementing an accountability system at the start of the cycle to ensure that the teacher would continue with the intervention after the cycle ended and making sure the teacher was motivated by the right reasons to engage in the modeling cycle.

Table 4.29
Modeling Cycle Conditions for Meg, Michelle and Mackenzie

	Meg-Michelle Cycle		Meg-Mackenzie Cycle	
	Michelle	Meg	Mackenzie	Meg
Content				
Materials Needed to be in Place[37]	x		x	
Adequate Knowledge About Calendar Math	x		x	
Management				
Behavior Management System Needed to be in Place		x	x	
Planning and Logistics				
Coach and Teacher Had Consistent Expectations			x	
Coach and Teacher Scheduled Planning Time			x	
Contextual Factors				
Coach and Teacher Had Trusting Relationship				x

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[36] The highlighted rows contains a challenge that was mentioned across both pairs.

[37] Highlighted rows contain a condition that was reported across both pairs.

Table 4.29
Modeling Cycle Conditions for Meg, Michelle and Mackenzie

Other		
Teacher Accountability System in Place	x	
Teacher Committed to Continue with Intervention		x
Teacher Motivated by Right Reasons		x

Hence, the findings presented in this chapter illustrate how Coach Meg supported two different teachers in one-on-one settings through the practice of modeling. As previously mentioned, coaching is a rather expensive form of professional development and when coaches make the decision to work with individual teachers, this potentially decreases the amount of time they spend supporting groups of teachers. Hence, it is important to understand how coaches can effectively engage in these one-on-one forms of professional development to ensure they are consistently maximizing their time. While the literature suggests that teachers need opportunities to learn about content and pedagogy through mathematics professional development, from these two coach-teacher pairings, we found that the teachers had few opportunities to discuss and learn about mathematics. While the coach and teachers did engage in pedagogical discussions, it was mostly logistical as they talked about when to give an assessment, how long it would take, etc. Furthermore, we learned that most of the coach-teacher talk during both modeling cycles lacked depth, often focusing on materials, logistics, and classroom management.

In the next chapter, I discuss co-teaching, another common form of one-on-one professional development enacted by coaches as they engage with teachers. I explore how Coach Claire engaged in co-teaching cycles with Teachers Cathy, Caroline and Cecilia to implement various aspects of guided mathematics instruction, and highlight whether these trends we saw in the modeling cycles related to the substance and depth of coach-teacher talk continued with a different coach and teachers as they engaged in a different one-on-one strategy.

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CHAPTER 5:

CO-TEACHING RESULTS

The previous chapter told the story of instructional coach Meg and how she enacted

modeling cycles with elementary teachers Michelle and Mackenzie. I now turn to explore how

Claire, an instructional coach at a different elementary school in the same school district,

engaged in co-teaching cycles with Cathy, Caroline, and Cecilia, three elementary teachers in

grades 5, 4, and 2, respectively. In this chapter, I start by introducing Coach Claire and

discussing her conception of high-quality mathematics instruction. Then, I introduce each

teacher and provide a description of a typical co-teaching model enacted with that teacher. I then

draw upon interview and classroom data and present the findings for each of my research

questions, including what *motivated* the coach and teachers to engage in the co-teaching cycles,

how they together enacted the co-teaching cycles, what was *beneficial* as well as *challenging*

about partaking in the co-teaching cycles, and the *conditions* that needed to be in place to help

alleviate the challenges. At the end of the chapter, I discuss the depth of coach-teacher talk

across all three co-teaching cycles.

An Introduction to Coach Claire, Her Context, and Her Conception of High-Quality

Mathematics Instruction

An Introduction to Coach Claire

Claire had been an educator for the past 10 years. She started her teaching career in a

small town in the Midwest where she taught for two years. In her first year, she taught middle

school math, and in her second year, she taught language arts as well as 8th grade math. After,

Claire left education for two years as she became a case manager for the Division of Child and

Family Services (DCFS) and started a master's degree program in social work. After two years,

Claire quit her job with DCFS as she got a full-time position teaching 3ʳᵈ grade. During this time, Claire pursued her master's degree in administration. After four years, Claire moved to a different school in the same city. There, she had exceptional rapport with the principal and he wanted to put her in a position where she could run school programs while attending to administrative work. Thus, Claire taught computer classes to students in grades K-5; oversaw the implementation of the Compass Learning, Accelerated Reader, and Social Skills programs; and also substituted for the principal when he was absent. After one year, Claire came to her current school district and worked as an instructional coach for grades 3-5 for a year before moving schools to her current one, where – at the time of the study – she had been an instructional coach for two years.

Coach Claire's Context

In Claire's baseline interview, I asked her to describe general strategies she used to support individual teachers at her school:

> I do a lot of co-planning. I do a lot of co-teaching and then like "coaching in" is what we tend to call it because it's more allowing the teacher to do their thing and then kind of reaching in whenever we see that they are struggling, or if there's a lull, you know what I mean? Like being there as their back-up support. Um, I do a lot of, you know, just kind of fly by meetings when people need something quick and easy…if I'm working with a teacher on guided math or guided reading, I'll pull a small group here and there and while they're pulling a group so that it kind of helps. Um, I don't always do that very often because I'm—it's hard for me to dedicate and always be there.

Hence, when providing one-on-one professional development for her teachers, in general, Claire engaged in co-planning, co-teaching, "coaching in,"[38] and pulling small groups.

When asked how she decided which strategy to use with a particular teacher, Claire said that usually it was teacher-initiated.

> Most of it is prompted by the teacher through my pre-conference. And most teachers know what they're wanting out of that coaching cycle, so…I let them kind of guide it and I'm just there as a support because I don't want…to inflict so much of my own stuff on them that they don't feel like it's their own.

Claire only made suggestions about which form of coaching to pursue when working with novice teachers who might need more guidance: "This is more for newer teachers who don't really know what the coaching cycle is, they'll kind of tell me what they need help with, and then I'll make suggestions." Generally speaking, however, Claire mentioned that she tried to avoid modeling: "I tend to try and lean away from the modeling. Not with everyone, but with teachers…that I know are, you know, not going to take it on."

Last, Claire reflected on what it was like working with her principal, Mr. Stacey. Overall, Claire perceived that they had a positive relationship:

> We have a very open-door kind of policy…I mean I probably touch base with him at least five times throughout every day…We work really well together because we have the same vision and we have the same expectations when it comes to student growth and learning and professional development kinds of things.

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[38] I asked Claire to further describe what she meant by "coaching in" during the baseline interview, and she said, "Its kind of a mix of modeling and co-teaching. The teacher will lead the lesson and I'll just kind of sit next to them and then if they get to a part of the lesson where…they're unsure, that's when I'll step in and kind of just take over that part and then the teacher will step back in."

This was corroborated by Mr. Stacey in his baseline interview: "Yeah, so it has been really good though. Really positive." Furthermore, Claire and Mr. Stacey described a number of ways in which they worked together to support their teachers. First, Claire and Mr. Stacey met on a weekly basis. Mr. Stacey described these meetings in his baseline interview.

> We met every Monday morning from nine until about ten-thirty, and we basically planned out all of our grade level collaborations[39]. What are we going to talk about at each collaboration?...We'd talk about professional development at the same time, too. What are some things that we notice as a staff we are needing? Is it more, is it literacy-based and what are those things? Is it math? What is it about math that our students are struggling with?

Hence, during their weekly meetings, Claire and Mr. Stacey planned grade-level collaborations as well as professional development for the entire staff. In addition to meeting once a week, the coach and teacher facilitated the bi-monthly grade-level collaborations as well as the monthly whole-staff professional development. I now turn to discuss Claire's perception of high-quality mathematics teaching.

Coach Claire's Conception of High-Quality Mathematics Instruction

When probed in her baseline interview, Claire described three aspects of high-quality mathematics instruction that she would expect to see in a classroom. First, Claire expected to see small group instruction.

> I am a huge proponent of small groups, especially when it comes to math because kids are at such varying levels. So, the model I did when I was in the classroom that I really liked is I would do a 20-30 minute whole group lesson… and then the remainder of the

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[39] During grade level collaborations, groups of teachers from each grade level come together twice a month for professional development facilitated by the coach and principal.

time I had math stations and I was pulling small groups. That way, you know, if it was a

group that just didn't get my instruction during whole group, I could reteach it. Or if it

was a group that was so low that they weren't even going to grasp it, I could teach

something at their level to try and build for it. So, um, you know if we were teaching, I

taught 3rd grade, so if multiplication was something that we were covering, then with that

super low group, I may just focus on that repeated addition.

Hence, Claire viewed small group instruction as beneficial as it enabled her to differentiate her

mathematics instruction to meet all students' needs.

Second, Claire talked about student engagement which meant that, according to her,

students were "actively doing something. Um, whether it be, you know, working on a problem

on a white board. Or, um, you know thumbs up if you're with me." Last, Claire mentioned the

mathematics content: "And then, of course, that the content is appropriate for the grade level."

In summary, Coach Claire had a positive working relationship with her principal and

enjoyed working at her current school. The remainder of this chapter is organized by coach-

teacher pairing. For each, I start by describing the teacher and providing a brief overview of her

co-teaching cycle with Coach Claire. Then, I use my four research questions, referenced above,

as a lens to explore the data. Similar to Chapter 4, as the data gathered for my second research

question regarding how the coach and teachers engaged in the co-teaching cycles was richer and

more complex than the interview data used to answer questions one, three and four, more space

and focus was given to question two's results for all pairings. Last, in the summary at the end of

the chapter, I discuss the depth of coach-teacher talk across all three co-teaching cycles.

Coach-teacher Pairing: Claire and Cathy

An Introduction to Teacher Cathy

Cathy had been an elementary educator for the past 11 years. She started her teaching career in a rural, Midwestern town where she taught 3rd and 5th grades for nine and three years, respectively. As Cathy was in her second year of teaching 5th grade at her current school at the time of the study, she was not tenured just yet because she was new to the district. Cathy's bachelor's degree was in Elementary Education, and her master's degree was in Curriculum and Instruction. The previous school year, Cathy engaged in coaching cycles with Coach Claire. Thus, from her perspective, they had already established a good professional relationship: "I feel like we work really well together."

Co-teaching Cycle Overview

Cathy's co-teaching cycle with Claire started at the beginning of the 2016-2017 school year and lasted for nine weeks. Throughout their cycle, Cathy and Claire consistently had planning meetings, which will be described below, to plan upcoming co-taught lessons. The planning meetings, which lasted an average of 30 minutes, typically took place in Cathy's classroom during her prep period while students were at specials. The co-taught lessons, lasting an average of one hour and six minutes, took place at 11 AM each morning, which was the time at which Cathy normally taught mathematics. Claire and Cathy engaged in brief, informal reflection conversations at the end of each co-taught lesson. For this study, I observed three planning conversations, three co-taught lessons and one informal reflection conversation that all took place within the first month of the nine-week coaching period.

Research Question One: Co-teaching Cycle Motivation for Claire and Cathy

When asked in their pre-cycle interviews about their motivation to engage in the co-teaching cycle, Claire and Cathy both shared that they primarily wanted to complete their Evaluation Tool (ET) (see Table 5.1). According to Cathy, "We're both doing our ET together.

And so we are both using my students as our evaluation data." This was also confirmed by

Cathy: "A big part of it is the ET and doing that."

Furthermore, Claire wanted to implement guided math groups ("I want to push her to do

a little bit more of the guided math."), while Cathy hoped to experience yet another successful

co-teaching cycle with her coach:

> We did some coaching cycles together, um, in guided reading and we actually did Unit 3
>
> math together last year…I think it was really successful, and Unit 3 was hard, very hard.
>
> So, um, I think it just kind of started there, really.

Building upon their previous working relationship, overall it was chiefly the ET that motivated

Claire's and Cathy's participation in this co-teaching cycle.

Table 5.1
Co-teaching Cycle Motivation for Claire and Cathy

	Claire	Cathy
Pedagogy		
Wanted to Implement Strategy	x	
Contextual Factors		
Completed Evaluation Tool (ET)	x	x
Other		
Experienced Previous Success Co-teaching		x

Research Question Two: How Claire and Cathy Engaged in the Co-teaching Cycle

To better understand how Claire and Cathy engaged in the co-teaching cycle, I first

explore the substance of three planning conversations I was invited to observe over the course of

nine-weeks. Next, I turn to the three observed co-taught lessons, exploring the various co-

teaching models enacted by Claire and Cathy, as well as how the teacher and coach engaged

direct and indirectly throughout the lessons. Last, I consider one informal reflection

conversation.

Planning conversations. As previously mentioned in Chapter 3, all planning conversations were coded with a set of 14 codes. A content analysis of three observed planning conversations demonstrated that Claire and Cathy most commonly discussed two main topics: (1) Assessment (23%); and (2) Curriculum, Activities and Materials (CAM) (23%) (see Table 5.2). Each topic is described below.

Table 5.2
Planning Meetings Substance Codes for Claire and Cathy

Planning Meeting	Overall	Meeting 1[40]	Meeting 2	Meeting 3
Assessment	23%	20%	31%	18%
Curriculum, Activities and Materials	23%	44%	7%	18%
Grouping	12%	9%	18%	9%
External Requirements	10%	1%	24%	4%
General Pedagogy	9%	7%	2%	17%
Other	7%	6%	3%	11%
Time and Schedule	7%	11%	4%	6%
Relationship Building	6%	0%	2%	16%
External Individuals	3%	8%	0%	0%
Classroom Management	1%	2%	0%	0%
Facilitator's Role	1%	1%	0%	2%
Classroom Composition and Attendance	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%
Mathematics	0%	0%	0%	0%
Technology	0%	0%	0%	0%

Claire and Cathy planning conversation theme 1: Assessment. The average percentage of talk about assessment for the three planning meetings was 23%. Most of the conversations about assessment focused on using data to inform instruction (54%) and monitoring student learning (33%) (see Table O.1 in Appendix O). These two sub-themes are explored below.

Assessment sub-theme 1: Data Informing Instruction. Most of the exchanges about assessment focused on using assessment data to inform the placement of students in small

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[40] The first planning conversation transcript contained 21,778 characters on about 18 double-spaced pages (roughly 4,000 words), the second had 9,964 characters on about 8 double-spaced pages (roughly 2,000 words), and the last had 20,071 characters on 16 double-spaced pages (about 4,000 words).

groups, creation of growth goals for small groups, and instructional plans. I now explore each topic.

Claire and Cathy selected students for placement in small groups based on assessment data. The following example illustrates this idea.

Claire: Do you think we will be able to get four groups out of the pre-test? I'm okay with that.
Cathy: One or two of our groups might be really big.
Claire: That's ok. (1st planning meeting, 8/29/16)

In addition to using data to create small groups, Claire and Cathy used data to create growth goals for small groups of students. In the following excerpt, the coach and teacher used data to develop a growth goal for one of their groups.

Cathy: And so the next group would be Allyson, Kristen and Ashley.
Claire: What do we want them to increase by?
Cathy: They have a 16, an 18, and an 11.
Claire: Do you want to say eight?
Cathy: Yeah. I'd say at least eight.
Claire: Do you want to say 10 for them?
Cathy: Yeah. (2nd planning meeting, 9/6/16)

Last, the coach and teacher also used data to inform their instructional plans. For example, the following excerpt reflects how they agreed to adjust their plans based upon students' homework.

Cathy: And we can see how they did on that homework 1.3 and if we need to readjust Thursday, we can.
Claire: Okay. Good deal. (1st planning meeting, 8/29/16)

Assessment sub-theme 2: Student Learning. In addition to engaging in logistical assessment conversations, Claire and Cathy talked about student mastery of, and readiness to engage in the content and/or curriculum. Regarding the former, the following represents a characteristic exchange.

Claire: And they did really well with expanded form the other day.
Cathy: I was really impressed, actually.

| *Claire:* | This is probably a group that I feel like has a pretty good handle on place value compared to last year. |
| *Cathy:* | Yeah, I agree. I agree. (3rd planning meeting, 9/19/16) |

Thus, the coach reflected on students' understanding of expanded form, and the coach and teacher agreed that, overall, students had a good understanding of place value concepts. Furthermore, Cathy and Claire had conversations in which they predicted if students would be ready to engage in upcoming content and/or curriculum. The following excerpt illustrates one such discussion.

| *Cathy:* | Are they going to be ready for this by then? |
| *Claire:* | I mean, they did that, they did that in 1.2. But they didn't have to draw it out. (1st planning meeting, 8/29/16) |

Here, Cathy and Claire contemplated whether students would be ready for a future lesson, and in doing so, referenced a previous lesson where students were exposed to a somewhat related concept.

Claire and Cathy planning conversation theme 2: Curriculum, Activities and Materials (CAM). Across the three planning meetings, the average daily percentage of CAM talk was 23%. As shown in Table O.2 in Appendix O, the majority (65%) of the conversations under this theme focused on the Everyday Mathematics 4 curriculum, in particular. While engaged in discussions about the curriculum, Claire and Cathy primarily talked about what students in groups should work on (51%) (see Table O.3 in Appendix O). Given its prevalence, I now briefly discuss this sub-theme further[41].

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[41] As a reminder from Chapter 3, CAM is a Level-2 code with the following sub-codes: (1) Curriculum, (2) Activities and (3) Materials. Unlike discussions about the materials, the coaches and teachers tended to talk about the curriculum in different ways. Hence, Curriculum was further parsed into the following sub-themes: (1) timing; (2) rigor; (3) what students in groups should work on; (4) perceptions of the curriculum; and (5) seeking to understand/navigate the curriculum.

CAM Sub-theme 1: What Students in Groups Should Work On. When discussing the curriculum, Claire and Cathy most frequently considered which parts students should complete while working in their small groups. For example, this exchange focuses on whether students not engaged with the teacher or coach should complete all unfinished Math Boxes, which was part of the Everyday Mathematics 4 curriculum.

Cathy:	My only hold up in this is that there is a Math Box that goes with every single lesson. And so if they're doing Math Boxes every other day, they're missing…
Claire:	Do you think they should go back and do the previous one that they missed?
Cathy:	I thought about that. Just saying do any Math Boxes that you need to do. But today's group will only have one.
Claire:	Right. But on Wednesday they'll have two.
Cathy:	So maybe up on the board, we can write the Math Box pages that they need to complete?
Claire:	Yeah. That's a good idea. (3rd planning meeting, 9/19/16)

To provide an additional example, below, Claire and Cathy discussed a game that was embedded in the Everyday Mathematics 4 curriculum that promoted fact practice.

Cathy:	I wonder if we should do that in, with either me or you the first time.
Claire:	Like, what do you mean?
Cathy:	In our small group. Since it's the first time they're playing it, just to make sure. 'Cuz it is facts.
Claire:	Yeah. (1st planning meeting, 8/29/16)

The coach and teacher decided to introduce a new game to students first in small group to ensure they understood how to play it.

Co-taught lessons. To illustrate how Claire and Cathy engaged in the three observed co-taught lessons, I first examine the various co-teaching models they enacted during instruction. Then, I turn to describe instances of Direct and Indirect Coach-teacher Engagement.

Co-teaching models. Across the three observed co-taught lessons, the most common co-teaching model utilized by Claire and Cathy was One Teach, One Assist (see Table 5.3). When enacting this particular co-teaching model, one teacher facilitated whole group instruction while

the other engaged in brief interactions with students to, for example, ask and answer questions, redirect behaviors, and/or re-explain concepts. While enacting One Teach, One Assist, just over half of the time Cathy was lead teaching while Claire assisted (see Table 5.4). In addition, Claire and Cathy also enacted Station Teaching, where each teacher worked with a small group of students, and One Teach, One Observe, where one individual facilitated whole group instruction while the other observed students.

Table 5.3
Co-teaching Models Utilized by Claire and Cathy

Lesson Number	Overall	1	2	3
Total Time (minutes)	66	68	61	70
One Teach, One Assist	65%	75%	70%	52%
Station Teaching	11%	0%	16%	17%
One Teach, One Observe	8%	0%	0%	24%
Parallel Teaching	0%	0%	0%	0%
Team Teaching	0%	0%	0%	0%
Alternative Teaching	0%	0%	0%	0%
Beginning of Lesson[42]	13%	20%	11%	8%
End of Lesson	3%	6%	4%	0%

Table 5.4
A Closer Look at One Teach, One Assist for Claire and Cathy

Lesson Number	Overall		1		2		3	
Total Time (minutes)	43		51		43		36	
	Teach	Assist	Teach	Assist	Teach	Assist	Teach	Assist
Coach Claire	42%	58%	38%	62%	30%	70%	61%	39%
Teacher Cathy	58%	42%	62%	38%	70%	30%	39%	61%

I now turn to provide a rich description of a typical segment of instruction that illustrated how Claire and Cathy engaged in the One Teach, One Assist co-teaching model during the

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[42] As a reminder from Chapter 3, I created the two additional codes Beginning of Lesson and End of Lesson to reflect times when the coach and teacher got students ready for class, or closed out class, yet did not enact a particular co-teaching model.

second observed co-taught lesson. This particular segment of instruction began approximately

12 minutes into the lesson, and lasted for about 30 minutes. To provide some context for the

classroom events that precipitated this segment of instruction, I begin by briefly summarizing the

first 12 minutes of class.

A typical One Teach, One Assist episode. As was typical in all observed co-taught

lessons, Cathy and Claire shared responsibility for getting students ready at the beginning of

class. For approximately seven minutes, Cathy passed out white boards to students, reminded

them of expectations while using white boards, and asked students to open their reference books

to page 100. Just as students were finishing getting ready for class, Cathy turned to Claire to ask

her to get started with a review so she could go and find a particular student.

Cathy:	Okay, Claire, would you maybe start on this page for a second while I go?
Claire:	Yeah, not a problem!
Cathy:	[I will] Make sure Fernando's in the right spot.

After this exchange, Cathy briefly left the room to go and find Fernando, while Claire started

with instruction. For the next six minutes, Claire engaged students in a brief review of the partial

products strategy. After returning to the classroom, Cathy circulated and provided behavioral

directives to students such as "Let's go!" and "Just wait!" She also briefly interjected while

Claire explained expanded form to help students better understand what this term meant.

Cathy:	Think about what the word expanded means. What does the word expand mean?
Violet:	To stretch it out.
Cathy:	To stretch it out, right? So, you're kind of stretching that number out. K?

At some points during this segment, Cathy also positioned herself near the front of the room to

watch Claire and students.

Approximately 12 minutes into the co-taught lesson, Claire and Cathy transitioned once

again with Cathy leading whole group instruction while Claire assisted. As previously stated,

this was the most typical arrangement during episodes of One Teach, One Assist. Cathy began

by reviewing the definition of product with students ("What does the word product mean?") and

asking them to explain the partial products strategy in their own words ("Can anybody put in

their own words why this way right here is called partial products?"). During this time, Claire

watched students from the side of the classroom and, unprompted, wrote the words "Partial

Products" on the board.

Next, Cathy modeled the problem "521 x 3" with students. Similar to Claire, she first

asked students to expand the number 521 into its place value components ("K, so the first step to

partial products means we're gonna break that number apart. Right? We're gonna expand that

number") before multiplying ("So I'm going to multiply every single one of these by three") and

adding the partial products ("And the important part like Claire said is to line up your numbers.

K? You can't write them randomly. You do have to line up your digits."). As Cathy talked

students through this problem, Claire had academically-focused interactions with students:

"Check this. Two times three is six. And then you add how many zeroes? There you go! Make

sure you line them up." After Cathy finished the problem, Claire briefly interjected to engage

students in the following check for understanding.

> Can I get a feel of how you guys… Thumbs up means I've got it, this is simple to me.
> Sideways is kind of got it, I need a little bit more work. And down is, Miss Cathy and
> Miss Claire, I may need some help.

Then, Cathy asked students to complete the problem "248 x 5" independently: "This one

is on your own. And you can solve it all the way out. And I want you to put your hand on top of

your head when you're all the way done. K?"). For approximately the next two minutes,

students worked on the problem while Claire and Cathy circulated. As was typical during

circulation events, Claire and Cathy not only checked in on students, but they also engaged in brief conversations with one another, such as the following:

Cathy:	So, I think they get the one-digit thing. But now we should do a two-digit one. And use the box. Like this.
Claire:	That's similar to lattice.
Cathy:	I'm afraid they'll confuse it with lattice.
Claire:	Yeah, I don't. Do you have to use the box?
Cathy:	I think so. 'Cuz otherwise you don't know all the numbers multiplied together. You know what I mean?

Here, the coach and teacher talked about how they wanted to engage students in a multiplication problem with a two-digit factor, using the box method to help them write out the partial products. The teachers were concerned students would confuse the box and lattice methods, but decided to show students the box method anyway as it would help them organize their work.

After Cathy reviewed the previous problem with students, she modeled the problem "43 x 26" for students, again using partial products, but this time incorporating the box method. To be proactive and ensure students did not confuse the box and lattice methods, Cathy told students the following:

So, here's a new way to do it. The only thing that can be a little bit hard about this way is that it looks very similar to lattice. But it is not the same. So I want you to look and see what some of the differences are. So, what I first want you to do is draw a box that has, that's a four square.

As Cathy guided students to set up their box, putting 40 and 3 along the top of the box. Claire interjected to ask students a question.

Claire:	Why do you think Cathy put the 40 and the 3 on top? Zaz, why do you think?
Zaz:	There's space there to write the two numbers.
Claire:	We have the same amount of spaces on the side. So, why do you think she chose the top for 43?
Dora:	43 is the first number.

Claire: Very good. Because 43 is the first number in the problem, and so you're going to put the first number on top.

Cathy continued going over the problem with students and Claire circulated, providing feedback to students such as, "Make sure you're following along."

Last, Cathy asked students to complete one problem ("32 x 75") independently: "You can try one on your own. K, ready? Raise your hand if you need help. We'll come help you." For the next five minutes, Claire and Cathy circulated, providing feedback to students as they independently practiced the box method for partial products. Cathy quickly checked in on several students while Claire focused her attention on one student in particular. For the remaining portion of this One Teach, One Assist episode, Cathy reviewed the problem that students had just completed independently and then collected white boards from students. Before they transitioned into having Claire lead teach while Cathy assisted, Cathy got students ready for Claire by telling them the following:

> We're going to show you how we're going to break you up to do some small group thing. So, I want you to pay attention because as long as both of us are in here, this is how it's going to be run from now on. So pay attention.

In summary, in this 30 minute episode demonstrating the One Teach, One Assist method, the coach and teacher were both actively involved, with the teacher leading whole-class instruction as the coach assisted. I now examine instances of Direct and Indirect Coach-teacher Engagement across all three observed co-taught lessons.

Coach-teacher engagement. Across the three observed co-taught lessons for Claire and Cathy, 71% of all instances of Coach-teacher Engagement were coded as Direct Engagement (see Table 5.5). In other words, the most prevalent way in which instances of Coach-teacher Engagement unfolded during the three observed co-taught lessons was when Claire and Cathy

engaged with one another through singular comments or brief conversations. Instances of

Indirect Engagement, when Claire or Cathy interacted with students in support of whoever was

providing lead instruction, were less prevalent (29%). I now explore the substance of examples

of Direct and Indirect Engagement.

Table 5.5
Teacher-Coach Engagement Codes for Claire and Cathy

Lesson Number	Overall	1	2	3
n	151	51	55	45
Direct Engagement	71%	75%	69%	69%
Indirect Engagement	29%	25%	31%	31%

Similar to the planning conversations, instances of Direct Engagement were coded with

one of 14 codes. A content analysis revealed the most prevalent themes were: (1) Curriculum,

Activities and Materials (CAM) (25%); and (2) Grouping (20%) (see Table 5.6). Each theme is

discussed below.

Table 5.6
Direct Engagement Substance Codes for Claire and Cathy

Lesson Number	Overall	1	2	3
n	107	38	38	31
Curriculum, Activities and Materials	25%	47%	8%	19%
Grouping	20%	3%	34%	23%
Technology	11%	11%	3%	23%
Facilitator's Role	10%	13%	8%	10%
Assessment	8%	11%	8%	6%
Relationship Building	8%	3%	18%	3%
Mathematics	4%	5%	5%	0%
Other	4%	5%	3%	3%
General Pedagogy	4%	3%	3%	6%
Classroom Composition and Attendance	2%	0%	3%	3%
Classroom Management	2%	0%	5%	0%
Time and Schedule	2%	0%	3%	3%
External Requirements	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%

Claire and Cathy Direct Engagement theme 1: Curriculum, Activities and Materials

(CAM). Across the three co-taught lessons, the average daily percentage of CAM talk was 25%.

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In particular, most of the conversations about CAM focused on the curriculum and activities (67%), as opposed to the materials (see Table O.4 in Appendix O). While engaged in discussions about the curriculum and activities, Claire and Cathy most frequently talked about issues related to timing (44%) and rigor (33%) (see Table O.5 Appendix O). Regarding timing, Claire and Cathy discussed the order in which they would complete the curriculum, activities, and/or mathematics problems. The following exchange illustrates how Claire and Cathy negotiated what they would do for the rest of class.

Claire: Do we want to try and have them do the first two problems since we just talked about it and then we'll go over it?
Cathy: Sure. (3rd lesson, 9/19/16)

Regarding rigor, Claire and Cathy either discussed the ease ("It's a pretty easy one.") and/or difficulty ("This is a hard lesson.") of the curriculum.

Claire and Cathy Direct Engagement theme 2: Grouping. In addition to discussing CAM, Claire and Cathy regularly talked about items related to grouping during the co-taught lessons (20%) (see Table 5.6 above). When discussing grouping, Claire and Cathy primarily (95% of the time) focused on logistics, such as those related to organizational resources needed to implement small groups and scheduling (see Table O.6 in Appendix O). For example, before transitioning into small groups during one lesson, Claire and Cathy had a brief exchange regarding the rotation schedule students would reference to understand which group they were in as well as what they should be working on.

Cathy: Maybe I'll just pull it up there. Claire, do you have a copy of the rotations or no? Should I pull it up on here?
Claire: Yeah, I was just going to pull it up from Google drive. 'Cuz I figured we could just edit it week by week in there.
Cathy: K. (2nd lesson, 9/17/16)

In addition to talking about organizational resources need to enact small group instruction, Claire and Cathy also discussed small group scheduling, such as how much time they would spend working in small groups. For example, Claire and Cathy had a conversation from across the room discussing for how long they would work with their small groups.

Claire: Cathy, do you want to do like seven minutes? Five minutes?
Cathy: That clock is slow. So, we'll have to do five.
Claire: Oh yeah. Five? Okay. (3rd lesson, 9/19/16)

Again, Claire and Cathy most often engaged directly while co-teaching, but about 1/3 of the time, they engaged indirectly. We now look at how Claire and Cathy contributed to the lessons when they were not leading instruction.

Claire and Cathy Indirect Engagement theme 1: Helping Students Learn Mathematics.

Table 5.7
Indirect Engagement Substance Codes for Claire and Cathy

Lesson Number	Overall	1	2	3
n	44	13	18	13
Helping Students Learn Mathematics	55%	54%	50%	62%
Classroom Management	39%	46%	39%	31%
Other	7%	0%	11%	8%

The most prevalent Indirect Engagement substance code was Helping Students Learn Mathematics (see Table 5.7). That is, as either Cathy or Claire engaged with students in support of the individual who facilitated whole group instruction, most of the time it was in an effort to help students access or focus on the assigned mathematical work and mathematical concepts being taught in class. Most frequently, Claire and/or Cathy either asked students a question about the content, or provided students with a hint to help them access the mathematics content being taught. The following exchange illustrates the former. Prior, Cathy asked students to create a pictorial representation for the fraction one third and, as she guided students in doing so,

talked about how there would be three pieces. Here, Claire wanted to ensure all students

understood why the whole should be equally divided into three pieces.

Claire:	How do you know it was out of three pieces? What told you it was out of three total pieces?
Students respond:	The denominator.
Claire:	The denominator. And the denominator was what?
Students respond:	Three. (1st lesson, 9/1/16)

In addition to questioning students about the mathematics content, either Claire or Cathy

provided students with a hint to help them access the mathematics content being taught in class.

For example, in the second observed co-taught lesson, Cathy, who was lead teaching while

Claire assisted, asked students to use the box method to solve the multiplication problem "43 x

26". Claire interjected to provide students with the following hint: "You might want to draw it

kind of big because you're going to be writing some numbers in there."

Other emergent, yet less prevalent sub-themes within the Helping Students Learn

Mathematics code included the following: clarifying the mathematical task for students ("You're

going to have to erase this one because we're not doing it like that. Nice job on that first one

though"), revoicing something a student and/or teacher said ("Ten million"), and providing

students with an alternative strategy:

Can I add one way to the one and one half plus one and one half? So, since we're

supposed to be doing this in our heads, this math in our heads, I thought of this as a

picture. K? And so I was thinking of like pizzas, k? And so I was thinking one and a

half pizzas plus one and a half pizzas. In my head I could picture that as three whole

pizzas, okay? So that's another way to do it, too. (1st lesson, 9/1/16)

Claire and Cathy Indirect Engagement theme 2: Classroom Management. While

Classroom Management was meant to encompass instances when the coach and teacher

redirected students' behaviors, gave out consequences, or praised students for their general behavior, for Claire and Cathy, this code was used primarily for instances related to monitoring students' use of classroom materials. The following example reflects expectations stated by Cathy about how she wanted students to clean their white boards.

And I'm going to add one more expectation for your white boards. If you could please not use your hands to erase them, because it gets the boards really gross. So I'm going to put a pile of tissues on your table. My white boards won't last very long if you erase with your hands. Like the oil on your hands doesn't work very well. So please use the tissue, okay? (1st lesson, 9/1/16)

In addition to requesting that students engage with materials in a particular way, Claire and Cathy controlled the noise level ("Raise your hand."), praised students ("Very good. Good job, Manuel."), and managed seating ("Scoot in, please.").

Claire's focus for instances of Direct and Indirect Engagement with Cathy. In the exit interview, I asked Claire what guided her as she directly and indirectly interacted with Cathy during the co-taught lessons. She shared the following:

So, with Cathy, she's a strong math teacher already. And she's super confident in it already. So, with her I know I did a lot more interjections or I have a question, or how about this, or how about this? Because I wanted to show students that, like, I wanted to bring the misconceptions out that maybe they were thinking but didn't feel comfortable asking, so, um, trying to bring those out to light and have Cathy answer them because sometimes when you are the lead teacher in that instance, you forget about those misconceptions. So, um, my interjections with her were in that context...I think a lot of our side conversations were reflection kind of pieces, or okay, they're not getting it so we

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need to adjust this, or um, you know, you take this group, I take this group. It was more

in the moment, let's make a tweak. I feel like some of our interactions were nonverbal,

too, between the two of us. Just kind of a look like, oh no, crap, they're not getting this.

So, um, knowing that by that nonverbal interaction we were on the same page and we

needed to make a change.

Hence, regarding instances of Indirect Engagement, Claire shared that she wanted to ask students

questions to address any misconceptions they may have about the mathematics being presented

in class. This is consistent with data from Table 5.7 presented above as the most frequent

Indirect Engagement code was Helping Students Learn Mathematics. Regarding instances of

Direct Engagement, Claire perceived that her interactions with Cathy were primarily about using

their impressions regarding student learning to inform instruction ("Okay, they're not getting it

so we need to adjust this.") and grouping ("You take this group, I take this group."). This is

somewhat consistent with data presented in Table 5.6. While conversations about grouping were

quite prevalent, discussions about assessment where Claire and Cathy referenced student

learning to inform their instruction were rare.

Reflection conversations. Claire typically participated in formal and informal reflection

conversations with teachers during and after a cycle. However, when I finished collecting data at

Claire's school, she still had not engaged in a formal, end-of-cycle reflection conversation with

Cathy:

I still have to schedule a post-conference with her because I haven't had time to put it in

yet. And there are a lot of unanswered questions, too, because we haven't had our final

wrap up conversation. How did it go? Is there anything you want to continue? Do you

feel like you can keep doing these things if I'm not in your classroom? But it will come.

I did, however, observe one informal reflection conversation that lasted approximately four minutes at the end of the third observed co-taught lesson. To provide some useful context, this was the first lesson in which Claire and Cathy implemented Station Teaching where each of them worked with a small group of students while the rest of the class did something else. Thus, the most prevalent emergent theme during this brief informal reflection conversation was Grouping (see Table 5.8) as Claire and Cathy primarily discussed organizational resources, such as the rotation schedule, needed to enact the small groups.

Claire:	I can edit that, so that it's just the Math Boxes and the math games and have the A and the B in there, 'cuz they don't need to see who we're pulling.
Cathy:	Right.
Claire:	Right?
Cathy:	Yeah. Yeah, they don't know who's in Group 1, Group 2. Well, they will eventually, but it doesn't really mean anything to them.
Claire:	Right. Yeah. So, I'll edit that just so that they see the two centers or whatever. Maybe with it being less busy it will be easier for them to read. And I think eventually they're going to learn I'm A group. I think it's just getting them to learn which one they're in.

Table 5.8
Reflection Conversation Substance Codes for Claire and Cathy

Substance Codes	Percent Coverage[43]
Grouping	45%
External Individuals	18%
Curriculum, Activities and Materials	16%
Other	9%
Relationship Building	9%
Time and Schedule	3%
Assessment	0%
Classroom Composition and Attendance	0%
Classroom Management	0%
External Requirements	0%
Facilitator's Role	0%
General Pedagogy	0%
General Plans for Coaching Cycle	0%
Mathematics	0%
Technology	0%

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[43] The reflection conversation transcript contained 2,897 characters on 2 double-spaced pages (roughly 600 words).

In summary, across Claire's and Cathy's three observed planning meetings, three observed co-taught lessons, and one informal reflection conversation, they most frequently discussed the curriculum needed to enact the co-taught lessons, as well as issues related to grouping. The grouping conversations are consistent with Claire's desire to help Cathy implement small guided math groups. I now turn to discuss the perceived benefits.

Research Question Three: Co-teaching Cycle Perceived Benefits for Claire and Cathy

Table 5.9
Co-teaching Cycle Perceived Benefits for Claire and Cathy

	Claire	Cathy
Pedagogy		
Coach Learned New Teaching Methods	x	
Small Groups Increased Student Engagement		x
Students Enjoyed Small Group Movement		x
Students Heard Multiple Strategies for Teaching Mathematics	x	
Students Received Individualized Instruction		x
Teacher Planned More Effectively		x
Other		
Coach Learned About Different Teachers	x	

In the post-cycle interview, I asked Claire and Cathy what they perceived to be beneficial about the co-teaching cycle (see Table 5.9). While Cathy seemed especially concerned with describing how students benefitted from the cycle, Claire primarily discussed how she benefitted.

From Cathy's perspective, students (1) enjoyed the movement afforded by the small groups; (2) received individualized instruction to meet their specific needs; and (3) increased their engagement:

I think the kids really enjoyed the movement of small groups as well as the individualization of small groups. We were able to really address issues that came up on homework or in classwork very specifically as opposed to just, you know, your tier 1 instruction. I was really able to give them some one-on-one or small group time, which is

really where they learn the best. Those kids who are not listening during whole group time, it doesn't matter who's teaching, they're not going to listen. But during small group is when you can really get some good stuff done.

Claire primarily discussed how the co-teaching cycle benefitted her. On one hand, it helped her get to know Cathy on a deeper level.

And then, you know, you just learn things about the person and you learn their limits and what you can and can't push and, you know, um, which is definitely I feel like what I learned with her about the guided math. I really think it was too much right now… I think it's the beginning of the year is super busy because she is getting to know her kids. But also this year in particular we had ET's, which were brand new... I just feel like there's a lot of new things going on this year that maybe it was encouraging her to do the guided math portion of it was, I think that had I presented it to her second semester, she maybe would have had less anxiety about taking it on.

Hence, Claire learned that encouraging Cathy to implement guided math into her instruction was perhaps too much to ask at the beginning of the year when Cathy already had a lot on her plate. On the other hand, Claire also talked about what a strong teacher Cathy is and how she learned so much about general teaching methods from co-teaching with her: "I always learn from her and her methods of teaching because I would have never thought to teach it in some of the ways she teaches it. And so I learn that from her a lot."

Research Question Four: Challenges and Conditions for Claire and Cathy

Here, I begin by discussing challenges Claire and Cathy perceived during the co-teaching cycle. Then, I turn to highlight conditions mentioned by Claire and Cathy that could perhaps help to alleviate some of these challenges.

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Table 5.10

Co-teaching Cycle Challenges for Claire and Cathy

	Claire	Cathy
Pedagogy		
Coach and Teacher Had Different Teaching Methods	x	
Planning and Logistics		
Scheduling	x	x
Cycle Length	x	
Other		
Coach Did Too Much for Teacher	x	
Ensuring Teacher Follow Through	x	x

Challenges. In the post-cycle interview, I asked Claire and Cathy to discuss challenges

from the cycle. It seemed they were both concerned about Cathy's ability to continue

implementation after cycle completion (see Table 5.10). For example, Cathy shared the

following:

> I am going to be honest. When it's just me in here, it's kind of hard because my class is
>
> kind of needy. So, with just one adult it's difficult, um because I feel like I'm giving the
>
> attention to one or two kids at the table while I've got 23 others and really five or six
>
> others need my attention, too, to be productive. So, it's hard by myself.

This was corroborated by Claire: "I get this sense from her that she doesn't feel like she can

implement it unless I'm there. And that's not, I hate leaving coaching cycles, I don't leave

coaching cycles like that because then there's no point of my work in there."

Furthermore, Claire and Cathy both mentioned the challenge of coordinating schedules.

For example, Cathy stated the following:

> Just the time to find to work with Claire…The time to not only teach together, but also
>
> the time to plan together. That was difficult. I think guided math takes a little more

planning. You don't just pick up the book and teach whole group and then assign a

workbook page…But yeah, the time would probably be the biggest challenge.

This was consistent with what Claire said in her post-cycle interview: "Being consistent with

being in her classroom. There were some weeks when I was able to be there five days a week.

And there were some weeks where I was able to be there one."

It is worth mentioning that Claire described two additional challenges stemming from the

fact that the Evaluation Tool (ET) was a significant motivating factor. First, Claire was

concerned that she did too much for Cathy:

Typically, I wouldn't have created groups and things for the teacher…I mean, we did the

groupings for the small groups together, but as far as the groupings for like the math

boxes and math games, I would typically do that with the teacher and then build the

schedule and things like that with the teacher… I kind of wonder if I did too much.

Claire felt that she needed to do more for Cathy because of the ET: "I do feel like the ET really

drove that for me a lot more with Cathy because I wouldn't have normally done that. But I felt

like I had to because I needed to do my part, number one, and number two, it was tied to my

evaluation."

Second, Claire perceived the nine-week length of the coaching period to be a challenge,

as she would normally very rarely choose to engage in a coaching cycle that long. This was,

however, influenced by the ET.

It could have been shorter. But it wouldn't even have probably lasted four weeks. But it

needed to be at least four and so we felt like we needed nine so we could have a midpoint

in there. Because if you do anything less than nine, you can't have midpoint revisions to

revise your goals if you need. So, that's why we made it nine so in case we needed to

revise those goals, we could. But it, I, very, very rarely would I have a nine week long

coaching cycle…So that's really frustrating to me because I feel like I spent so much time

with that coaching cycle that I didn't need to. But I'm also not gonna choose a teacher

that I don't feel like is as strong as I am in a content area.

In summary, Coach Claire tended to reflect on challenges associated with the fact that the ET

motivated their cycle, while Cathy was concerned about scheduling and being able to continue

implementing guided math groups after the cycle ended.

Conditions.

Table 5.11
Co-teaching Cycle Conditions for Claire and Cathy

	Claire	Cathy
Planning and Logistics		
Coordinating Schedules		x
Contextual Factors		
Being Open Minded	x	x
Coach and Teacher Had Trusting Relationship	x	
Other		
Getting Guided Math Groups Up and Running		x

In the post-cycle interview, I asked Claire and Cathy to describe conditions that needed to

be in place to ensure a successful co-teaching cycle. The coach and teacher both seemed to agree

on the importance of having the classroom teacher enter the cycle with an open mind (see Table

5.11). To illustrate, Cathy shared the following:

And I think just being able to take constructive criticism and feedback. I wouldn't call it

criticism, but just feedback about what we could do to make it better. And not stuck on

one person's way, or you know. So I think just the openness of ideas and willing to try

something new.

Furthermore, the coach and teacher each mentioned additional conditions. Cathy focused on practical conditions, such as coordinating schedules ("Maybe setting up a schedule for co-planning…so that way we can always block out that time and schedule around that") and getting guided math groups up and running ("I think modeling all of the stuff up front…Just having your materials ready"), while Claire emphasized the necessity of having a trusting relationship between the coach and teacher ("It goes back to establishing that trust with the teacher so that they understand and know that I'm not telling the principal").

Summary

Overall, Claire and Cathy had a prior relationship and mutual respect for one another – so much so, that they wanted to work together on their ET evaluation. However, their completion of the ET during the cycle posed numerous challenges. I now turn to discuss the second coach-teacher pairing for co-teaching of Claire and Caroline.

<div align="center">Coach-Teacher Pairing: Claire and Caroline</div>

An Introduction to Teacher Caroline

Caroline, a tenured elementary school teacher, had spent her entire teaching career at the elementary school where this study took place. In her first year, she taught 2nd grade, and after that moved to first grade which she taught for the past eight years. Caroline has a bachelor's degree in Elementary Education and a master's degree in Curriculum and Instruction. According to Claire, Caroline was a strong teacher and someone who, she believed, would make an exceptional instructional coach.

Co-teaching Cycle Overview

Caroline began her co-teaching cycle with Claire halfway through the fall semester of the 2016-2017 school year. Overall, their co-teaching cycle lasted for approximately two-and-a-half

weeks. This encompassed several planning meetings, which were an average of 27 minutes long and always took place in Caroline's classroom during her prep period while students were at specials. Their co-taught lessons averaged 23 minutes and commenced in the mornings right after announcements ended. Due to scheduling issues, the co-taught lessons did not take place during Caroline's normal mathematics block, which occurred in the afternoons. Additionally, Claire and Caroline engaged in two informal and one formal reflection conversation. The two informal reflection conversations, which were an average of three minutes long, took place at the end of the third and fourth observed co-taught lessons. The formal reflection conversation took place at the end of the co-teaching cycle in Claire's office and was about 24 minutes long.

Research Question One: Co-teaching Cycle Motivation for Claire and Caroline

Table 5.12
Co-teaching Cycle Motivation for Claire and Caroline

	Claire	Caroline
Pedagogy		
Needed Assistance with Differentiation	x	x
Implemented Gradual Release Process[44]	x	

Pedagogical reasons primarily motivated Claire's and Caroline's co-teaching cycle (see Table 5.12). In particular, the coach and teacher both wanted to create a differentiated mathematics writing center that students could access independently. Caroline shared the following:

> So, writing. Especially in the beginning of the year for first grade. We don't expect them
>
> to write a ton. And at this point, the kids are more hung up on their spelling and things

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[44] In this chapter, the gradual release process is primarily intended to describe the process by which the teacher scaffolds instruction so that students can eventually complete a task independently. In previous chapters, the gradual release process was also used to describe the process by which teachers assumed responsibility for teaching something independently, as part of the modeling and co-teaching continuum.

like that. So, when you get in a math center and you throw a different kind of writing at

them, they kind of, deer in headlights. I have to write in math, too? I thought we were

done with this station! I wanted to make something that was differentiated, but also

something that could be independent. That was a problem area last year in centers, so

that was kind of why we focused on it this year.

I now turn to describe how Claire and Caroline engaged in their co-teaching cycle.

Research Question Two: How Claire and Caroline Engaged in the Co-teaching Cycle

Similar to above, I begin by exploring the two observed planning meetings, and then I

turn to describe the four observed co-taught lessons, discussing the co-teaching models enacted

by Claire and Caroline, in addition to examining the ways in which they directly and indirectly

engaged with one another during the lessons. Last, I explore the substance of and contributions

made by the coach and teacher to their informal and formal reflection conversations.

Planning conversations. A content analysis of the two observed planning conversations

revealed that Claire and Caroline most frequently talked about assessment and general pedagogy

(21% each, see Table 5.13). In the space that follows, I explore each of these two themes.

Table 5.13

Planning Conversation Substance Codes for Claire and Caroline

	Overall	Conversation[45] 1	Conversation 2
Assessment	21%	11%	30%
General Pedagogy	21%	26%	16%
Time and Schedule	12%	16%	8%
Grouping	10%	10%	10%
Other	9%	7%	11%
Curriculum, Activities and Materials	8%	10%	5%
External Individuals	6%	12%	0%
General Plans for Coaching Cycle	3%	6%	0%
Facilitator's Role	2%	0%	3%
Mathematics	2%	0%	3%
Classroom Management	1%	2%	0%
External Requirements	1%	0%	1%
Relationship Building	1%	0%	2%
Technology	1%	0%	1%
Classroom Composition and Attendance	0%	0%	0%

Claire and Caroline planning conversation theme 1: Assessment. When discussing topics related to assessment, Claire and Caroline most often talked about student learning (54%) and how data informed their instructional plans (39%) (see Table O.7 in Appendix O). These sub-themes are explored below.

Student Learning. Student Learning was the most prevalent sub-theme for Assessment. That is, while engaged in conversations about assessment, Claire and Caroline most commonly discussed how students engaged with the content and/or curriculum, as well as predicted whether students would be ready to engage with the content and/or curriculum. The following exchange illustrates this idea.

Claire: So is their issue writing the words or taking it from their brain to the paper?
Caroline: Well, Lisa is a whole nother story, but Tony it's writing.
Claire: So could we draw? Could we model?
Caroline: Yes. I mean, when it's with me. That's the problem, this is kind of...

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[45] The first planning conversation transcript had 13,677 characters on 11 double-spaced pages (about 3,000 words), while the second transcript had 18,157 characters on 14 double-spaced pages (about 3,600 words).

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Claire: Independent a little bit. (1ˢᵗ planning meeting, 10/6/16)

Data Informing Instruction. Additionally, the coach and teacher talked about how they

would use data or their informal observations to inform their instruction, as well as how they

created groups. In the following example, Claire described how independent work samples

would inform how they grouped students, as well as their small group instructional plans.

Why don't we use their independent work and kind of break them up into smaller groups?

And then if these kids are ready to move on and do more, then maybe we pull them aside

and one of us will do the next step with them and that's what they can be working on.

Because you want to still push them ahead, but at the same time, you know… (2ⁿᵈ

planning meeting, 10/13/16)

Claire and Caroline planning conversation theme 2: General Pedagogy. The average

daily talk for General Pedagogy was 21%. When engaged in conversations about general

pedagogy, Claire and Caroline most often discussed the following sub-themes: (1) Planning

and/or Creating Original Materials (41%); (2) Pedagogical Principles and Practices (22%); (3)

Differentiation (17%); and (4) Gradual Release Process (16%) (see Table O.8 in Appendix O).

In the space that follows, each sub-theme will be described.

Planning and/or Creating Materials. Claire and Caroline frequently planned and/or

created original activities and/or graphic organizers that went beyond the district-provided

curriculum. In the following exchange, the coach and teacher brainstormed ideas for a template

they wanted to create for students.

Caroline: So I mean, this is easy. I could just put a prompt, build it and then show a picture
next to it right here on the, and then they write it.
...
Claire: Or plan it, build it, write it?
Caroline: What do you mean plan it?

Claire: They would have to have some sort of discussion on how they're going to do it to come up with a plan, even if it's just a discussion. (1st planning meeting, 10/6/16)

Pedagogical Principles and Practices. During their second planning meeting, Claire and

Caroline engaged in a discussion about pedagogical principles and practices. The following is an

excerpt in which they discussed their view of homework.

Caroline: They need to be kids. They need to go home and play instead of sending these things home with dry erase markers. I'm just, what do you think? I think parents liked this. But, I did this a lot last year 'cuz I was doing it for every student every week.

Claire: I would say if a parent asks you for more, then I would. But you do such a good job in here with...

Caroline: Stop, you should really be here in the afternoon.

Claire: Your groups are so focused when you have them back here. You get a lot done.

Caroline: That's, yes. I would agree with that.

Claire: So the instruction you have with them at your guided math table is so much more powerful than a lot of what you can send home. I think that's totally fine. And I think I heard somewhere that the amount of homework, I'm not, I'd always heard half of their grade or something like that, so, I don't know. But you know, if they're reading at home before bed, that's 20-30 minutes there. So, but yeah, I think that's fine. (2nd planning meeting, 10/13/16)

Differentiation. Claire and Caroline talked about how they would differentiate instruction

for students. In the following example, the coach and teacher discussed how they would modify

what two students completed on the template in an effort to differentiate.

Caroline: I think we're gonna have to make something else for them.

Claire: I do, too. Even if it's just rolling the die. Even if it's just the top part.

Caroline: And doing like we did yesterday, the unifix cubes. (2nd planning meeting, 10/13/16)

Gradual Release Process. When engaged in conversations about general pedagogy, at

times, Claire and Caroline discussed how they would enact the gradual release process so that

students could eventually complete a task independently. During the second observed planning

meeting, the coach asked the teacher about her plans to continue modeling the template for

students: "So, you're thinking model this again? But, model this part in a different way each time? Like these are options you could do?"

It is worth mentioning that, in her post-cycle interview, Claire discussed her perceptions that co-planning in this co-teaching cycle with Caroline felt different than it did with other teachers.

> I would say that there was much less co-planning. Um, and I don't know if it was because it was such a short period of co-teaching or if it was because she pretty much had everything done and she just needed that affirmation. Um, I would say almost all of our co-planning was on the fly because when we did sit down to quote un quote co-plan, it was her showing me what she thought of and me saying yeah that's great, yeah that's great…And there's a lot of times, too, where she stopped in my office back from dropping her kids off at specials…and be like okay, here's what I'm thinking. Here's where I would like to move. And so we would kind of like have a 15-minute conversation in that regard.

In summary, during their planning conversations, Claire and Caroline most commonly designed differentiated experiences for students that would help them learn more effectively.

Co-taught lessons. To illustrate how Claire and Caroline participated in the four observed co-taught lessons, I first describe the co-teaching models they enacted during instruction. Then, I analyze instances of Direct and Indirect Coach-teacher Engagement during their co-taught lessons.

Co-teaching models. Across all four observed co-taught lessons, by far the most common co-teaching model enacted by Claire and Caroline was Alternative Teaching (see Table 5.14). That is, while one teacher engaged most students in whole group instruction, the other teacher

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worked with a small group of students in the back of the room at a small table. Specifically, in

three out of the four observed co-taught lessons, Claire facilitated whole group instruction while

Caroline supported a small group of students. To illustrate a typical segment of Alternative

Teaching, I now describe one 16-minute segment.

Table 5.14
Co-teaching Models Utilized by Claire and Caroline

Lesson Number	Overall	1	2	3	4
Total Time (minutes)	23	22	27	21	23
Alternative Teaching	63%	73%	52%	64%	63%
One Teach, One Assist	13%	16%	24%	0%	10%
One Teach, One Observe	0%	0%	0%	0%	0%
Parallel Teaching	0%	0%	0%	0%	0%
Team Teaching	0%	0%	0%	0%	0%
Station Teaching	0%	0%	0%	0%	0%
Beginning of Lesson	23%	12%	22%	36%	24%
End of Lesson	1%	0%	2%	0%	3%

A typical Alternative Teaching episode. Claire and Caroline quickly got ready for the

first three minutes of class while listening to announcements. Claire passed out graphic

organizers to students while Caroline left the room briefly to make extra copies. Then, for the

next three minutes, Claire and Caroline briefly engaged in One Teach, One Assist, with Claire

leading whole group instruction while Caroline assisted. Claire asked students to write their

name and date at the top of the page, rolled the dice and got a one and six, and told students to

record these numbers on their graphic organizers. During this time, Caroline assisted by

circulating and providing academic feedback ("I know some of you are trying to come up with a

really creative and fun unit, but you just need to pick one and draw it") as well as behavioral

feedback ("You need to reset") to students. Then, the coach and teacher switched into

Alternative Teaching.

Claire and Caroline spent about 30 seconds transitioning at the beginning of their

Alternative Teaching segment as Caroline called the names of three students with whom she

would work at the macaroni shaped table in the back: "You're going to meet me at the macaroni table. I need…" Claire interrupted Caroline when she heard her mention the "macaroni table":

Claire: Macaroni table?
Caroline: Oh yeah.
Claire: I've never heard of it!
Caroline: Doesn't it look like a macaroni?
Claire: It does.
Caroline: Right? We decided it was macaroni this year instead of a kidney table.
Claire: I like that.

After this exchange, Claire resumed responsibility for facilitating whole group instruction while Caroline worked with her small group in the back. Claire began by asking students to independently create a number sentence and turn around fact using the numbers they just rolled: "I want you to try and do the number sentence and the turn around fact on your own. So take a couple of minutes and try and do that right now." While students worked, Claire assisted one student in particular, giving him with the following academic feedback:

> You got it? K, start with one and count up six. K. We're going to start with one. Let's count six up. Ready? One, two, three, four, five, six. Would it have been easier to start at six and count up one? Let's try that. Let's start at six and count up one. Ready? Six. What's one more than six? What comes after six? After six?

Here, the coach provided the student with two strategies to add six and one. After students completed the number sentence and turn around fact independently, Claire called on two volunteers to share their answers. Next, Claire modeled how to create the number story. Before doing so, she first asked one student to select the units for the number story, and the student settled on tigers. After creating the number story with students (6 tigers plus 1 tiger…), Claire asked them to draw a pictorial representation of what they did. While students completed this task, Claire circulated and provided individual feedback ("K, Tony. Look at this seven. Do you

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see how that seven is written? Can you fix your sevens to look like that?"), as well as group

feedback ("Okay, I'm coming around to make sure I see the math symbols."). As students

finished, Claire instructed them to turn in their graphic organizers, take out a book and start

reading.

While Claire facilitated whole group instruction, Caroline worked with her small group

of three students at the back table. Caroline began by providing her students with the following

rationale as to why they were working with her as opposed to staying with the rest of the class:

> Now, the reason you're over here is because you get distracted a lot and you don't finish
>
> your work. If you can finish your work, then you can do it whole group instead of with
>
> me. Do you understand? I've gotta make sure that you're working on your own, and I
>
> can do that if you're here at the table.

Before continuing, Caroline raised her voice and told a student who was in the whole group

working with Claire that it was time for him to leave class to receive services: "Eric, head on out

please!". First, Caroline asked her small group of students to write a number sentence for the

numbers one and six. While doing so, she reminded one of her students how to write the number

six: "When you do a six, you do a circle just like that and then pull it up and around. Ok?" To

help students determine the sum, Caroline provided them with a number grid, asked them to find

six on the grid and then take one "hop" to get seven.

Caroline:	I want you to find six for me. Can you find six? You got it. I see you looking right at it. Can you help him out, Sam? Where's six? Point to it. Can you find six? Nope. One, two, yes. There's six. Now, what do we have to add to it? What does it say? What do we have to add to it? What do we have to add to it? How many hops?
Students respond:	One.
Caroline:	Yes. We have to do one. So, watch me. I'm going to do it, then you're going to do it. One, you do it. Ready? Six plus one, one hop. What is it? What's one plus six?
Students respond:	Seven.

After determining the number sentence, Caroline asked her students to quickly record the turn around fact. Next, Caroline helped her students write the number story, and they selected a crab as their unit. Then, the teacher instructed her students to model the number story using unifix cubes, asking them to first put six cubes together of the same color, then add one cube of a different color, and ultimately count how many cubes there were total. Last, Caroline told her small group to draw a pictorial representation of the unifix cubes, using the same colors as they did in their concrete model. While her students completed this task, Caroline once again raised her voice to praise students who were working with Claire in the whole group:

> Wow! Boys and girls, thank you for being so respectful to not only your teachers, but your friends that are working. This is exactly what's expected. Way to go, guys! I see pencils moving. That means brains are thinking.

As Caroline finished working with her students, as was typical, she and Claire engaged in a series of brief exchanges, such as the following exchange about students' drawings of their chosen units:

Caroline: So detailed!
Claire: I know!

As students in Caroline's small group finished filling out their graphic organizers, she collected it from them and sent them back to the whole group. Before Claire left Caroline's class, they engaged in a brief informal reflection conversation (described further below), focused on how things went during the lesson and their plan for the subsequent lesson. I now turn to discuss examples of Coach-teacher Engagement.

Coach-teacher Engagement. In examining examples of Coach-teacher Engagement

across the four observed lessons, Direct Engagement was the most prevalent code (see Table

5.15). I now discuss the most prevalent themes for instances of Direct and Indirect Engagement.

Table 5.15
Coach-teacher Engagement Codes for Claire and Caroline

Lesson Number	Overall	1	2	3	4
n	72	27	9	14	22
Direct Engagement	68%	56%	89%	71%	73%
Indirect Engagement	32%	44%	11%	29%	27%

A content analysis revealed the two most prevalent themes for Direct Engagement were

(1) Assessment (28%); and (2) Curriculum, Activities and Materials (CAM) (22%) (see Table

5.16). I now discuss each theme.

Table 5.16
Direct Engagement Substance Codes for Claire and Caroline

Lesson Number	Overall	1	2	3	4
n	50	15	8	10	17
Assessment	28%	17%	50%	18%	29%
Curriculum, Activities and Materials	22%	20%	13%	45%	12%
Relationship Building	12%	0%	13%	9%	24%
Facilitator's Role	8%	8%	13%	0%	6%
General Pedagogy	8%	13%	13%	0%	6%
Grouping	8%	17%	0%	18%	0%
Time and Schedule	6%	8%	0%	0%	12%
Technology	4%	0%	0%	0%	12%
Mathematics	2%	8%	0%	0%	0%
Other	2%	8%	0%	0%	0%
Classroom Composition and Attendance	0%	0%	0%	0%	0%
Classroom Management	0%	0%	0%	0%	0%
External Requirements	0%	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%	0%

Claire and Caroline Direct Engagement theme 1: Assessment. Assessment represented

28% of the average daily talk for Claire and Caroline. Furthermore, as the coach and teacher

directly engaged with one another about assessment, they commonly discussed how data

informed their instruction (57%), and student learning (29%) (see Table O.9 Appendix O).

These sub-themes are described below.

Claire and Caroline frequently used data to inform how they created small groups, as well

as their instructional plans. For example, this brief exchange reflects how Caroline used data to

guide her placement of students in small groups.

Caroline: I don't know. I know we had talked about pulling her. But, she did one on her own in math group and it was perfect. So, I didn't pull. I pulled them over because…
Claire: Ok. (1st lesson, 10/17/16)

Here, Caroline shared with Claire that she did not place a particular student in a small group as

she correctly and independently completed a particular mathematics problem. Claire and

Caroline also used data to inform their instructional plans:

Claire: Caroline, they totally know what they're doing on this.
Caroline: Him and him, it was just checking his answer was the only problem, which I'm going to mark. Yeah.
Claire: But for the most part, they're all zooming through it.
Caroline: Yeah. I think if I take the prompts out, maybe next time…
Claire: You just do a word bank?
Caroline: Yeah. Yes. (3rd lesson, 10/21/16)

Claire began this exchange by telling Caroline that students understood how to create a turn

around fact, write a number story and draw it on their graphic organizer. In response, Caroline

wanted to take out scaffolding prompts from the graphic organizer for next time.

In addition to using data to inform their instruction, Claire and Caroline also talked about

student learning of the content, curriculum and/or activity. For example, in the following

exchange, the coach and teacher examined a student's work sample and discussed how he wrote

everything backwards.

Caroline: Look at this stuff that's starting to pop up. Perfectly backwards, everything.
Claire: Yeah.

Caroline: It's like, mirrored. He's doing that in all of his writing now. It's almost like forced dyslexia. I read about it this weekend.
Claire: Forced dyslexia?
Caroline: When you try to make the brain read too early. (4th lesson, 10/24/16)

   Claire and Caroline Direct Engagement theme 2: Curriculum, Activities and Materials (CAM). Curriculum, Activities, and Materials was the second most prevalent substance code for instances of Direct Engagement, surfacing in 22% of the average daily talk. Most CAM exchanges (82%) were related to the materials needed to enact the co-taught lessons, including manipulatives and worksheets (see Table O.10 in Appendix O). The following exchange is a typical one about manipulatives.

Claire: Caroline, where are your unifix cubes?
Caroline: Sorry, we met over here yesterday for math. (3rd lesson, 10/21/16)

In another brief exchange about materials, Claire asked Caroline where the graphic organizers were as she needed to pass them out to students.

Claire: Do you have the papers?
Caroline: Yes, they're right here on my desk. (4th lesson, 10/24/16)

   Claire and Caroline Indirect Engagement theme 1: Classroom Management. Most instances of Indirect Engagement focused on classroom management issues (see Table 5.17). For example, Claire and Caroline either used kind words with students ("Hi sweetheart. How are you? Did you miss the bus this morning? I like your jacket."), requested that students do something specific with their materials ("Just leave your book boxes right next to your chair. If you already put it back, it's no big deal. Just put it right next to your chair."), controlled the noise level ("This is a perfect voice volume that is respectful to your friends, but also to your teachers. Make sure you keep it up."), praised students ("Good job!"), and/or reminded particular students when it was time to leave the classroom ("Did you wash your hands? And then hurry down to Ms. Jenny.").

Table 5.17

Indirect Engagement Substance Codes for Claire and Caroline

Lesson Number	Overall	1	2	3	4
n	23	12	1	4	6
Classroom Management	70%	67%	100%	100%	50%
Helping Students Learn Mathematics	26%	25%	0%	0%	50%
Other	4%	8%	0%	0%	0%

Claire and Caroline Indirect Engagement theme 2: Helping Students Learn Mathematics.

The less prevalent code, Helping Students Learn Mathematics, primarily reflected times when

the coach or teacher clarified something about the mathematics task students completed. For

example, in the following example from the fourth observed co-taught lesson, as Caroline

circulated while students worked, she noticed that many students were spending too much time

generating a unique unit, which prompted her to say, "I know some of you are trying to come up

with a really creative and fun unit. But, you just need to pick one and draw it. Okay?" In

addition to clarifying the mathematics task for students, Claire and Caroline also made comments

about the content ("Zero one is one. We need the one first if you're writing 10. K?") and asked

students to write notes ("Right here, date!").

Claire's focus for instances of Direct and Indirect Engagement with Caroline. In

reflecting about her direct and indirect engagement with Caroline during the co-taught lessons,

Claire shared the following in her exit interview:

> With Caroline…her and I it was just so different because I feel like we were teaching two
>
> separate lessons. So, I think our interactions were more reflective. Here's where these
>
> kids were…Here's where I think we need to move forward for the individual groups the
>
> next day. Or even just, I'm checking in and now, this is what this group needs, right?

This reflection is consistent with data presented above in two distinct ways. First, Claire said

that she felt like she and Caroline taught two independent lessons. This compliments data

presented above in Table 5.14. As the most prevalent co-teaching model was Alternative

Teaching where Caroline worked with a group of students in the back while Claire facilitated

whole group instruction, it makes sense that Claire perceived instruction to be quite separate.

Second, Claire talked about how when she did directly engage with Caroline, it was mostly to

talk about how the students were doing ("Here's where these kids were") and how to plan

instruction to meet students' needs ("Here's where I think we need to move forward for the

individual groups the next day"). This is consistent with data reflected in Table 5.16 as the most

prevalent Direct Engagement code was Assessment, and the most common sub-code of

Assessment was Using Data to Inform Instruction.

Reflection conversations. I observed one informal and one formal reflection

conversation during Claire's and Caroline's co-teaching cycle. While the informal reflection

conversation lasted for about five minutes and took place at the end of the third observed co-

taught lesson, the 24-minute formal reflection conversation occurred in Claire's office at the end

of the two-and-a-half week co-teaching cycle. The most prevalent themes discussed during these

meetings were Assessment (35%) and General Pedagogy (33%) (see Table 5.18). Each theme

will be described below.

Table 5.18
Reflection Conversation Substance Codes for Claire and Caroline

Substance Codes	Overall	Informal[46]	Formal
Assessment	35%	25%	45%
General Pedagogy	33%	46%	19%
Other	12%	1%	22%
External Individuals	9%	14%	4%
Time and Schedule	9%	14%	3%
Classroom Composition and Attendance	1%	0%	1%
Curriculum, Activities and Materials	1%	0%	2%

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[46] The informal reflection conversation transcript contained 3,427 characters on 3 double-spaced
pages (roughly 700 words), while the formal reflection conversation transcript contained 15,241
characters on 12 double-spaced pages (about 3,000 words).

Table 5.18
Reflection Conversation Substance Codes for Claire and Caroline

Facilitator's Role	1%	0%	2%
Relationship Building	1%	0%	2%
Technology	1%	0%	2%
Classroom Management	0%	0%	0%
External Requirements	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%
Grouping	0%	0%	0%
Mathematics	0%	0%	0%

Claire and Caroline reflection conversation theme 1: Assessment. Claire and Caroline

most commonly engaged in conversations about assessment during the reflection conversations.

In particular, they frequently talked about their observations of students' learning (73%) (see

Table O.11 in Appendix O). In the following example from the informal reflection conversation,

Caroline discussed her observations of two students' knowledge of numbers beyond 13:

> They were tracing the numbers, but they didn't know what the numbers were. So, like,
>
> even if it was in order, so 1, 2, 3, 4, 5, 6 past I thought it was 13, 'cuz that's what they
>
> were showing me, past 13 was unknown. So, after 13, they were just saying like 86 even
>
> though it was 14 when it was them on their own in centers.

To provide an additional example from the formal reflection conversation, below, the coach and

teacher discussed overall student learning on an independent work sample.

Claire:	So, out of your class, it's only five kids.
Caroline:	Well, I feel like they are major outliers.
Claire:	Right. So, it's really only three. And this one is just a matter of counting and adding.
Caroline:	Yeah, she always does, like, 1, 2...
Claire:	Yeah, she counts the spot she's in instead of like a game counting on.
Caroline:	Yeah. Which is an easy fix.
Claire:	So our student work is showing that, I mean, 80% or more of the class is getting it.

Although Claire and Caroline's reflections about the lessons focused on assessment more than

other topics, General Pedagogy was a close second.

Claire and Caroline reflection conversation theme 2: General Pedagogy. When Claire

and Caroline engaged in pedagogical discussions, the vast majority of their exchanges (89%)

focused on differentiating their instruction to meet the needs of all learners (see Table O.12 in

Appendix O). For example, in the informal reflection conversation, Caroline considered taking a

different approach with two of her struggling students.

Caroline:	I think I'm going to need to do number writing with them, instead. I mean completely different.
Claire:	What about like a tracing book?

During their later formal reflection conversation, the coach and teacher had a more in-depth

conversation about how to differentiate for these two students.

Claire:	I think I would break it down for them even more and just have them focus on the number sentence and turn around fact.
Caroline:	Yeah, ok. So what if I have a bunch of different cubes built and then they just do the number sentence for each one? Or maybe I don't even build 'em. I draw them on the paper for them so that way they don't have to...
Claire:	Yep.

In summary, across the two observed planning meetings, four observed co-taught lessons,

and two observed reflection conversations, Claire and Caroline primarily talked about items

related to assessment, in particular how data informed their instructional plans, as well as student

learning of the content, curriculum, and/or activities. I now turn to discuss the perceived benefits

of the co-teaching cycle.

Research Question Three: Co-teaching Cycle Perceived Benefits for Claire and Caroline

Table 5.19
Co-teaching Cycle Perceived Benefits for Claire and Caroline

	Claire	Caroline
Pedagogy		
Students Benefitted from Gradual Release Model	x	x
Teacher Differentiated Instruction	x	x
Teacher Planned More Effectively	x	
Other		
Coach Gained Exposure to New Grade Level	x	

Table 5.19

Co-teaching Cycle Perceived Benefits for Claire and Caroline

Coach Got Back Into Classroom	x
Held Teacher Accountable	x

Claire and Caroline seemed to agree on two benefits from the co-teaching cycle (see Table 5.19). First, they said they differentiated their instruction for students, which enabled them to more effectively support their struggling students. Claire shared the following in her post-cycle interview:

> It was beneficial to the students because we were able to kind of divide and conquer, um, and that lower group of students were able to get more of that individualized attention, whereas the majority of the class didn't need it.

Furthermore, Caroline talked about how she and her students benefitted from Claire's deep pedagogical knowledge about how to differentiate instruction.

> I think Claire sees a lot from being at another school, too. So, she kind of can bring that. And it's a school that sometimes has a high amount of struggling learners. So, I think having that knowledge is really valuable of how to differentiate in a larger quantity of struggling learners. So, I think, um, I think that's really valuable.

> Second, the coach and teacher perceived that the gradual release model benefitted students. For example, Caroline noted that instead of quickly showing students the guided mathematics center once as a whole group before requiring them to do it independently, Claire and Caroline reviewed the center in parts, and then after a week of this type of focused instruction, asked students to complete it independently. Caroline said, "I think that was also good for them because it was focused and it was more of a gradual release instead of whole group and then doing it on their own. It was…bit by bit."

Furthermore, Claire and Caroline each mentioned additional perceived benefits not described by the other. Claire said that the co-teaching cycle not only enabled Caroline to plan more effectively ("For her [Caroline], it was just the bouncing of ideas and like, this is what I'm thinking, what do you think?"), but Claire gained exposure to what exemplary instruction looked like in the primary grades ("When I get to work with a strong teacher like Caroline, it builds my capacity of okay this is how it looks in first grade."). Caroline, on the other hand, said that the cycle increased accountability for her ("It also held me accountable.") and that Claire benefitted by having the opportunity to return to the classroom ("When you're removed from a classroom, I think it's good to get back in the classroom.").

Research Question Four: Challenges and Conditions for Claire and Caroline

Now, we turn to Claire's and Caroline's perspectives on challenges and conditions that might alleviate challenges.

Challenges.

Table 5.20
Co-teaching Cycle Challenges for Claire and Caroline

	Claire	Caroline
Content		
Organizing Materials		x
Pedagogy		
Next Steps for Students	x	x
Planning and Logistics		
Scheduling	x	x

In describing challenges from the co-teaching cycle, the coach and teacher seemed to agree that scheduling was difficult, as well as determining next steps for students who needed additional support. Regarding scheduling difficulties, Caroline stated the following:

She's busy, so it's hard to plan and get things settled and sometimes we have fly by conversations because that's the time we have, with our ET's and everything else going

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on… It is intentional, but I wish our planning could be a little bit more. But our schedules are completely different and it's just, it's kind of hard to make that happen.

Claire also reflected on challenges related to scheduling. On the one hand, it was problematic for Claire to consistently find time to co-plan and co-teach with Caroline due to her own hectic coaching schedule:

At the time that I was doing Caroline's cycle…I had five open coaching cycles…I had to kind of look at myself and be like, okay, I don't have time in one school day to do five coaching cycles effectively…I know they say average is three to five, but I personally think five is too many if you're really going to dig deep…So I think that during Caroline's cycle time was even more of a factor because I had so many open cycles.

On the other hand regarding scheduling, Claire perceived that there was insufficient time for the actual co-taught lessons in Caroline's classroom:

I think that a challenge in her cycle was the very limited amount of time that we had to do co-teaching. I mean, when everything was said and done it was 15 minutes tops? Maybe 10 depending on when announcements are over. And that just, it doesn't give a whole lot of time for reflection and looking at data and all of that. So, that was a challenge.

Furthermore, Claire and Caroline described how determining next steps for struggling and enrichment students was also challenging. Caroline shared the following:

With Steven and Ted, knowing that they couldn't do it so how do we problem solve for them?...I wish I would know where to go after this, you know? After this paper, okay, where are we going?...So whether it be enrichment or my students who struggle. The middle ones are fairly easy. You know, sometimes it takes re-teaching…So I don't know

where to start with them. So I think that's my struggle, where to go next…I wish we

could do more of, okay, what comes next?

While Claire and Caroline both agreed on challenges associated with scheduling and determining

next steps for students, Caroline also mentioned it was difficult organizing her materials for the

small groups.

Conditions.

Table 5.21
Co-teaching Cycle Conditions for Claire and Caroline

	Claire	Caroline
Planning and Logistics		
Coordinating Schedules		x
Contextual Factors		
Being Open Minded	x	
Coach and Teacher Had Trusting Relationship	x	x
Other		
Coach and Teacher Continuously Engaged in Reflection		x
Coach Had In-depth Knowledge of Students		x

Both Claire and Caroline seemed to agree that one integral condition that promoted a

beneficial co-teaching cycle was that they had a trusting relationship (see Table 5.21). Caroline

stated the following: "I think there's got to be a good relationship between the coach and teacher.

If I didn't trust that they had my best interest or even my school and my kids, I would not do it."

While Claire and Caroline agreed that a trusting relationship between the coach and

teacher was important, Caroline mentioned additional conditions, including setting a schedule up

front ("So, I think you need to be really intentional with your planning. You have to have set

aside time to plan… Without that it can just be chaos") and ensuring the coach had in-depth

knowledge of the social, emotional, and academic needs of her students.

I think the coach, especially, has to realize that they are coming into the teacher's

sanctuary and their world and these kids, and there has to be a meeting about, hey, after

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they've kind of figured out what they're going to do, but, hey just so you know, don't keep going back to this kid because he fishes for support or things like that. Because then I think it kind of can unravel some of your day or really knowing what they can and can't do.

Summary

Overall, pedagogical reasons motivated Claire and Caroline to engage in the co-teaching cycle as they wanted to create a differentiated mathematics writing center. This seemed to focus their conversations during the planning and reflection conversations, as well as co-taught lessons, as Claire and Caroline primarily engaged in pedagogical conversations about assessment. Furthermore, at the conclusion of the co-teaching cycle, Claire and Caroline chiefly discussed pedagogical benefits. I now turn to discuss the last coach-teacher pairing of Claire and Cecilia, before synthesizing the results for each research question across all pairings and discussing the depth of all coach-teacher talk.

Coach-teacher Pairing: Claire and Cecilia

An Introduction to Teacher Cecilia

Cecilia went to college on a sports scholarship while pursuing her credentials to teach pre-school through 3rd grade with a concentration in special education. She had five, three and two years' experience teaching kindergarten, first and third grades, respectively, before moving to her current school. When Claire contacted Cecilia about a 4th grade opening at her school, Cecilia was hesitant to apply as she had no prior experience in the intermediate grades. However, Cecilia applied, interviewed, was offered the position, and immediately accepted, as she knew that she wanted to be back in the school district where she started her career. Collectively, Cecilia has 10 years of teaching experience in kindergarten, 1st, and 3rd grade.

According to Cecilia, she had a positive personal and professional friendship with Claire. She shared the following in her post-cycle interview:

> But as far as her and I working together, I don't see any potential problems because we're friends outside of school. So, um, and we've worked together before. She wasn't my coach, but she was the intermediate coach at my last school and I was a primary teacher. But I have a good working relationship with her and a good personal relationship with her. She understands my sarcasm and where it would offend most people. She understands that I'm not being serious.

Although Cecilia had never engaged in a cycle with Claire before, Cecilia was very eager to improve her practice and actively sought out Claire's help after she was hired. Claire shared the following in her post-cycle interview: "She sought out support the minute she was hired. She was like, you're going to be in my room for math and I'm gonna need your help and I was like okay."

Co-teaching Cycle Overview

Cecilia's co-teaching cycle, which only lasted for one-and-a-half weeks, took place about halfway through the fall semester of the 2016-2017 school year. Claire and Cecilia met consistently throughout the cycle to co-plan lessons. These planning meetings, which will be described below, lasted for an average of 24 minutes and typically took place in Cecilia's classroom during either her prep or lunch periods. The co-taught lessons started at 1:10 PM (at the time Cecilia normally taught mathematics), lasted an average of 47 minutes, and were usually over by 2:00 PM. For this study, I observed four planning meetings, three co-taught lessons, and one informal reflection conversation.

Research Question One: Co-teaching Cycle Motivation for Claire and Cecilia

Table 5.22
Co-teaching Cycle Motivation for Claire and Cecilia

	Claire	Cecilia
Content		
Deepened Teacher's Mathematics Content Knowledge	x	x
Provided Teacher with Help Navigating Curriculum		x
Pedagogy		
Enhanced Teacher's Pedagogical Knowledge	x	
Students Heard Multiple Strategies for Teaching Mathematics		x
Teacher Wanted to Make Mathematics Instruction Fun for Students		x

Claire and Cecilia both agreed that a strong motivating factor was their desire to help

Cecilia deepen her mathematics content knowledge (see Table 5.22). Cecilia shared the

following:

> I asked her to come in here because of my coming into fourth grade as an intermediate
>
> teacher, coming from primary, and not feeling confident to teach them what they need to
>
> know. So, basically, a lack of understanding on my part with math.

This was consistent with what Claire discussed in her interview:

> All of her background is primary. Primary, like K-1, um, and I think maybe 3rd grade.
>
> She is not confident in her math. In her math ability in general, which turns into not
>
> being confident in her math teaching. So…that's why she wanted me to go in there.
>
> Furthermore, Cecilia mentioned additional motivating factors not stated by Claire. In

particular, she wanted help with the following: (1) navigating the district-provided curriculum

("I'm hoping to get a better understanding of the curriculum…the way that the book is organized

is confusing"); (2) making mathematics instruction fun for her students ("Whatever ideas she has

for making this much more fun than I can make it…I cannot make math fun"); and (3) exposing

students to multiple strategies to help more students understand mathematics:

When you get someone else in here teaching them, maybe she can get some of the kids I

haven't gotten… The kid that's sitting there, struggling and has been struggling while I

have been trying to teach it. She comes in and does a different way and now that kid's

got it and then I can just kind of capitalize on that from there. So, I'm hoping that we can

make this work for all the kids because all these kids are all different levels.

Thus, Cecilia expected that students, in particular those who struggled in class, would benefit

from hearing multiple mathematical perspectives.

Research Question Two: How Claire and Cecilia Engaged in the Co-teaching Cycle

Similar to the sections above, to better understand how Claire and Cecilia jointly

participated in their co-teaching cycle, I examine data gathered from four planning

conversations, three co-taught lessons, and one informal reflection conversation.

Planning conversations. A content analysis of four observed planning conversations

between Claire and Cecilia revealed the most frequently discussed themes were: (1) General

Pedagogy (25%); and (2) Curriculum, Activities and Materials (18%) (see Table 5.23). Next, I

explore each theme.

Table 5.23
Planning Meeting Substance Codes for Claire and Cecilia

Planning Meeting	Overall	1[47]	2	3	4
General Pedagogy	25%	28%	20%	28%	23%
Curriculum, Activities and Materials	18%	11%	18%	25%	16%
Other	11%	10%	9%	14%	12%
Time and Schedule	11%	20%	4%	8%	11%
Assessment	10%	6%	21%	9%	2%
Grouping	8%	10%	15%	4%	1%
Relationship Building	6%	6%	4%	7%	6%

[47] The first planning conversation transcript was 15,433 characters on 12 double-spaced pages
(about 3,000 words), the second transcript was 15,573 characters on 13 double-spaced pages
(about 3,000 words), the third transcript was 13,349 characters on 11 double-spaced pages (about
2,500 words), and the fourth transcript was 15,633 characters on 13 double-spaced pages (about
3,000 words).

Table 5.23
Planning Meeting Substance Codes for Claire and Cecilia

Facilitator's Role	4%	1%	6%	2%	7%
Mathematics	4%	0%	3%	3%	11%
External Requirements	0%	1%	0%	0%	0%
External Individuals	0%	0%	0%	0%	0%
Classroom Management	0%	0%	0%	0%	0%
Classroom Composition and Attendance	0%	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%	0%
Technology	0%	0%	0%	0%	0%

Claire and Cecilia planning conversation theme 1: General Pedagogy. While engaged in general pedagogical discussions, Claire and Cecilia most often discussed the following sub-themes: (1) planning and/or creating original materials (39%); (2) differentiating their instruction (25%); (3) and pedagogical principles and practices (24%) (see Table O.13 in Appendix O). Below, I discuss each sub-theme.

Planning and/or Creating. Claire and Cecilia regularly planned and/or created original reviews, activities, games, extensions, warm ups, etc. that went beyond the district-provided curriculum. For example, in an upcoming lesson, students would be required to complete a worksheet from the Everyday Mathematics 4 curriculum focusing on In and Out Boxes (see Figure 5.1). As part of this worksheet, students would review the In and Out Box at the top of the page, and then evaluate the three conjectures at the bottom while providing an explanation.

Figure 5.1
In and Out Boxes from Everyday Mathematics 4 Curriculum[48]

The following exchange illustrates how Claire and Cecilia planned additional examples to help

students complete this worksheet.

Claire: But I feel like we need to do an example of this with them before we give them this page.
Cecilia: Okay. So why don't, can you do the example, and then I'll do this? Or no?
Claire: Well, the example meaning this.
Cecilia: Oh, ok.
Claire: So, here's what I'm saying. Like, we put the rule box up here. And we say, okay, this is how you're going to use this rule box. I'm gonna give you, here's your in. Out. K, let's say one, three, five go in. Your rule is multiply two. K? You don't even have to really draw that if you don't want to. If I put one in, I multiply two, I get two. If I put three in, I multiply two, I get six. I think if you just go over that with them so that they know what that means.
Cecilia: They remember what this is.
Claire: Right. Then I think they'll be able to do that on their own. If, and then if you want, you could do another one with them and you could say, is this true or false? Here's your in, here's your out. You have one, three, and five. I want you to add six. Your out is, um, and then you could ask them, is this correct or not? And they have to do this. Okay, one plus six is five. Three plus six, not ten. So it's not correct. (4th planning meeting, 10/24/16)

Here, Claire planned two additional examples where students would apply a given rule to fill out

an In and Out Box, and then evaluate one that had already been filled out for them, prior to

completing the Everyday Mathematics worksheet involving In and Out Boxes.

Differentiation. When engaged in discussions about differentiation, Claire and Caroline

most commonly talked about differentiating the content, level of support and type of work

provided to different groups of students. In the following excerpt, Claire helped Cecilia think

about how she could differentiate content related to factors for groups of "high" and "low"

students.

For your lower kids, you're gonna give 'em simple problems like they have here: 12, 6,

15. For your higher kids, you could give 'em, list the factors of 127…So I think for this

lesson, that's how you can extend it for them. (1st planning meeting, 10/13/16)

Pedagogical Principles and Practices. Claire and Cecilia also engaged in discussions about pedagogical principles and practices about, for example, how to structure small group work, student-led independent work, and Number Talks. In the following excerpt, the coach and teacher debated the extent to which Cecilia implemented student-led work during her centers.

Claire:	So, you're more doing, we're not gonna call this, you're doing more like student-led work out here during your centers.
Cecilia:	I wouldn't call it student-led because I'm telling them what to do. They just get to choose what order they do it in.
Claire:	Right, that's still kind of student-led though.
Cecilia:	Well, they're in fourth grade. I feel like they should have a choice.
Claire:	So, you're giving them a to-do list?
Cecilia:	Correct. So then, another thing I was thinking is with these…
Claire:	That is similar to student-led thought. (3rd planning meeting, 10/19/16)

Thus, while Cecilia perceived that students lacked choice in her current set up, Claire felt that students still got to choose the order in which they completed activities from the teacher-provided list, thus making it similar to student-led work.

Claire and Cecilia planning conversation theme 2: Curriculum, Activities and Materials (CAM).

Across the four planning meetings, the percentage of CAM talk averaged 18% (see Table 5.23 above). In particular, Claire and Cecilia primarily discussed different aspects of the district-provided curriculum (78% of average CAM talk) (see Table O.14 in Appendix O). While conversing about the district-provided curriculum, the coach and teacher mostly sought to understand and/or navigate Everyday Mathematics 4 (44%) and to plan what students in groups should work on (28%) (see Table O.15 in Appendix O). Below, both sub-themes are discussed.

Seeking to Understand and/or Navigating the Curriculum. While engaged in CAM talk, Claire frequently helped Cecilia understand and navigate the Everyday Mathematics 4 curricula. Regarding the former, one way in which the coach and teacher acquainted themselves with the

curriculum was by reading and discussing it. For example, in an upcoming lesson, Cecilia's

students would complete a task called "Little Big" (see Figure 5.2).

Figure 5.2
"Little Big" Task from Everyday Mathematics 4 Curriculum

In the following example, Claire and Cecilia read through this task in an effort to better

understand what it was asking students to do.

Claire:	So, what is the problem?
Cecilia:	The problem is this. It's little.
Claire:	Oh shoot.
Cecilia:	I didn't print it. I'm sorry.
Claire:	Ana has two dogs. Little and Big. She has a picture of them sitting side by side. But the dogs ate most of the picture.
Cecilia:	It's this right here. It's this picture.
Claire:	Do they get to see the picture? Oh, okay. Most of the Big is now missing. She used dog treats to measure the Little's height in the picture. Starting at the floor by his paw and going up to the top of his head, Little's height is two doggie treats. Ana measured the picture of the Big in the same way before the picture was torn using the same dog treats. Big's height was six dog treats. K. Look at the picture of Little. Measure Little's height using paper clips. (3rd planning meeting, 10/19/16)
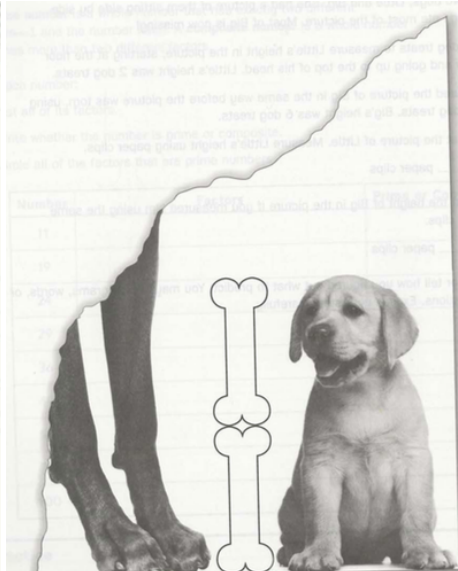
In addition to taking time to understand what the curriculum required of students, the coach also

helped the teacher navigate the curriculum. The following excerpt is a typical one in illustrating

how Claire helped Cecilia steer through the curriculum.

Claire:	So, when I go through, 'cuz EDM I think can be a little confusing, personally, when you first start using it. When I go through and look at this, I always look at the game to see if it's something that I can do whole group. And then, I don't know, some teachers like to do the whole math journal page as a group, others don't.
Cecilia:	I don't. Just pick two or three.
Claire:	Right, I think there's value in picking a couple and doing them as a group. (2nd planning meeting, 10/14/16)

What Students in Groups Should Work On. In addition to discussing the timing of the curriculum, Claire and Cecilia talked about which aspects of the curriculum students would work on while engaged in small groups. The following exchange illustrates this idea.

Claire:	And then, oh this would be good to do in a small group. This chart down here. You have to list the factors of 12 first and then the multiples. It would be a good review and then to do in small group.
Cecilia:	Sure. (1st planning meeting, 10/13/16)

Thus, the teacher and coach agreed that a chart in the curriculum would be an effective way to help students review factors and multiples while in small groups.

Co-taught lessons. To demonstrate how Claire and Cecilia engaged in the three observed co-taught lessons, I first examine the various co-teaching models they utilized during instruction. Then, I turn to describe examples of Direct and Indirect Coach-teacher Engagement.

Co-teaching models.

Table 5.24
Co-teaching Models Utilized by Claire and Cecilia

Lesson Number	Overall	1	2	3
Total Time (minutes)	46	51	46	42
One Teach, One Assist	57%	41%	41%	93%
Alternative Teaching	26%	43%	31%	0%
Team Teaching	10%	4%	25%	0%
One Teach, One Observe	0%	0%	0%	0%
Parallel Teaching	0%	0%	0%	0%
Station Teaching	0%	0%	0%	0%
Beginning of Lesson	7%	12%	4%	7%
End of Lesson	0%	6%	0%	0%

Across all three observed co-taught lessons, Claire and Cecilia most commonly enacted the One Teach, One Assist co-teaching model (see Table 5.24). That is, as one individual provided whole group instruction, the other assisted by giving academic and behavioral feedback to students. In particular, when engaged in One Teach, One Assist, most of the time Cecilia taught while Claire assisted (see Table 5.25). Claire and Cecilia also enacted Alternative Teaching (where one teacher worked with a small group of students while the other facilitated whole group instruction) and Team Teaching (where both teachers shared responsibility for teaching the whole group of students).

Table 5.25
A Closer Look at One Teach, One Assist for Claire and Cecilia

Lesson Number	Overall		1		2		3	
Total Time (minutes)	26		21		19		39	
	Teach	Assist	Teach	Assist	Teach	Assist	Teach	Assist
Coach Claire	41%	59%	78%	22%	52%	48%	15%	85%
Teacher Cecilia	59%	41%	22%	78%	48%	52%	85%	15%

As Claire and Cecilia were the only coach-teacher pairing to engage in Team Teaching, and the ways in which they enacted One Teach, One Assist and Alternative Teaching did not significantly differ from the other coach-teacher pairings, I now examine a typical enactment of Team Teaching by Claire and Cecilia.

A typical Team Teaching episode. I now focus on a Team Teaching segment that occurred during the second observed co-taught lesson. The segment lasted for approximately six minutes, and took place almost 20 minutes into the lesson. First, I briefly summarize the classroom events leading up to this Team Teaching segment before describing what took place during that period of time.

Claire and Cecilia spent the first minute and a half getting students ready for class. Next, the coach and teacher transitioned into the first part of their Number Talk, which they team taught for five minutes. Claire and Cecilia then began part two of the Number Talk, which lasted for the next six minutes. During this time, Cecilia facilitated whole group instruction while Claire assisted. After the Number Talk, the coach and teacher reviewed the concepts of factors, factor pairs, and multiples. They continued to enact One Teach, One Assist, however they changed roles as Claire facilitated whole group instruction while Cecilia assisted. During the next segment of instruction, which lasted for approximately three minutes, Claire and Cecilia remained in the One Teach, One Assist model, but once again switched roles. This time, Cecilia provided lead instruction as she reviewed the difference between prime and composite numbers while Claire assisted.

The next segment of instruction, which is the focus of this section, was team taught by Claire and Cecilia as they shared responsibility for facilitating a game that reviewed prime and composite numbers. Both teachers were positioned at the front of the classroom on either side of the SMART board. At the beginning of this segment, Claire introduced students to the rules of the game: "Miss Cecilia is gonna put a number up. If it is a prime number, you're going to cluck like a chicken…If it's a composite number, you guys are going to bark like a dog." Then, Cecilia asked students to practice clucking and barking: "Let's practice clucking like a chicken…I want you to bark like a real dog. Not a little sissy dog." Before starting the game, Claire and Cecilia had the following quick exchange:

Claire: I think we forgot which is which.
Cecilia: Yeah, we did.

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After watching students practice, the coach noticed that students could not remember whether they were supposed to bark or cluck depending on if the number was prime or composite. Claire came up with a solution.

Cecilia: Composite number…
Claire: Cluck. We'll do chicken because it starts with a "C."
Cecilia: Ok.

Next, the coach and teacher wrote a series of numbers on the board, asked students to bark like a dog if the number was prime or cluck like a chicken if the number was composite, and requested that students raise their hands and describe why the number is prime or composite. The following excerpt reflects the first example Claire and Cecilia completed with students.

Claire: Shhh. Okay. Now, look at 24. Shhh.
Cecilia: Prime or composite?
Claire: Come on, Jay, play along.
Students: Cluck, cluck, cluck! Bark, bark, bark!
Cecilia: Stop.
Claire: K. Raise your hand if you can tell us why it's composite. Oh, I said raise your hand. Ken?
Ken: It has more than one factor pair.
Claire: Right, so it has more than one factor pair. Nice job.
Cecilia: Good job.

Here, Claire and Cecilia truly shared responsibility for facilitating all aspects of instruction as they took turns asking students academically focused questions, as well as managing the classroom behaviors. As an additional example, the following excerpt represents the last problem the coach and teacher did with students.

Claire: Do you want to do one more?
Cecilia: Yep! Alright. Here we go. Give me a number.
Claire: Ah, 23.
Cecilia: Good one.
Students: Ruf ruf ruf!
Cecilia: Nice job stopping when the hands went up.
Claire: Who can tell us the factor pairs?
Cecilia: Joel?
Joel: 23 and one.

Claire:	Right. So, 23 is what? Prime or composite?
Students:	Prime.
Claire:	Prime. Nice job.
Cecilia:	Prime.
Claire:	Do you want to do, um, your one group and have the rest do…
Cecilia:	Yeah. They're moving through this quick.
Claire:	Yeah.
Cecilia:	I didn't think that it would be this quick.
Claire:	Do we want to have all of 'em do the hundreds chart then?
Cecilia:	No.
Claire:	See what they can do?
Cecilia:	Because I want to review, well, I guess we could.
Claire:	Let's see what they can do with the hundreds chart.
Cecilia:	We can see what they can do 'cuz I have extra copies of the hundreds chart.

Hence, at the beginning of this excerpt, the coach and teacher shared responsibility for engaging students in the last problem and at the end, they discussed what to do next in the lesson. The coach and teacher then transitioned into One Teach, One Assist as Claire explained the hundreds chart activity to students while Cecilia assisted.

Across this and the other two lessons observed, the coach and teacher regularly engaged with each other, both directly and indirectly.

Coach-teacher Engagement. The most frequently occurring coach-teacher Engagement code across the three observed co-taught lessons was Direct Engagement, in the form of quick comments and conversations during instruction (see Table 5.26). Instances of Indirect Engagement were less prevalent. I now turn to describe the substance of examples of Direct and Indirect Engagement.

Table 5.26
Coach-teacher Engagement Codes for Claire and Cecilia

Lesson Number	Overall	1	2	3
n	138	42	52	44
Direct Engagement	64%	67%	69%	55%
Indirect Engagement	36%	33%	31%	45%

A content analysis revealed that the most prevalent themes for instances of Direct Engagement were the following: (1) Curriculum, Activities and Materials (22%); (2) General Pedagogy (13%); (3) Facilitator's Role (11%); and (4) Relationship Building (11%) (see Table 5.27). In the space that follows, I discuss each theme.

Table 5.27
Direct Engagement Substance Codes for Claire and Cecilia

Lesson Number	Overall	1	2	3
n	88	28	36	24
Curriculum, Activities and Materials	22%	18%	22%	25%
General Pedagogy	13%	11%	13%	17%
Facilitator's Role	11%	7%	17%	8%
Relationship Building	11%	14%	14%	4%
Assessment	9%	7%	14%	4%
Other	9%	11%	6%	13%
Technology	8%	4%	3%	21%
Classroom Management	5%	7%	6%	0%
Grouping	5%	11%	0%	4%
Time and Schedule	3%	7%	0%	4%
Classroom Composition and Attendance	2%	0%	6%	0%
Mathematics	2%	4%	4%	0%
External Requirements	0%	0%	0%	0%
External Individuals	0%	0%	0%	0%
General Plans for Coaching Cycle	0%	0%	0%	0%

Curriculum, Activities and Materials. CAM was the most prevalent theme of Claire's and Cecilia's direct exchanges, surfacing in 22% of their average daily talk while co-teaching. When engaged in CAM talk, Claire and Cecilia discussed the curriculum and activities (53%) slightly more than they did the materials (47%) (see Table O.16 in Appendix O). While discussing the curriculum and/or activities, the coach and teacher either talked about issues related to timing (60%) or what students in small groups should work on (30%) (see Table O.17 in Appendix O). Regarding the former, the following exchange demonstrates how Claire and Cecilia sequenced their activities for that day:

Claire: Why did you hand me these?
Cecilia: 'Cuz aren't we defining a factor pair and a factor today?

Claire:	Yes, but I'm doing my Number Talk first. Right?
Cecilia:	Well, I'm just trying to be prepared is all.
Claire:	Ha ha ha. And then you're doing the house, right?
Cecilia:	Forgot about the house!
Claire:	Oh shoot. Good thing I reviewed our notes.
Cecilia:	Good thing you did 'cuz I didn't take any. 'Cuz you know I don't take any.
Claire:	Ha ha ha. (1st lesson, 10/17/16)

Here, the teachers agreed to start with a Number Talk, and then complete a house activity where they reviewed factors, factor pairs, and multiplication fact families. In addition to sequencing activities, Claire and Cecilia also sequenced mathematical problems and/or examples to be used with students. For example, Claire and Cecilia had the following brief exchange:

Cecilia:	Can we actually go back to that 12 you had up there?
Claire:	Yeah. (2nd lesson, 10/19/16)

Here, the teacher wanted to return to a previous example as she engaged students in a review of factor pairs. In addition to having discussions about sequencing, Claire and Cecilia also talked about what students in small groups should work on.

Cecilia:	I'm doing this with these kids here and then the on-level kids are gonna start it. Whatever.
Claire:	So, do you want me to pass this out to all of them?
Cecilia:	Yes, um, yes. And then when they're done they can get on Prodegy [a computer game]. (1st lesson, 10/17/16)

General Pedagogy. General pedagogical discussions represented 13% of the average daily talk for Claire and Cecilia. While engaged in general pedagogical discussions, the coach and teacher either (1) planned and/or created original activities, games, reviews, and mathematical examples (55%); or (2) discussed pedagogical principles and practices (36%) (see Table O.18 in Appendix O). To illustrate the former, the following exchange reflects how Claire and Cecilia planned a review activity for students about products, factors, and factor pairs.

Claire:	Look. Here's your house, right?
Cecilia:	Yeah, multiplication in the house. And I'm showing 'em how to move it from multiplication to division? 'Cuz we've done that.

Claire:	No, just multiplication. 'Cuz we're just doing factors and factor pairs. So, how would you do an addition house? Just a triangle?
Cecilia:	An addition house?
Claire:	Yeah.
Cecilia:	I would do a fact triangle. Like this.
Claire:	Okay, okay.
Cecilia:	So, then like your answer is 11. 6, 5.
Claire:	K. So, let's just take the subtraction out of this and introduce it like this. (1st lesson, 10/17/16)

Here, Cecilia compared the multiplication house, an analogy embedded in the curriculum, to an addition fact triangle. The coach and teacher agreed to start their review by showing students a fact triangle for the addition fact family five, six, and 11. Then, they would relate this to multiplication and provide students with a multiplication fact family while reviewing the words product, factor and factor pair.

In addition to planning and/or creating original activities, games, reviews, and mathematics examples, at times, the coach and teacher discussed pedagogical principles and practices, which were typically prompted by Cecilia asking Claire a question. For example, during the second observed co-taught lesson, Claire was leading a Number Talk and asked students to hold their thumbs up to their chest when they had the answer. Cecilia asked Claire, "How many thumbs do you usually wait for?"

Facilitator's Role. Claire and Cecilia occasionally conversed as they negotiated the role each of them played in relation to the other. As an example, Claire, who was facilitating a whole group review as Cecilia assisted, asked Cecilia if she wanted to engage students in an example:

Claire:	Do you want to try one?
Cecilia:	Sure. Of course I do.
Claire:	Of course. (2nd lesson, 10/19/16)

After this exchange, the coach and teacher switched roles, with Cecilia leading instruction and Claire assisting.

Relationship Building. Last, Relationship Building reflected instances when Claire and Cecilia showcased their friendship. This encompassed interactions when they joked around, such as the following exchange.

Cecilia: Did I tell you my old as mold story, Claire? Peter googled how old is mold. He asked me how old I was, and I said old as mold. And I was lookin' at his Chromebook and in his search thing it said how old is mold.
Claire: Did he find out? It's really old, isn't it?
Cecilia: He didn't figure it out. We couldn't get it. Could we, Peter? So I guess you'll just have to settle with I'm 18.
Claire: Ha ha ha. Ok, ok, ok. (2nd lesson, 10/19/16)

In addition to joking around with one another, Claire and Cecilia also expressed appreciation to each other ("Cool! Thanks!").

Claire and Cecilia Indirect Engagement theme 1: Classroom Management.

Table 5.28
Indirect Engagement Substance Codes for Claire and Cecilia

Lesson Number	Overall	1	2	3
n	50	14	16	20
Classroom Management	60%	69%	56%	60%
Helping Students Learn Mathematics	34%	23%	38%	40%
Other	6%	15%	6%	0%

The most common Indirect Engagement substance code was Classroom Management (see Table 5.28). That is, as either Claire or Cecilia interacted with students while the other teacher facilitated whole group instruction, most of the time it was in an effort to help with aspects related to managing a classroom. Claire and Cecilia either requested that students engage in a particular way with their materials ("Put that down. Nobody said to get a white board out."), controlled the noise level in the room ("Shhh. Don't blurt it. You know what? Treat it like a Number Talk. Put your thumb up when you have it."), praised students ("Smart, Heidi!"), repeated a student's name as a way or reprimanding them ("John!"), and/or facilitated seating ("If you want to sit in a chair, pull your chair over. Okay?").

Claire and Cecilia Indirect Engagement theme 2: Helping Students Learn Mathematics.

In comparison to Management, Claire and Cecilia less frequently supported the other's

instruction by helping students with the assigned mathematical work and/or mathematical

content. The most frequent way in which the coach and teacher helped students learn

mathematics was by asking them questions about the content. The following exchange took

place while Cecilia was lead teaching. She asked the class to list all factor pairs of 36:

Claire:	Look at the digit in the ones place. What is that?
Students respond:	Three.
Claire:	The ones place.
Students respond:	Six.
Claire:	Six, right? Is that an even number or an odd number? If it's an even number, one of the factors is always two. So, think to yourself. Two times what number would be 36? And then raise your hand. So, we know one factor is two. So now you need to figure out the factor pair. (1st lesson, 10/17/16)

As students struggled with this task, Claire interjected to ask students a series of questions that

ultimately helped them review divisibility rules. In addition to questioning students about the

mathematics content, although less common, Claire and Cecilia also clarified the mathematical

task for students ("Use it [multiplication chart] to check your answers through, guys. Try and

come up with them on your own first"), revoiced something a student said ("So, it was the only

one left on the in column. Ok"), and/or provided students with a strategy to help them access the

mathematics content:

Here's a way that I look at that to figure out if I have it all. I start with one. I say okay, I

have one times 36, two times 18, three times 12, four times nine, five is nothing because

the only numbers that have a factor of five end in a five or a zero. I have six times six.

And now I've repeated, right? So, if I do seven, I don't have a seven. If I do eight, any

time you start to repeat, you know you're done. So I did one, two, three, four, five, six,

and six repeated so I don't go any higher. You could do seven, eight, nine. Well, there's

nine again. (1st lesson, 10/17/16)

In this last example, Claire interjected while Cecilia provided whole group instruction to provide

students with a strategy for methodically determining all of the factor pairs for a given number.

Claire's focus for instances of Direct and Indirect Engagement with Cecilia. In her exit

interview, when asked to reflect on how she directly and indirectly engaged with Cecilia during

lessons, Claire shared the following:

Our interactions were either number one, um me jumping in to save a little bit and

support when she was struggling. Um, or number two, like, a reminder of we were gonna

make 'em cluck like chickens, we're gonna cluck like chickens. Um, but I think a lot of

'em were more like her looking at me being like and then almost like a life raft, you

know what I mean? Like here's your life raft, I'll jump in and you know, tag team,

um...and that, I think those were nonverbal and verbal, 'cuz I feel like there were a couple

of times where she was like, okay, your turn.   Because maybe I didn't pick up on

(inaudible), I don't know, but she's just so much more blunt…I do feel like hers were

more life raft saving as opposed to real reflection.

Claire's reflection is consistent with data presented in Table 5.27 above in two main ways. As

Claire shared, some of their interactions were prompted by Cecilia indicating that she needed

assistance teaching something. These instances were best captured in the Direct Engagement

code of General Pedagogy, which was the second most prevalent emergent theme. Second,

Claire stated that they often discussed what they would do next in the lesson, which was captured

by the most prevalent Direct Engagement code of Curriculum, Activities and Materials.

Reflection conversation. When I finished collecting data at Claire's and Cecilia's school site, they had still not engaged in their formal end-of-cycle reflection conversation as their cycle had not yet ended. I did, however, have the opportunity to observe one informal reflection conversation that took place at the end of the first observed co-taught lesson and lasted for approximately four minutes. Regarding the substance of this conversation, Claire and Cecilia talked most about assessment (38%) (see Table 5.29).

Table 5.29
Reflection Conversation Substance Codes for Claire and Cecilia

Substance Codes	Percent Coverage[49]
Assessment	38%
General Plans for Coaching Cycle	20%
Other	11%
Time and Schedule	11%
Grouping	9%
General Pedagogy	7%
Curriculum, Activities and Materials	3%
Classroom Composition and Attendance	0%
Classroom Management	0%
External Requirements	0%
External Individuals	0%
Facilitator's Role	0%
Relationship Building	0%
Mathematics	0%
Technology	0%

In particular, as illustrated by the following exchange, the coach and teacher used observational data to inform their next steps regarding what students who were not in a small group should work on.

Claire:	I think that most of them just want to get finished.
Cecilia:	Want to what?
Claire:	Get finished and not think about it.
Cecilia:	Oh yeah.

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[49] The reflection conversation transcript had 3,183 characters on 3 double-spaced pages (roughly 600 words).

	Claire	Cecilia

Claire: That's the only problem I'm really running into, is they're not getting all of 'em listed.

Cecilia: 'Cuz they just want to get em finished?

Claire: Yes.

Cecilia: So that they can get on Prodegy?   So what I need to do is take away Prodegy. Take away Chrome books during this time, at least until they learn that they need to finish their work before they get on it. So instead of…

Claire: That's what I'm thinking. I checked some of them.

In summary, although Claire and Cecilia wanted to participate in the co-teaching cycle to help Cecilia gain knowledge of fourth grade mathematics concepts, their discussions during planning and reflection conversations, as well as during co-taught lessons, rarely focused on mathematical concepts specifically, but instead tended to focus on pedagogy and curriculum. I now turn to discuss the perceived benefits of the co-teaching cycle.

Research Question Three: Co-teaching Cycle Perceived Benefits for Claire and Cecilia

Table 5.30
Co-teaching Cycle Perceived Benefits for Claire and Cecilia

	Claire	Cecilia
Content		
Deepened Teacher's Content Knowledge	x	
Improved Students' Perception of Mathematics	x	
Increased Teacher's Mathematics Confidence	x	
Teacher Gained Exposure to Mathematics Vocabulary		x
Teacher Learned How to Navigate Curriculum		x
Pedagogy		
Enhanced Teacher's General Pedagogical Knowledge	x	
Teacher Implemented a Strategy	x	x
Teacher Gained Exposure to Slower Pacing		x
Other		
Coach Engaged in Reflection	x	
Coach Got Back Into Classroom		x

In reflecting on the perceived benefits of the co-teaching cycle, Claire and Cecilia primarily talked about content and pedagogical benefits to the teacher (see Table 5.30). Regarding content benefits, Cecilia said she gained exposure to mathematics vocabulary ("When

we were talking about factors and factor pairs and um multiples, the language that she used was great") and learned how to navigate the mathematics curriculum:

It also has helped with being able to look at, take a look at the lesson for the day and pull out the important things and know that I don't have to say exactly what this book says because that's where I was getting confused. I was having to look at the book while I was teaching and it was confusing me and the math language and all of that. So, um, just being able to pull out those important pieces, and that's kind of what Claire and I are still doing as far as co-planning. I feel much more confident in teaching the lessons now and using the language. But, um, the planning part and knowing what's important and what I can throw away. Because as a teacher you're looking at this, you assume it's all important. I have to teach this, but some of it is not super important or some of it we can kind of…glaze over it a little bit, save it for later, um. But that was extremely helpful.

Furthermore, Claire perceived that Cecilia became more comfortable with the fourth grade mathematics content, and as a result, she was more confident teaching it to her students: "First and foremost, I feel like she gained more confidence in 4th grade math – to be able to do it herself and take it on."

Regarding pedagogical benefits, Claire and Cecilia seemed to agree that Cecilia successfully integrated Number Talks into her instruction. Cecilia shared the following:

So, for me, um, it was beneficial because I learned how to do Math Talks, which I had no clue how to do that and now it's a routine, it's a daily routine in this classroom. Um, and that not only benefitted me, but now it's benefitting my children. And multiplication is my ET goal, so I'll be interested to see come December how they do on their post-test, if the Math Talks have been helping.

Additionally, while Claire perceived that she helped Cecilia build her pedagogical toolset ("I feel like a lot of the strategies that you do in math are repetitive…So us co-teaching I feel like kind of built that toolbox a little bit for her so that she has something to fall back on"), Cecilia felt she benefitted from observing Claire's pacing.

> We did a lesson on classifying triangles and quadrilaterals, and then some of the things that she did under the doc cam, like, um, finding lines of symmetry and folding things and going through the alphabet, which letters have a vertical line of symmetry and a horizontal line of symmetry, and just kind of folding, and showing them exactly what to do and taking that time - that was really beneficial to me because as a teacher, you kind of feel rushed and I didn't get that rushed sense from her. Um, there were several times where after a lesson we decided we needed to kind of extend that lesson and go into another day. And it wasn't a rushed type thing, and you know, so, um, it was extremely beneficial.

Thus, as Cecilia often felt pressured to cover the curriculum quickly, it was helpful for her to observe how Claire took her time with students.

Research Question Four: Challenges and Conditions for Claire and Cecilia

Here, I begin by discussing challenges from Claire's and Cecilia's co-teaching cycle. Then, I examine conditions mentioned by the coach and teacher that would help address some of the challenges.

Challenges.

Table 5.31
Co-teaching Cycle Challenges for Claire and Cecilia

	Claire	Cecilia
Content		
Students Struggled with Content	x	
Teacher's Negative Attitude Towards Mathematics	x	

Table 5.31
Co-teaching Cycle Challenges for Claire and Cecilia

Pedagogy		
Teacher Struggled to Shift Pedagogy Mindset	x	
Planning and Logistics		
Scheduling	x	x

As noted by most of the previous coach-teacher pairs, both Claire and Cecilia seemed to agree that scheduling, including consistently finding the time to co-plan and co-teach, were challenges encountered during the co-teaching cycle (see Table 5.31). Cecilia spoke in-depth regarding scheduling challenges:

Planning time, that was a challenge. Trying to find, because Claire is like pulled in so many different directions and she's only one person and so finding um time to plan and like really dig in. A lot of times we would have to plan like half the lesson, and then we'd have to talk on the phone and then plan and talk through text and plan, which was fine, I mean it was getting done and we have that relationship. But, I could see where someone else who doesn't have that relationship, that would be very difficult when…someone has to go home and she's being pulled to sub and she can't plan with me. So that was definitely a challenge…Um, I feel like everything really moved really smooth during this except for the planning part. When we were able to like dig in and really plan like at conferences where we had like an hour where we could plan, we got a lot done. through it.

Claire also talked about how scheduling was difficult.

Time is always a challenge. Like, finding the time to co-plan. Not being pulled away for meetings. I missed some co-teaching sessions because I got pulled away to sub and that is always a challenge. And I feel like when I get pulled away to sub, it's the last minute

sicknesses and they're just hard to fill. And so I don't want to say I'm the go-to person

because I don't think I'm the go-to person when that happens. But I'm probably the most

flexible one that can kind of…move things around in order to make that happen.

Furthermore, Claire mentioned three additional challenges: (1) Cecilia's negative attitude

towards mathematics ("Her attitude towards math was a challenge…And getting her to

understand that her attitude towards math is going to, the kids are going to reflect that"); (2)

some students had difficulty understanding the mathematics content ("I think that there were

some individual students that were a challenge. Maybe it's just because they're so low in math

that anything we would do whole group was just so over their head"); and (3) Cecilia needed to

shift her mindset regarding pedagogy for mathematics instruction.

Because at her last school, the general population was that the kids were so low that you

couldn't do a whole group instruction math…So that was a shift for her, and so that was a

challenge. Getting that mindset shift of, you can do whole group here. Because 80 to

90% of your kids are gonna get it in whole group. It's not the majority anymore that

aren't gonna get it. So, that was kind of a challenge because I think that whenever we

first started, she didn't want to let go of the small groups because of that.

Conditions.

Table 5.32
Co-teaching Cycle Conditions for Claire and Cecilia

	Claire	Cecilia
Management		
Consistent Expectations Regarding Behavior Management		x
Time and Schedule		
Coordinating Schedules	x	
Contextual Factors		
Coach and Teacher Had Trusting Relationship	x	x
Other		
Teacher Communicated to Students and/or Parents About Cycle	x	x

Both Claire and Cecilia agreed on two conditions that needed to be in place to help alleviate challenges: having a trusting relationship between the coach and teacher and communicating to students and/or parents about the upcoming co-teaching cycle (see Table 5.32). Regarding the former, Cecilia described how it was important that she already had a trusting relationship with her coach.

> I think there has to be a trust factor there between teacher and coach. I think a lot of times when you have an instructional coach in a building and a teacher and it works out well 'cuz Claire and I are friends outside. But I can see where other teachers might look at a coach and think of the coach as being an evaluative person within their classroom. And so they don't necessarily, um, want a coach in their classroom for that reason. They don't want the coach going back. So I think there has to be that level of trust, um, and trust is earned obviously.

Claire also reflected on her friendship with Cecilia outside of school:

> She was one, actually she was the one that recommended my current babysitter for my kids. So, and it just, I mean we have a friendship outside of school. Whereas, I mean, she and I, I went to her wedding. You know? We have a friendship. Whereas, this is gonna sound really bad. But I don't, I have a professional friendship with a lot of teachers in this building. But, she's really the only one who I have an outside friendship with. Like, she knows my kids. She knows my husband…But that definitely started at our last school. And I think, too, people bond over traumatic events, and it was traumatic, our experience at that other school, it was bad.

According to Claire, this friendship enabled Cecilia to trust Claire in two distinct ways: "Trust…that I'll keep it confidential and trust in terms that um I know what I'm talking about and I'm not gonna tell you something that I haven't done or tried myself."

Regarding the latter, both the coach and teacher recognized the importance of letting students and parents know about the coaching cycle at the start. Cecilia shared the following:

> I also let all of my parents know…that Claire was going to be in here and we were going to be doing a co-teaching model for Unit 2 in math…I had a lot of, well why? I was very honest with them… I'm a primary level teacher. That's where I've been for the past 10 years. I'm very confident in teaching your child the foundational skills they need, which is why the low kids, I can work with them a lot easier than I can work with the kids that are on or above grade level. And when you don't do math like this on a daily basis, you don't remember. And this is not the way I learned it. So this is not the way that I'm comfortable teaching it… And as a mother of a child I would be appreciative if my son's teacher said [this], you know, I would be like that's great!

Claire also acknowledged how Cecilia set expectations for students at the beginning of the coaching cycle:

> Setting up your class for this is Miss Claire. She's another teacher, too. You treat her the same way you would treat me. You know what I mean? Like having the kids ready for me to come in, too, as opposed to just the teacher. So, I think that's one thing that Cecilia did really well, is she introduced me and said we're going to be doing this together…It set the kids up for knowing and not having it feel like it was weird.

In addition, Cecilia discussed the importance of having consistent behavioral expectations with the coach ("Claire had no problem correcting my children and so there's kind

of that understanding where she kind of knows how I manage my classroom"), while Claire

expressed how it was important for Cecilia to devote a significant amount of her own planning

time to meet with Claire: "This coaching cycle was a lot more time heavy than what Caroline's

was. She gave up a lot of plan times for us to meet. So the time piece needed to be set." In

summary, Claire and Cecilia primarily reflected on similar conditions, including having a

trusting relationship and letting students and parents know about the coaching cycle.

Summary

Overall, Claire and Cecilia had a personal friendship outside of school, which helped

promote a trusting professional relationship between the coach and teacher. While Claire and

Cecilia were both motivated to participate in the co-teaching cycle to help expose Cecilia to

fourth grade mathematics concepts, any discussions related to math tended to happen while they

discussed implementation of specific lessons in the curriculum. Issues related to the content and

depth of coach-teacher talk about mathematics and other topics are synthesized in the next

section.

<p align="center">**Summative Analysis of the Three Pairs**</p>

I now describe what was common, as well as unique, for each coach-teacher pairing for

all research questions that guided this investigation. Furthermore, as I synthesize findings across

the three coach-teacher pairs for the research question regarding how the coach and teachers

engaged in the co-teaching cycles, I analyze the depth of coach-teacher talk.

Research Question One: Co-teaching Cycle Motivation

I utilized pre- and post-cycle interview data to better understand what motivated Cathy,

Caroline and Cecilia to engage in their respective co-teaching cycles with Claire. Each coach-

teacher pairing seemed to be motivated by different sets of reasons (Table 5.33 below). Claire

<p align="center">240</p>

and Cathy primarily wanted to complete their Evaluation Tool (ET), which was a new measure of coach and teacher effectiveness being implemented in the school district that year. Claire and Caroline wanted to create a differentiated mathematics writing center that Caroline's students could access independently during small groups. Claire and Cecilia wanted to expose Cecilia to 4th grade mathematics concepts.

Given literature that was previously referenced in Chapter 2, I expected that mathematical reasons would more strongly motivate all co-teaching cycles. However, this was not the case as mathematical reasons only motivated one of these three coach-teacher pairs. Furthermore, the ET was an interesting motivating factor for Claire and Cathy as they weren't primarily motivated to engage in the co-teaching cycle because they wanted to learn something new, but rather they wanted to fulfill a district requirement. It is important to keep these motivating reasons in mind as we look at how the coach and teachers directly and indirectly engaged with one another during the co-teaching cycle. For example, given that mathematical reasons primarily motivated Claire and Cecilia to engage in their cycle, one would expect that their conversations during the planning and reflection meetings, as well as the co-taught lessons, would heavily favor mathematics. The same would be true about pedagogy for Claire and Caroline, as pedagogical reasons primarily motivated their cycle.

Table 5.33
Co-teaching Cycle Motivation for All Pairs

	Claire-Cathy Cycle Motivator: ET		Claire-Caroline Cycle Motivator: Writing		Claire-Cecilia Cycle Motivator: Math	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content						
Deepened Teacher's Content Knowledge					x	x
Helped Teacher Navigate Curriculum						x
Pedagogy						
Enhanced Teacher's Pedagogical Knowledge					x	
Implemented Gradual Release Process			x			
Needed Assistance with Differentiation			x	x		
Students Heard Multiple Strategies						x
Wanted to Implement Strategy	x					
Wanted to Make Math Instruction Fun for Students						x
Contextual Factors						
Completed Evaluation Tool	x	x				
Other						
Experienced Previous Success Co-teaching		x				

Research Question Two: How the Coach and Teachers Engaged in the Co-teaching Cycle

To answer my second research question regarding how the coach and teachers engaged in their co-teaching cycles, I used field notes and transcripts which were generated from observations of planning and reflection conversations, as well as the co-taught lessons. Below, I discuss the substance of the coach-teacher talk for all three co-teaching cycles, starting with the planning conversations, then moving onto the co-taught lessons, and ending with the reflection conversations. Last, I explore the depth of all coach-teacher talk.

Planning conversations. I observed a total of nine planning conversations across the three coach-teacher pairs. Table 5.34 shows the average contributions made by the coach and each teacher. The coach talked the least (40%) in her cycle with a strong teacher who was the only tenured one (Caroline), while she talked the most (58%) in the cycle with the teacher who had the least amount of experience in her current grade level (Cecilia).

Table 5.34
Planning Conversation Contributions

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Percent Coverage[50]	47%	51%	40%	58%	58%	41%

Overall, discussions during the planning conversations tended to focus on the district-provided curriculum (between 8-23%), or pedagogy (between 9-25%) (see Table 5.35 below). However, the pairs talked about these topics differently. When Claire and Cathy discussed the curriculum, they most frequently talked about what students in small groups should work on. Cecilia, on the other hand, primarily needed help from Claire navigating and understanding the curriculum. The same is true for conversations about assessment. Claire and Cathy primarily used data to inform their grouping decisions, while Claire and Caroline chiefly monitored student

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[50] Percents for each pair do not add up to 100% as, at times, External Individuals also contributed to the planning conversations.

learning. There was more consistency in the general pedagogical conversations, with Claire,

Caroline and Cecilia mostly planning and/or creating original resources that went beyond the

district-provided curriculum.

Table 5.35
Co-teaching Planning Conversation Substance Codes for All Pairs

Planning Conversation	Overall	Math Indicator	1	2	3	4
Content						
Curriculum, Activities and Materials						
Claire-Cathy	23%	14% (3%)	44%	7%	18%	n/a
Claire-Caroline	8%	11% (1%)	10%	5%	n/a	n/a
Claire-Cecilia	18%	22% (4%)	11%	18%	25%	16%
Mathematics						
Claire-Cathy	0%	n/a	0%	0%	0%	n/a
Claire-Caroline	2%	n/a	0%	3%	n/a	n/a
Claire-Cecilia	4%	n/a	0%	3%	3%	11%
Pedagogy						
Grouping						
Claire-Cathy	12%	2% (0%)	9%	18%	9%	n/a
Claire-Caroline	10%	6% (1%)	10%	10%	n/a	n/a
Claire-Cecilia	8%	2% (0%)	10%	15%	4%	1%
Assessment						
Claire-Cathy	23%	14% (3%)	20%	31%	18%	n/a
Claire-Caroline	21%	5% (1%)	11%	30%	n/a	n/a
Claire-Cecilia	10%	21% (2%)	6%	21%	9%	2%
General Pedagogy						
Claire-Cathy	9%	14% (1%)	7%	2%	17%	n/a
Claire-Caroline	21%	13% (3%)	26%	16%	n/a	n/a
Claire-Cecilia	25%	26% (7%)	28%	20%	28%	23%
Management						
Classroom Composition and Attendance						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	0%	0% (0%)	0%	0%	n/a	n/a
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	0%
Classroom Management						
Claire-Cathy	1%	0% (0%)	2%	0%	0%	n/a
Claire-Caroline	1%	0% (0%)	2%	0%	n/a	n/a
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	0%

Table 5.35
Co-teaching Planning Conversation Substance Codes for All Pairs

Planning and Logistics						
Facilitator's Role						
Claire-Cathy	1%	0% (0%)	1%	0%	2%	n/a
Claire-Caroline	2%	0% (0%)	0%	3%	n/a	n/a
Claire-Cecilia	4%	4% (0%)	1%	6%	2%	7%
General Plans for Coaching Cycle						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	3%	0% (0%)	6%	0%	n/a	n/a
Claire-Cecilia	4%	0% (0%)	0%	0%	0%	0%
Technology						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	1%	0% (0%)	0%	1%	n/a	n/a
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	n/a
Time and Schedule						
Claire-Cathy	7%	0% (0%)	11%	4%	6%	n/a
Claire-Caroline	12%	0% (0%)	16%	8%	n/a	n/a
Claire-Cecilia	11%	0% (0%)	20%	4%	8%	11%
Contextual Factors						
Relationship Building						
Claire-Cathy	6%	0% (0%)	0%	2%	16%	n/a
Claire-Caroline	1%	0% (0%)	0%	2%	n/a	n/a
Claire-Cecilia	6%	0% (0%)	6%	4%	7%	6%
External Requirements						
Claire-Cathy	10%	7% (1%)	1%	24%	4%	n/a
Claire-Caroline	1%	0% (0%)	0%	1%	n/a	n/a
Claire-Cecilia	0%	25% (0%)	0%	0%	0%	0%
Other						
External Individuals						
Claire-Cathy	3%	0% (0%)	8%	0%	0%	n/a
Claire-Caroline	6%	0% (0%)	12%	0%	n/a	n/a
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	0%
Other						
Claire-Cathy	7%	0% (0%)	6%	3%	11%	n/a
Claire-Caroline	9%	0% (0%)	7%	11%	n/a	n/a

Table 5.35

Co-teaching Planning Conversation Substance Codes for All Pairs

Claire-Cecilia	11%	1% (0%)	10%	9%	14%	12%

Many of these differences and similarities in how the coach and teachers discussed the most prevalent codes can be attributed to their motivating reasons. For example, as Claire helped implement small guided math groups in Cathy's classroom, it makes sense that they used assessment data to create those small groups, and discussed what students in those small groups should work on. Furthermore, it seems logical that Claire and Caroline seldom discussed the district-provided curriculum as their goal was to create a differentiated mathematics writing center. Last, it makes sense that Claire and Cecilia together navigated the district-provided curriculum as Cecilia mentioned wanting help with this in her pre-cycle interview.

An additional trend worth highlighting is that External Requirements were focal in only Claire's and Cathy's planning meetings (10%) (see Table 5.35 above), leaving less time for them to talk about content, pedagogy, or other substantive issues related to teaching mathematics. This focus makes sense in light of the fact that the Evaluation Tool (ET) strongly motivated their co-teaching cycle.

Planning conversation: Where's the math? Similar to Chapter 4, based on current research describing effective professional development as having a content focus, I expected to hear more mathematical conversations during the planning meetings. This was especially true for Claire's and Cecilia's cycle as a strong motivating factor for this coach-teacher pairing was to deepen Cecilia's understanding of the fourth-grade mathematics content. However, discussions about mathematics were relatively rare for all coach-teacher pairings, surfacing in no more than 0-4% of the planning conversations (see Table 5.35 above).

As discussed in Chapters 3 and 4, all coach-teacher talk coded as Mathematics was parsed into Coburn and Russell's (2008) low-, medium- and high-depth categories. A total of 12 segments were coded as Mathematics (total of 3,222 characters, or 600 words). As can be seen

in Table 5.36 below, when discussions about Mathematics did surface during the co-teaching planning meetings, overall, most of the conversations were of medium-depth (43%). However, low- (32%) and high-depth (25%) interactions also took place.

Table 5.36
Depth of Mathematical Talk During Co-Teaching Planning Meetings

	Low	Medium	High
n (Segments)	7	2	3
n (Characters)	1,037	1,390	795
Overall Percentage (Character-level)	32%	43%	25%
Claire-Cathy	n/a[51]	n/a	n/a
Claire-Caroline	0%	0%	100%
Claire-Cecilia	51%	26%	23%

To illustrate one example of a medium-depth interaction, Claire and Cecilia discussed possible student mathematical solutions while working through the "Little Big" task involving dog height comparisons (see Figure 5.2 above).

Some of the kids won't need paper clips because some of 'em will be able to look at that and be like okay I used 3 paper clips for the 2 dog bones. The big dog was, um, was 6, so 3 paper clips are 2. Then 6 dog treats would be 9 paper clips. Some of 'em won't need the paper clips. Some of 'em will. You know what I mean? So, here's how I could see some of them doing it. Going, taking it and measuring. Okay here's paperclip, paperclip, paperclip, k. There's 2 dog bones. Now I'm going to draw 2 more dog bones and do paper clip. I can see some of 'em drawing the dog bones and doing it that way. Or I could see some of 'em doing repeated addition and saying okay if 2 dog bones is 3, 2, 4, 6. That would be 3 sets of 2. So, 3 + 3 + 3. You're gonna see them solve it in a variety of ways and that's what you want them to do. (4th planning meeting, 10/24/16)

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[51] Not applicable (n/a) means that discussions about mathematics did not take place during Claire and Cathy's planning meetings.

Here, Claire anticipated that some students would jump straight to the proportion, while others would need to draw or use concrete representations or use repeated addition. Still, it is worth noting that the term "proportion" was not used, nor was the mathematical goal(s) for student learning from this problem discussed. To provide one additional example of a medium-depth interaction, in the following exchange, the coach and teacher talked through an In and Out Box problem from the district-provided curriculum.

Cecilia: Is this a first grade in and out box?
Claire: It's similar. Like, so your rule is down there. The first box says multiply by 1.
Cecilia: Where does it say multiply by 1? Oh, right here!
Claire: Yeah. So your number in. So your 1...
Cecilia: Yeah, 1 x 1, 2 x 1...
Claire: Multiplied by 1. It's coming out 1. So we could do, like, we could draw this up there, whatever.
Cecilia: But this doesn't work if we're... Oh, okay. So, no. The box is not correct 'cuz 2 x 1 is not 3.
Claire: Right. (4th planning meeting, 11/24/16)

In addition to engaging in medium-depth mathematical conversations, the coach and teachers also had low- and high-depth mathematical exchanges. To provide some examples of low-depth interactions, the coach and teachers talked about simple computation problems ("1 + 6 is not 5. Right? 1 + 6 would be 7.") and also discussed definitions ("A multiple are all of the answers to a multiplication problem... So, you have 4. The multiples of 4 are 4, 8, 12, 16, because 4 x 1 is 4, 4 x 2 is 8, 4 x 3 is 12."). To provide one illustration of a high-depth mathematical exchange, in the following example, Claire and Caroline made connections across multiple mathematical concepts, including counting, place value, pattern recognition, and skip counting.

Caroline: But today, the only thing I did was we looked at the ones place. So, how it moves. But, the tens place stays. So, 11, 12, 13. So, they can recognize that pattern so when they get to 30, it's oh, okay.
Claire: 31, 32, 33.

Caroline: Yeah. Even if they don't know the 3 is a 30, they at least know it moves. And we
started counting by 10's. That way, they know their tens place.

Overall, during the co-teaching planning meetings, although the coach and teachers did engage

in some low- and high-depth mathematical discussions, they primarily had medium-depth

conversations. Still, conversations focused on mathematics were rare, and even relatively

substantive conversations may appear to lack depth in some ways.

  Mathematics Indicator. This then begs the question of where was the mathematics

during the nine observed planning conversations? In general, instead of having discussions

about mathematics, Claire, Cathy, Caroline and Cecilia used mathematical words and phrases

while talking about other items, such as curriculum, pedagogy, or assessment. Again, these

instances were assigned a Mathematics Indicator to reflect that a mathematical term and/or

phrase was listed, however it was not coded as Mathematics as it was not a conversation about

the actual content.[52] For example, the following exchange between Claire and Cathy received a

primary code of Curriculum, Activities and Materials.

Claire: So, Wednesday are we going back to 2.2?
Cathy: Yes, which is exponents.
Claire: I really like that exponents lesson. (3rd planning meeting, 9/19/16)

In addition, the underlined sentences were coded with the Mathematics Indicator as the coach

and teacher used the mathematical word "exponents" while discussing the topic for the textbook

chapter, instead of discussing the mathematical meaning of exponents.

  Across all coach-teacher pairs, the Mathematics Indicator most commonly emerged as the

coach and teachers discussed the curriculum, activities and materials; assessment; and general

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[52] As discussed in Chapters 3 and 4, I do not mean to give the impression that everything coded
as Mathematics involved the coaches and teachers attending to mathematical meanings or that
exchanges flagged with a Mathematics Indicator were necessarily less substantive than
exchanges coded as Mathematics.

pedagogy (see Table 5.35 above). Regarding the curriculum, activities and materials, the example provided above is a typical one in that the Mathematics Indicator was assigned as the coach and teacher named mathematical terms while navigating the Everyday Mathematics Four textbook. Regarding assessment, the Mathematics Indicator most commonly surfaced as the coach and teachers named mathematical topics while (1) monitoring student learning ("This is a probably a group that I feel like has a pretty good handle on *place value* compared to last year."); and (2) using data to inform their instruction ("My kids that did not get or had trouble, struggling with the finding the *multiples*, I thought before I have them do like the *prime* and *composite*, we work on this." In both examples, the coach and teacher listed the mathematical words "place value," "multiples," "prime," and "composite," but did not discuss the mathematical meaning of these words. Last, the Mathematics Indicator typically surfaced for General Pedagogy as the coach and teachers used mathematical words while (1) talking about pedagogical resources ("It's basically a book on *addition* and *subtraction* facts and a book on *multiplication* and *division*."); (2) discussing differentiation ("Ok, so the on-level group. We decided that it's just going to be higher level *factors*."); and (3) planning and/or creating original resources ("We could just have an empty spot where they could either write the *number sentence* or they can actually write a *story problem*.") Again, the coach and teacher named mathematical words such as "addition," "multiplication," "factors," and "number sentence" without discussing their meaning.

Co-taught lessons. I observed a total of 10 co-taught lessons across the three coach teacher pairs. Regarding the enacted co-teaching models, One Teach, One Assist was used in all three cycles, and was the most commonly implemented model in Cathy's and Cecilia's cycles. Alternative Teaching was also frequently used as it was implemented in Caroline's and Cecilia's cycles. Furthermore, while Claire and Cathy were the only pair to enact Station Teaching and

One Teach, One Observe, Claire and Cecilia were the only pair to implement Team Teaching.

Last, Parallel Teaching was never utilized during any cycle.

Table 5.37

Co-teaching Direct Engagement Substance Codes for All Pairs

Lesson Number	Overall	Math Indicator	1	2	3	4
Direct Engagement						
Claire-Cathy	107	n/a	38	38	31	n/a
Claire-Caroline	50	n/a	15	8	10	17
Claire-Cecilia	88	n/a	28	36	24	n/a
Content						
Curriculum, Activities and Materials						
Claire-Cathy	25%	11% (3%)	47%	8%	19%	n/a
Claire-Caroline	22%	9% (2%)	20%	13%	45%	12%
Claire-Cecilia	22%	26% (6%)	18%	22%	25%	n/a
Mathematics						
Claire-Cathy	4%	n/a	5%	5%	0%	n/a
Claire-Caroline	2%	n/a	8%	0%	0%	0%
Claire-Cecilia	2%	n/a	4%	4%	0%	n/a
Pedagogy						
Grouping						
Claire-Cathy	20%	0% (0%)	3%	34%	23%	n/a
Claire-Caroline	8%	25% (2%)	17%	0%	18%	0%
Claire-Cecilia	5%	0% (0%)	11%	0%	4%	n/a
Assessment						
Claire-Cathy	8%	22% (2%)	11%	8%	6%	n/a
Claire-Caroline	28%	21% (6%)	17%	50%	18%	29%
Claire-Cecilia	9%	75% (7%)	7%	14%	4%	n/a
General Pedagogy						
Claire-Cathy	4%	25% (1%)	3%	3%	6%	n/a
Claire-Caroline	8%	50% (4%)	13%	13%	0%	6%
Claire-Cecilia	13%	64% (8%)	11%	13%	17%	n/a
Management						
Classroom Composition and Attendance						
Claire-Cathy	2%	0% (0%)	0%	3%	3%	n/a
Claire-Caroline	0%	0% (0%)	0%	0%	0%	0%
Claire-Cecilia	2%	0% (0%)	0%	6%	0%	n/a
Classroom Management						
Claire-Cathy	2%	0% (0%)	0%	5%	0%	n/a

Table 5.37
Co-teaching Direct Engagement Substance Codes for All Pairs

Claire-Caroline	0%	0% (0%)	0%	0%	0%	0%
Claire-Cecilia	5%	0% (0%)	7%	6%	0%	n/a
Planning and Logistics						
Facilitator's Role						
Claire-Cathy	10%	9% (1%)	13%	8%	10%	n/a
Claire-Caroline	8%	0% (0%)	8%	13%	0%	6%
Claire-Cecilia	11%	0% (0%)	7%	17%	8%	n/a
General Plans for Coaching Cycle						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	0%	0% (0%)	0%	0%	0%	0%
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	n/a
Technology						
Claire-Cathy	11%	0% (0%)	11%	3%	23%	n/a
Claire-Caroline	4%	0% (0%)	0%	0%	0%	12%
Claire-Cecilia	8%	0% (0%)	4%	3%	21%	n/a
Time and Schedule						
Claire-Cathy	2%	0% (0%)	0%	3%	3%	n/a
Claire-Caroline	6%	0% (0%)	8%	0%	0%	12%
Claire-Cecilia	3%	0% (0%)	7%	0%	4%	n/a
Contextual Factors						
Relationship Building						
Claire-Cathy	8%	0% (0%)	3%	18%	3%	n/a
Claire-Caroline	12%	0% (0%)	0%	13%	9%	24%
Claire-Cecilia	11%	0% (0%)	14%	14%	4%	n/a
External Requirements						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	0%	0% (0%)	0%	0%	0%	0%
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	n/a
Other						
External Individuals						
Claire-Cathy	0%	0% (0%)	0%	0%	0%	n/a
Claire-Caroline	0%	0% (0%)	0%	0%	0%	0%
Claire-Cecilia	0%	0% (0%)	0%	0%	0%	n/a
Other						
Claire-Cathy	4%	0% (0%)	5%	3%	3%	n/a
Claire-Caroline	0%	0% (0%)	8%	0%	0%	0%

Table 5.37

Co-teaching Direct Engagement Substance Codes for All Pairs

Claire-Cecilia	9%	0% (0%)	11%	6%	13%	n/a

Regarding instances of Coach-teacher Engagement, it was more common for all pairs to directly, rather than indirectly, engage with one another during the lesson (see Table P.1 in Appendix P), as this surfaced in 64-71% of the instances of Coach-teacher Engagement. The opposite trend emerged in the modeling data as it was more common for the coaches and teachers to indirectly engage with one another (range of 50-66%). In examining the substance of their Direct Engagement, the same trend we saw from the planning conversations held true during the co-taught lessons, as exchanges tended to focus on pedagogy (27-44%) and the curriculum, activities, and materials (22-25%) (see Table 5.37 above).

An additional trend worth highlighting is that during the co-taught lessons, as opposed to the planning conversations, the Facilitator's Role (8-10%) and Technology (4-11%) codes were more prevalent (see Table 5.37 above). This makes sense given that during the lessons the coach and teachers had to negotiate who was doing what, and they often used technology.

Co-taught lessons: Where's the math? Similar to the planning conversations, the following question remains: Where is the math? Discussions about mathematics during the co-taught lessons were rare, surfacing in no more than 2-4% of the instances of Direct Engagement (see Table 5.37). All coach-teacher talk coded as Mathematics during the co-taught lessons was parsed into Coburn and Russel's (2008) low-, medium- and high-depth categories (see Table 5.38 below).

Table 5.38
Depth of Mathematical Talk During Co-Taught Lessons

	Low	Medium	High
n (Exchanges)	7	0	0
Overall Percentage (Exchange-level)	100%	0%	0%
Claire-Cathy	100%	0%	0%
Claire-Caroline	100%	0%	0%
Claire-Cecilia	100%	0%	0%

Unlike the mathematical conversations that took place during the planning meetings which involved some medium- and high-depth mathematical discussions, all exchanges coded as mathematics during the co-taught lessons were of low-depth as they involved very brief statements where the teachers, for example, clarified the units selected for a number story ("Did you do ninja turtles? Oh, tigers!"), revoiced a student's response ("She said nine"), and/or made *brief* connections across concepts:

Cathy:	And use the box. Like this.
Claire:	That's similar to lattice. (2nd lesson, 9/17/16)

While it may seem that the Mathematics code would capture discussions in which the coach and teacher had conceptual conversations specifically focused on mathematics, such discussions rarely, if ever, occurred during the co-taught lessons. Instead, most exchanges coded as Mathematics were coded as such because they focused specifically on mathematics (as opposed to curriculum, assessment or other topics), but they typically involved brief comments in passing, as opposed to delving into mathematical meanings.

Mathematics Indicator. Instead of examining the mathematics content, the coach and teachers continued to name mathematical words and phrases while talking about other topics. Such exchanges were coded with a Mathematics Indicator. To illustrate, the following exchange received a primary code of Assessment as Claire and Cecilia used data to decide which students would first receive support through small group instruction.

Claire:	So, you want me to send kids back that are struggling with it? Or, you want me to send these kids back?
Cecilia:	I was gonna pull these kids first just because they struggle with the multiples and factors.
Claire:	Okay. (2nd lesson, 10/19/16)

This exchange was also coded with a Mathematics Indicator as, in the underlined sentence, Cecilia used the mathematical words "multiples" and "factors."

Across all three coach-teacher pairings, the Mathematics Indicator most commonly emerged during discussions about the curriculum, activities and materials; assessment; and general pedagogy (see Table 5.37). Regarding conversations about the curriculum, activities, and materials, the Mathematics Indicator typically surfaced as the coach and teachers used mathematic words while discussing the materials ("Caroline, where are your unifix *cubes*?") or sequencing mathematical examples ("Can we actually go back to that *12* you had up there?"). While engaged in conversations about assessment, the coach and teachers listed mathematical words while either describing how data would inform their instructional choices (as illustrated in the example above) or monitoring student learning ("I'm afraid they'll confuse it with *lattice*."). Last, while discussing general pedagogy, the Mathematics Indicator primarily emerged as the coach and teachers named mathematical words while planning and/or creating additional mathematical examples, reviews, games, etc. for students:

Claire: Alright. So, you want to do a quick review?
Cecilia: Of?
Claire: *Factors*? *Multiples*?
Cecilia: Yes. (2nd lesson, 10/19/16)

Unlike modeling, during the co-taught lessons it was more common for all of the teachers to directly engage with one another. When they did indirectly support one another by interacting with students, during Caroline's and Cecilia's cycles it was primarily in an effort to help with classroom management, while during Cathy's it was to help students learn mathematics and/or focus on the mathematical task at hand (see Table P.2 in Appendix P).

Reflection conversations. Across the three coach-teacher pairs, I observed one formal, and three informal reflection conversations. Table 5.39 reflects each individual's contributions to the reflection conversations. While there was roughly an even split for Claire's cycles with

Cathy and Caroline, Cecilia tended to contribute more (66%) to her informal reflection

conversation with Claire.

Table 5.39
Reflection Conversation Contributions

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Percent Coverage[53]	48%	47%	45%	55%	34%	66%

Regarding the substance of these reflection meetings, the coach and teachers primarily engaged

in pedagogical conversations (45-68%) (see Table P.3 in Appendix P). Claire and Cathy chiefly

discussed organizational resources to be used while implementing small guided math groups,

Claire and Caroline either monitored student learning or talked about how to differentiate

instruction, and Claire and Cecilia used data to inform their instructional decisions. Similar to

the planning conversations, as well as discussions during the co-taught lessons, discussions about

mathematics were non-existent, surfacing in 0% of all reflection conversations. While I did code

for the Mathematics Indicator, it was seldom used. Thus, I will not provide additional details

regarding the Mathematics Indicator here.

 Overall Depth. Above, I discussed the depth of data coded as Mathematics, using

Coburn's and Russell's (2008) low-, medium- and high-depth categories. Here, I use the depth

categories to take stock of all of the data from the co-teaching planning and reflection meetings,

as well as the co-taught lessons. As previously described in Chapter 3, Level-2 Codes such as

Curriculum, Activities and Materials; Time and Schedule; Classroom Management; and

Classroom Composition and Attendance were all coded as low-depth because the definitions of

those codes closely fit Coburn and Russell's (2008) definition of low-depth with their focus on

surface-level structures and procedures. Other Level-2 Codes, such as Mathematics,

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[53] Percents for each pair do not add up to 100% as, at times, External Individuals also contributed
to the planning conversations.

Assessment, and General Pedagogy, were parsed further to determine which depth level they most closely matched. Table F.1 in Appendix F illustrates how all Level-2 Codes and Level-3 Sub-Codes were mapped onto the low-, medium- and high-depth categories.

As demonstrated in Table 5.40 below, the coach and teachers primarily engaged in low-depth interactions during all parts of the co-teaching cycle (39-100%).

Table 5.40
Co-Teaching Depth

	Low	Medium	High
Planning Meetings			
Claire-Cathy	72%	30%	0%
Claire-Caroline	52%	40%	6%
Claire-Cecilia	63%	30%	8%
Co-Taught Lessons			
Claire-Cathy	87%	13%	0%
Claire-Caroline	66%	28%	0%
Claire-Cecilia	76%	18%	5%
Reflection Meetings			
Claire-Cathy	100%	0%	0%
Claire-Caroline	39%	64%	0%
Claire-Cecilia	54%	45%	0%

To illustrate, such low-depth interactions included exchanges when the coach and teachers discussed materials ("I don't like to pass out the boards until we have to."), the curriculum ("Every Day Mathematics I think can be a little confusing personally when you first start using it."), pedagogical resources ("I also have a book that kind of goes through the progression, so I'll get that book and we can look at the progression."), grouping logistics ("Are we thinking like the last 20 minutes each of us pull one group?"), stating a mathematical definition ("A prime number is any number greater than 1 that has exactly two different factors, one and itself."), technology ("We should probably set up my doc camera. I don't know how to do it."), and time and schedule ("I will be here tomorrow morning at 8:50 and then Monday, Wednesday, Friday or next week.").

Unlike the modeling cycles where medium-depth interactions were relatively rare, in the co-teaching cycles, medium-depth interactions were more prevalent (0-64%). The following exchange is one example of a medium-depth interaction, where Claire and Cecilia co-created an original assessment ("Exit Slip") about multiples.

Claire: So, for small group then, we'll do an Exit Slip with three questions on 'em.
Cecilia: Three?
Claire: Yeah, because we're just asking them the multiples.
Cecilia: Can we negotiate?
Claire: Okay, how many do you want?
Cecilia: One.
Claire: Are you going to get enough information from one question?
Cecilia: I just don't want to look at three questions.
Claire: They're going to be simple though. You can do one that's easy with five multiples of five. And then you can do one that's kind of a medium. (2nd planning meeting, 10/14/16)

As an additional example of a medium-depth interaction, in the following exchange, Claire and Caroline discussed their plans to create a template for students that would enable them to eventually write a story problem.

Caroline: I could just put a prompt, build it, and then show a picture next to it right here on the, and then they write it.
Claire: Build it, draw it, write it kind of thing?
Caroline: Yeah. Build it, draw it, write it. But the thing is that's…
Claire: Or plan it, build it, write it?
Caroline: What do you mean plan it?
Claire: They would have to have some sort of discussion on how they're going to do it to come up with a plan. Even if it's just a discussion. (1st planning meeting, 10/6/16)

Overall, examples of medium-depth interactions include times when the coach and teachers created an original assessment, made data-informed instructional decisions, monitored student learning, discussed grouping structures, and differentiated their instruction.

Last, high-depth interactions rarely surfaced (0-8%), and when they did, they were most prevalent during the planning conversations. To illustrate, in the following high-depth exchange about pedagogical principles and practices, Claire and Cecilia discussed how Cecilia structured

her small group work time. Specifically, in helping Cecilia think through how she would structure group work for students not meeting with her at the back table, Claire encouraged Cecilia to consider activities that would richly engage students so Cecilia could focus her attention on her small group of students at the back table.

Claire:	So, what did you decide to do for your small groups? Because I think that for sure needs to be in place before Thursday and Friday. So, I think they need to start that today. So, you're thinking to have them do the Extra Math?
Cecilia:	What I was thinking was…
Claire:	'Cuz I think you're gonna have to have out here set and ready to go before you're able to really do a lot of your work here because they're not independent enough with staying on task and doing, you know, Prodegy or whatever. (3rd planning meeting, 10/19/16)

It is worth pointing out that this high-depth example may seem on par with the medium-depth example presented above. As discussed in Chapter 3, I tried to stay consistent with Coburn and Russell's (2008) low-, medium- and high-depth definitions and while depth lines were indeed blurry for some medium- versus high-depth exchanges, in general, the point stands that the most interactions were of low-depth.

In summary, the coach-teacher talk across the three co-teaching cycles reflected primarily low-depth discussions about surface-level structures and procedures. In comparison to the modeling cycles, medium-depth discussions were more prevalent during the co-teaching cycles, however high-depth interactions continued to be rare.

Research Question Three: Perceived Benefits

I drew upon pre- and post-interview data to better understand, from the perspectives of the coach and teachers, how the co-teaching cycle was beneficial. Although the coach and teachers primarily discussed pedagogical benefits, there was little overlap among the three coach-teacher pairings regarding the specific pedagogical benefits mentioned (see Table P.4 in Appendix P). The only common pedagogical benefit, which was mentioned in two separate

cycles (Cathy's and Caroline's), was that the teacher planned more effectively as a result of participating in the co-teaching cycle.

Content-related benefits were mentioned only for the cycle involving Cecilia. On the one hand, this seems logical given that content-related factors motivated Cecilia's cycle. On the other hand, this may be seen as puzzling given that, as just mentioned, Claire and Cecilia primarily engaged in conversations about the curriculum and pedagogy during their co-teaching cycle, and rarely focused specifically on the mathematics under study.

Research Question Four: Challenges and Conditions

I utilized pre- and post-cycle interview data to describe emergent challenges from the co-teaching cycles, as well as conditions that could help alleviate the emergent challenges.

Challenges

Across all coach-teacher pairings, scheduling was a consistently mentioned challenge (see Table P.5 in Appendix P). That is, the coach and teachers all perceived that it was difficult finding the time to regularly co-plan and co-teach as Claire's schedule was hectic and she was often spread too thin. In addition to the common concern about scheduling, Claire and Cathy were both worried about Cathy's ability to continue implementing the guided mathematics groups after the cycle ended and Claire left. Additionally, Claire described challenges related to the ET, including that she did too much for Cathy and the cycle lasted longer than it needed to. Claire and Caroline were concerned about having concrete next steps in place for students who were still struggling with the differentiated mathematics writing center. Last, while Cecilia only cited scheduling as a challenge, Claire mentioned additional teacher-related challenges, including Cecilia's negative attitude towards mathematics and her persistent preference for small group, rather than whole group instruction.

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Conditions

Three conditions were reported across the co-teaching cycles (see Table P.6 in Appendix P). First, having a trusting relationship between the coach and teacher was mentioned by nearly all individuals. As previously mentioned, establishing trusting relationships with some teachers was difficult for Claire as they tended to view her as an administrator despite the fact that she had no evaluative power. Second, the idea of entering a co-teaching cycle with an open mind, willing to try something new, was mentioned across two co-teaching cycles. Third, the need to coordinate schedules and develop a set co-planning and co-teaching schedule was mentioned across two cycles as an important condition. There were additional conditions mentioned within various pairs, such as letting students and parents know about the cycle up front; maintaining a consistent set of expectations for behavior management between the coach and teacher; and ensuring the coach had knowledge about the social, emotional, and behavioral needs of students.

In the next, final chapter, I provide a discussion of the results presented in Chapters 4 and 5, focusing on the following three stories that cut across the modeling and co-teaching cycles: (1) how external requirements impacted the cycles; (2) differences between modeling and co-teaching as described in the literature and as observed in this study; and (3) the lack of conversations about mathematics. I selected these three stories as they were the most striking when considering the literature on effective professional development and high-quality mathematics instruction, and they seemed important in that they may illuminate facets of coaching that we rarely see up close. Furthermore, I describe limitations of this study, as well as implications for practice and research.

CHAPTER 6:

DISCUSSION

I begin this chapter by briefly summarizing the study and synthesizing the results

presented in Chapters 4 and 5 for each research question. Next, I discuss the three main stories

that emerged from both sets of findings: (1) the impact of external factors; (2) differences

between modeling and co-teaching as described in the literature and as observed in this study;

and (3) the lack of conversations about mathematics. I then describe limitations of the study and

close by discussing implications for research, as well as school districts.

Summary of Study

The purpose of this study was to better understand how Coaches Meg and Claire

implemented modeling and co-teaching cycles with Teachers Michelle, Mackenzie, Cathy,

Caroline and Cecilia to improve their mathematics instruction. I intentionally targeted the two

practices of modeling and co-teaching as they are popularly implemented by instructional

coaches as they engage in one-on-one professional development with in-service teachers, and yet

there is a lack of empirical research describing how these strategies can be used effectively

(Gibbons & Cobb, 2017). I investigated four research questions: (1) What *motivated* the coaches

and teachers to engage in the modeling and co-teaching cycles?; (2) *How* did the coaches and

teachers engage in the cycles?; (3) From the perspectives of the coaches and teachers, what are

the *perceived benefits* of participating in the cycles?; and (4) What are the *emergent challenges*

of partaking in the modeling and co-teaching cycles, as well as the *conditions* that could help

alleviate these challenges? Furthermore, I broadly situated this study using Campbell and

Griffin's (2017) conceptual framework, and then applied Coburn and Russell's (2008) depth

framework to analyze the coach-teacher talk during the modeling and co-teaching cycles.

I employed a total of 27 semi-structured interviews, as well as observations of 23

modeled and co-taught lessons, 11 planning meetings, and 4 reflection conversations. All

interviews and observations were audio-recorded and transcribed using the procedures outlined

in Chapter 3. I primarily used emergent codes – which were later mapped back onto pre-

determined codes informed by the literature – to fully capture the substance of what the coaches

and teachers discussed, and engaged in a process of reliability with two coders trained in

mathematics education research. The interviews helped me answer research questions one

(motivation), three (perceived benefits) and four (emergent challenges and conditions to alleviate

challenges), while the observations enabled me to better understand how the coaches and

teachers enacted the modeled and co-taught cycles (research question two). I now present a brief

summary of findings for each research question and connect my findings with prior research.

Summary of Findings

Research Question 1: Motivation

Previous research has focused on coaches' motivation to engage in modeling and co-

teaching cycles, and commonly found that coaches were motivated to participate in these

intensive forms of professional development to illustrate and/or implement various pedagogical

strategies (Bean et al., 2010; Feiman-Nemser, 2001; Lord, Cress & Miller, 2008; Poglinco et al.,

2003; West & Staub, 2003). Prior studies, however, do not consistently incorporate the

perspectives of the participating classroom teachers by reporting their motivating reasons for

engaging in modeling and co-teaching cycles. Thus, the current study addresses this gap in the

literature by not only seeking to understand what motivated the coaches, but also the teachers.

Overall, pedagogical reasons seemed to strongly motivate the coaches' and teachers'

participation in both the modeling and co-teaching cycles as six out of the seven participants

mentioned pedagogical reasons as motivating their respective cycles (see Table Q.1 in Appendix

Q). This aligns with findings from previous research described above regarding the coaches'

motivation to engage in modeling and co-teaching for primarily pedagogical reasons, and,

moreover, suggests that pedagogical reasons might also motivate classroom teachers'

participation.

Hence, while one significant finding is that, overall, pedagogical reasons primarily

prompted the coaches' and teachers' participation in the modeling and co-teaching cycles, there

are four additional findings worth highlighting. First, contextual factors, such as the Evaluation

Tool (ET) and being on an official improvement plan, were at play for four out of the seven

participants. Second, content-related reasons only motivated two out of seven individuals'

participation. As such, content-related reasons were, by far, mentioned less often than

pedagogical concerns. Third, the factors motiving the coaches' and teachers' to participate in

modeling and co-teaching were often similar. In other words, content-related, pedagogical, and

contextual factors influenced all coaches' and teachers' engagement across both practices of

modeling and co-teaching. Last, while previous research suggests coaches may be motivated to

engage in modeling and co-teaching cycles to establish their own credibility (Bean et al., 2010),

assist with behavior management (Bean et al., 2010), or show that students are capable of

engaging in rigorous instructional activities (Lord, Cress & Miller, 2008) these did not appear to

be significant motivating factors mentioned by the participants in this study.

Research Question 2: How the Coaches and Teachers Engaged in the Cycles

In this section, I begin by discussing the *focus* of coach-teacher talk during the modeling

and co-teaching cycles. Then I explore the *depth* of coach-teacher talk across both cycles.

 The Focus of Coach-Teacher Talk

Table 6.1 reflects the overall prevalence for the main codes during the planning meetings, modeled and co-taught lessons[54]. There are several trends worth highlighting.

Table 6.1
Coach-Teacher Talk for Modeling and Co-Teaching Cycles

	Modeling			Co-Teaching		
	Planning Meetings	Modeled Lessons	Overall	Planning Meetings	Co-Taught Lessons	Overall
	n=2	n=13		n=9	n=10	
Content						
Curriculum, Activities and Materials	26%	24%	25%	16%	23%	20%
Mathematics	4%	3%	4%	2%	3%	3%
Total	30%	26%	28%	18%	26%	22%
Pedagogy						
Grouping	0%	0%	0%	10%	11%	11%
Assessment	21%	7%	14%	18%	15%	17%
General Pedagogy	7%	1%	4%	18%	8%	13%
Total	28%	7%	18%	48%	34%	41%
Management						
Classroom Composition and Attendance	1%	13%	7%	0%	1%	1%
Classroom Management	2%	22%	12%	1%	2%	2%
Total	3%	35%	19%	1%	4%	3%
Planning and Logistics						
Facilitator's Role	2%	4%	3%	2%	10%	6%
General Plans for Coaching Cycle	7%	0%	4%	2%	0%	1%
Technology	0%	0%	0%	0%	8%	4%
Time and Schedule	16%	6%	11%	10%	4%	7%
Total	25%	10%	18%	14%	21%	18%
Contextual Factors						
Relationship Building	4%	15%	10%	4%	10%	7%
External Requirements	1%	2%	2%	4%	0%	2%
Total	4%	17%	11%	8%	10%	9%
Other	13%	4%	9%	12%	4%	8%

Curriculum, Activities and Materials. Across both modeling and co-teaching cycles, the coaches and teachers most frequently discussed the Curriculum, Activities and Materials (CAM) needed to enact the lessons. Specifically, CAM surfaced in 25% of the modeling coach-teacher talk, and 20% of the co-teaching coach-teacher talk (see Table 6.1 above). However, the coach-teacher CAM talk was different in the modeling and co-teaching cycles as during modeling, the coach and teachers primarily discussed the Calendar Math *materials*, while during

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[54] I excluded the reflection conversations as so few took place during the co-teaching cycles, and there wasn't a comparison group for the modeling cycles.

co-teaching, the coach and teachers chiefly talked about the *curriculum*. This difference reflects the fact that the modeling cycles centered on the implementation of Calendar Math, which was materials-intensive and not provided by the district, whereas in two out of the three co-teaching cycles, the Everyday Mathematics 4 curriculum guided the coach's and teachers' instruction.

Assessment. Current research on high-quality mathematics instruction reflects a consensus that teachers must systematically gather evidence of student thinking and let that data guide their instructional plans for students (NCTM, 2014). As such, I expected to hear a high volume of conversations about assessment during the modeling and co-teaching cycles. Next to CAM, coach-teacher talk about assessment was the second most prevalent discussed topic during all coaching cycles, surfacing in 14% of the modeling data and 17% of the co-teaching data (see Table 6.1 above). However, similar to CAM, there were differences regarding the coach-teacher assessment talk as during modeling, the coach and teachers primarily discussed logistical assessment items while during co-teaching, the coach and teachers monitored student learning and used data to inform their instructional plans. These differences can, in part be explained by the fact that when co-teaching, teachers share an instructional space and must confer with one another about student learning to make decisions that ultimately drive the lesson forward. During modeling, the coach does not have to make instructional decisions with another individual, and can engage in an internal thought process not visible to the observer as he or she monitors student learning and decides how to shift instructional plans to be responsive to students' needs. More on this will be discussed below in Story #2.

General Pedagogy. Current research on high-quality mathematics instruction promotes facilitating meaningful mathematics discourse by posing questions that enable students to justify their ideas, construct arguments, and make conjectures, as well as implementing mathematical

tasks that remain at a high-level of cognitive demand (Ball & Forzani, 2011a; 2011b; Ball, Sleep, Boerst & Bass, 2009; NCTM, 2014; Martin, 2007). Given the importance and challenges of implementing such instruction, I expected to hear a high volume of conversations about pedagogy between the coaches and teachers. After CAM and Assessment, general pedagogical discussions were the third most prevalent topic discussed during the co-teaching cycles, surfacing in 13% of the coach-teacher talk (see Table 6.1 above). During the modeling cycles, on the other hand, the coach and teachers seldom engaged in general pedagogical discussions (4%). Similar to above, this difference can potentially be explained by the fact that during co-teaching, the coach and teachers had to talk about pedagogy out of necessity as they negotiated how to teach in a shared instructional space.

Management. While general discussions about management rarely surfaced in the co-teaching cycles (3%), management conversations were significantly more prevalent during the modeling cycles (19%) (see Table 6.1 above). This could be due to a number of factors, including the fact that during modeling, Coach Meg frequently asked for her teachers' help pronouncing students' names and determining if students were absent or present, as well as discussing her behavior management system. Coach Claire, on the other hand, did not engage in such conversations with her teachers. These differences could also be due to the fact that during co-teaching, the coach and teachers had more reason to move beyond surface-level, nuts and bolts discussions to, instead, talk about pedagogy and assessment to make decisions to help push the lesson forward. As discussed above, while modeling, the coach could consider all of these decisions internally without conferring with the classroom teacher.

Mathematics. Current research reflects a consensus that effective professional development must focus on content (Ball & Cohen, 1999; Desimone, 2009; Elmore, 2002;

Hawley & Valli, 1999; Wilson & Berne, 1999). It is imperative that teachers understand the mathematics content they teach, going beyond procedures to focus on concept meanings and connections. Moreover, two of the teachers sought coaching because they wanted to learn more about the mathematics content they were to teach at their new grade levels. Hence, I expected to hear mathematically-focused conversations during the modeling and co-teaching cycles. As previously discussed in Chapters 4 and 5, this was rarely the case, as discussions about mathematics seldom occurred (range of 3-4%) (see Table 6.1 above). More about the lack of mathematical discussions will be examined below.

In summary, the coach-teacher talk during the modeling cycles largely focused on surface-level items such as materials, logistics and management. In contrast, although the coach and teachers frequently discussed the curriculum during the co-teaching cycles, their conversations also encompassed topics related to assessment and general pedagogical issues. As described above, this may be explained by the fact that modeling has no inherent mechanism that pushes the coach to discuss more substantive topics with teachers during instruction, while during co-teaching, the coach and teacher have no choice but to talk about some of these more substantive issues as they must make decisions, together, to move the lesson and students forward. I now turn to discuss the *depth* of the coach-teacher talk for all modeling and co-teaching cycles.

Depth

As discussed in previous chapters, I applied Coburn and Russell's (2008) depth framework to explore teachers' opportunities to learn. As a reminder, according to Coburn and Russell (2008), low-depth interactions focus on procedures and surface-level structures, while high-depth interactions address deeper pedagogical topics, such as how students learn

mathematics. Across both modeling and co-teaching cycles, the coaches and teachers engaged in

primarily low- (52-100%) and medium- (2-64%) depth interactions, while high-depth

interactions seldom occurred (0-8%) (see Table 6.2). This suggests that, overall, the coach-

teacher talk heavily emphasized surface-level structures and procedures. Still, more medium-

depth interactions occurred during co-teaching (range of 0-64%) than modeling (range of 2-

14%), and low-depth interactions were more prevalent during modeling (range of 81-94%) than

co-teaching (range of 52-100%).

Table 6.2
Depth for All Modeling and Co-Teaching Cycles

	Low	Medium	High
Modeling			
Planning Meetings			
Meg-Michelle	83%	9%	7%
Meg-Mackenzie	81%	14%	6%
Modeled Lessons			
Meg-Michelle	89%	11%	0%
Meg-Mackenzie	94%	2%	2%
Co-Teaching			
Planning Meetings			
Claire-Cathy	72%	30%	0%
Claire-Caroline	52%	40%	6%
Claire-Cecilia	63%	30%	8%
Co-Taught Lessons			
Claire-Cathy	87%	13%	0%
Claire-Caroline	66%	28%	0%
Claire-Cecilia	76%	18%	5%
Reflection Meetings			
Claire-Cathy	100%	0%	0%
Claire-Caroline	39%	64%	0%
Claire-Cecilia	54%	45%	0%

These differences in depth can potentially be explained by a number of different factors.

The depth variation may be related to the two particular coaches involved. Claire had slightly

more coaching experience than Meg (one year) and could perhaps more effectively steer

conversations with teachers in the medium-depth direction, while Meg was possibly still

grappling with how to do this ("I'm developing my coaching style."). This may also stem from differences in the focus of the cycles (e.g., with modeled lessons centered around Calendar Math, which was materials-intensive and outside the regular curriculum). However, some differences seem likely due to the fact that during modeling, the teachers generally assisted the coach (consistent with the greater focus on materials and classroom management), while during co-teaching, the coach and teacher implemented lessons together, which led to more substantive conversations about what they were doing. As such, examples of medium-depth coach-teacher talk that were unlikely to occur during modeling included times when the coach and teacher used data to inform their instructional decisions ("Do you want to pull small groups Wednesday afternoon and go over anybody that struggled with the homework from 1.2?"), discussed how to differentiate their instruction for students ("You could challenge him to use parentheses."), and monitored student learning ("I would say about half of them were able to figure that out mentally."). These differences in foci may have prompted the greater depth during the co-teaching discussions.

Scholars would argue, and I agree, that primarily low-depth coach-teacher talk will not ultimately help teachers integrate rigorous instructional approaches into their teaching to enhance student understanding of mathematics. However, I contend that the teachers in my study still gained something valuable from some of these low-depth interactions as they were aligned with what the teachers wanted and met the teachers where they were. For example, Teacher Cecilia was motivated to engage in her co-teaching cycle with Coach Claire, in part, because she needed help navigating the Everyday Mathematics 4 curriculum. As a reminder, Cecilia was new to the school district and had never used the EDM4 curriculum before. Additionally, content-related challenges stemming from the fact that Cecilia had previously only taught in the primary grades

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made it even more difficult for her to navigate the curriculum. Thus, she wanted assistance from Coach Claire in understanding how to steer through the curriculum. During their planning meetings, Claire and Cecilia had substantive (although "low-depth") interactions where Claire guided Cecilia through the curriculum, showing her how to integrate the various components to create a cohesive lesson for students (see examples in Chapter 5). Furthermore, in her post-cycle interview, Cecilia confirmed that she perceived this type of support from Claire, in terms of understanding and navigating the curriculum, to be highly beneficial. Thus, while professional development for in-service teachers should not solely focus on low-depth interactions, I argue that teachers may still gain something helpful from these low-depth interactions as they are aligned with what teachers feel they need. More on this topic will be discussed in the implications section.

Research Question 3: Perceived Benefits

The perceived benefits mentioned by the coaches and teachers will be discussed in three sections: benefits to the (1) students; (2) teachers; and (3) coaches.

Students. The coaches and teachers primarily discussed content- and pedagogy-related benefits to the students (see Table Q.2 in Appendix Q). Specifically, in the modeling cycles, the coach and teachers mainly talked about content-related benefits to students, while in the co-teaching cycles, they chiefly mentioned ways in which their pedagogy benefited students. Their perceptions align with findings from prior studies that students in co-taught classrooms enhanced their understanding and enjoyment of the content (Murphy et al., 2004; Murphy & Beggs, 2005) as the co-teaching experience made the content more accessible to students (Guise et al., 2016).

Teachers. Regarding teacher benefits, prior modeling and co-teaching studies point to pedagogical benefits, such as learning new questioning strategies and enhancing instructional

explanations (Lunenberg et al., 2006; Murphy & Beggs, 2005; Vanderburg & Stephens, 2010), as well as content benefits, including feeling more confident while teaching the content and gaining a deeper understanding of the content (Eick et al., 2003; Murphy & Beggs, 2005). The findings from the current study indicate that although the coaches and teachers mentioned both pedagogical and content benefits, they seemed to more frequently mention pedagogical benefits, such as gaining exposure to slower and/or faster pacing and differentiating instruction (mentioned by five out of five coach-teacher pairs), while content-related benefits were rare (mentioned by only one out of five coach-teacher pairs) (see Table Q.2 in Appendix Q). Specifically, content-related benefits included exposing the teacher to grade-level content and new math vocabulary, improving the teacher's math confidence, and helping the teacher navigate the district-provided curriculum.

Moreover, previous co-teaching research highlights additional teacher benefits, such as encouraging the co-teachers to develop learning communities (Scantlebury et al., 2008), strengthening the relationship between the co-teachers (Murphy & Beggs, 2005), and enabling the co-teacher to engage in deep, critical reflection (Eick et al., 2003; Lunenberg et al., 2006). The co-teaching participants in this study, however, did not tend to focus on these perceived benefits.

Coaches. Campbell and Griffin's (2017) model allows for both teacher and coach learning, but little empirical work has considered what coaches learn through modeling and co-teaching. In this study, one commonly mentioned coach benefit across both modeling and co-teaching was that the coach was able to get back into the classroom (see Table Q.2 in Appendix Q). Furthermore, some pedagogical benefits to the coach were discussed in both cycles, including learning new teaching methods and deepening understanding of assessment.

Research Question 4: Challenges and Conditions

Three challenges were mentioned across both modeling and co-teaching cycles (see Table Q.3 in Appendix Q). First, all coaches and teachers discussed how scheduling was a challenge. In particular, it was difficult to consistently find the time to model, co-teach, co-plan, and engage in reflection due to the coach's own hectic schedule. More about the coach's schedule will be explained later in the chapter as I discuss external conditions that impacted the cycles. This aligns with prior studies that found time to be a limited resource, which, for example, made it difficult to formally reflect about the lesson (Bean et al., 2010; Campbell & Griffin, 2017; Scantlebury et al., 2008). Second, the coaches and teachers discussed concerns related to ensuring teacher follow through after the cycle had ended and the coach left. Third, the coaches and teachers talked about difficulties associated with the materials needed to enact the modeled and co-taught lessons. The latter two challenges were not mentioned in previous modeling and co-teaching studies.

Conditions. Four conditions were mentioned across the modeling and co-teaching cycles that could potentially help address some of the emergent challenges (see Table Q.4 in Appendix Q). First, the coaches and teachers agreed that they needed to have a trusting relationship. Second, it was important for the coaches and teachers to coordinate their schedules and reserve consistent blocks of time for modeling, co-teaching, co-planning and reflection. Third, in relation to management, the coaches and teachers talked about the importance of having a behavior management system in place at the start of the cycle, as well as having consistent expectations between the coach and teacher about how to discipline students. Fourth, pertaining to materials, the coaches and teachers emphasized the necessity of ensuring all materials were in place prior to the cycle. These findings are largely consistent with previous research as several

of these conditions were highlighted in existing studies, such as the importance of developing trusting relationships (Knight, 2007; Mangin, 2005; West & Staub, 2003), setting aside time to co-plan (Campbell & Griffin, 2017; Scantlebury et al., 2008), and assisting with management and materials (Eick et al., 2003; Ellington, Whitenack & Edwards, 2017). More about building trusting relationships will be discussed below as this potentially held the coaches back from engaging in direct, challenging conversations with some of the teachers.

I now turn to discuss the three main stories that emerged across both sets of modeling and co-teaching findings. With Story #1, I begin at the macro-level as I describe the impact of various external factors on the modeling and co-teaching cycles. Next, in Story #2 I discuss differences between modeling and co-teaching as described in the literature and as observed in this study. Last, at the micro-level, with Story #3, I describe the lack of mathematical conversations during all modeling and co-teaching cycles.

Story #1: The Impact of External Factors on the Modeling and Co-teaching Cycles

As "coaching does not occur in a vacuum" (Neufeld & Roper, 2003, p. 15), it is important to recognize external factors that may influence coaches as they engage with teachers. In particular, as Meg and Claire enacted their modeling and co-teaching cycles, there were a number external factors that impacted them as they provided this type of individualized support to teachers. I now turn to discuss three external factors that had a presence in the coaches' cycles – (1) the Evaluation Tool (ET); (2) Teacher's Choice coaching structure; and (3) being spread too thin by district-level administrators and principals – and describe how they affected the coaching cycles. Ultimately, I argue that some of these external factors served as perverse incentives that caused the coaches to circumvent their work with teachers and focus on the immediate task of implementing lessons.

Evaluation Tool (ET)

Very little empirical research has examined how to evaluate the work of coaches, and how such evaluation plans impact coaches as they provide intensive, one-on-one professional development to teachers. In their practitioner-focused book, Killion and Harrison (2006) provide two thoughts regarding coach evaluation. First, districts should not use their teacher evaluation system for coaches, as coaches engage in work more closely related to that of a principal: "Many districts have unsuccessfully tried to use their teacher evaluation system to evaluate the work of coaches. But coaches' work is more closely aligned with principal's performance responsibilities and student learning" (p. 109). Second, districts should not solely rely on increased student achievement scores to measure coaches' effectiveness: "Measuring the success of coaching by improvement in student performance is insufficient" (p. 111). The current study illuminates what occurs when this advice, which has not been empirically tested, is ignored, and the impact it has on coaches and teachers as they engage in modeling and co-teaching cycles.

As previously described in Chapters 4 and 5, the Evaluation Tool (ET) was a new measure of coach and teacher effectiveness being implemented in the school district that year. To recall, the ET motivated Meg's modeling cycle with Michelle, as well as Claire's and Cathy's co-teaching cycle. In theory, the ET certainly had its benefits, as the purpose was to encourage coaches and teachers to consistently use student data to inform their instructional decisions, and to focus on student growth, instead of achievement. However, as I illustrate below, in practice, the ET became a perverse incentive, creating certain tensions for the coaches as they engaged in their respective modeling and co-teaching cycles, ultimately compromising their work with teachers.

Cycle lasted longer than it needed to. When completing a ET, the coaches and teachers could either decide to have it last four or nine-weeks. The benefit of doing a nine-week ET is that the coaches and teachers could then adjust their student growth goals at the mid-point if they noticed some groups of students needed more or less rigorous goals. Adapting goals in this way to make them more appropriate for students would ultimately increase the likelihood that students would meet their growth goals, which would reflect well on the coach and teacher, and enhance their ET evaluation score. Hence, Claire and Cathy agreed to complete a nine-week ET so that they could complete midpoint revisions if necessary. However, according to Claire, she would rarely choose to engage in a nine-week coaching period as part of her normal practice: "Very, very rarely would I have a nine-week long coaching cycle…So that's really frustrating to me because I feel like I spent so much time with that coaching cycle that I didn't need to." Thus, Claire spent more time in an intensive co-teaching cycle with a teacher who didn't necessarily need her help, removing her from working with other teachers at her school site.

Coach did too much for the teacher. In both the modeling and co-teaching cycles, Meg and Claire did much more for the teachers than they normally would have because the student data produced from those cycles was ultimately tied to their own evaluations. The primary way in which this manifested itself for Meg and Michelle is that Meg never released Calendar Math to Michelle and let her teach. Instead, Meg modeled for six continuous weeks before giving the post-test. This is interesting because on multiple occasions (see Chapter 4), Meg discussed her plans to release the cycle to Michelle, and yet it never happened. Claire, on the other hand, took on more of the work, such as creating the small groups and schedule: "Typically, I wouldn't have created groups and things for the teacher…I would typically do that with the teacher and then build the schedule and things like that with the teacher…I kind of wonder if I did too much." As

both Meg and Claire did more for their teachers than they normally would have during a typical modeling or co-teaching cycle, at the end of their cycles, Teachers Michelle and Cathy felt like they couldn't take on the Calendar Math and small math groups, respectively, after their coaches left. Michelle shared, "It's just me continuing with it and I am really trying to keep with it." Furthermore, Cathy stated, "When it's just me in here, it's kind of hard."

Coach evaluated on student rather than teacher improvement. Last, imposing the same evaluation system on coaches and teachers was challenging. It made sense for teachers as they normally engaged with students on a daily basis. Coaches, on the other hand, didn't typically work with groups of students over the course of the year, but rather they directly engaged with teachers. Hence, it would have perhaps been more logical to create different evaluation systems for the coaches and teachers based on their distinct roles. Claire shared the following: "It's almost like coaches' ETs need to be based on teachers' growth…I don't work with groups of students over the course of the year. My main job is to work with teachers." However, in his baseline interview, Mr. Smith mentioned that the district wanted coaches to think about their effectiveness in terms of student, rather than teacher, outcomes: "I think…a less mature coaching structure sort of…has this teacher focus…and maybe or maybe not that translates to improved student outcomes. We're trying to move as a district to that model."

By focusing on student, instead of teacher, improvement, the coaches were incentivized to circumvent the teachers rather than helping them improve their instruction. In other words, the new evaluation system made it *possible* for the coaches to show strong student growth without having made much, if any, impact on the teachers. This is consistent with data presented in Chapters 4, 5, and 6 in several ways. First, in reflecting on the perceived benefits of their respective modeling and co-teaching cycles, Teachers Michelle and Cathy primarily talked about

how the students benefitted, as opposed to discussing how their instruction was impacted (see Table Q.2 in Appendix Q). Second, when examining modeling and co-teaching depth data separately, the co-teaching pair that was motivated by the ET had a higher percentage of low-depth interactions than the other cycles that were not motivated by the ET. Modeling, on the other hand, was more mixed, as nearly all interactions were low-depth (see Table 6.2 above). These two points add more evidence that the coaches were more concerned about teaching the lessons and getting good student data, rather than ensuring the teachers were learning something valuable.

Furthermore, as additional challenges such as differences between Coach Meg's modeling and recommendations from the literature (which will be described below in more detail) and the avoidance of direct conversations by the coaches as teachers engaged in off-task behavior, permeated all modeling and/or co-teaching cycles, I do not claim they were unique to the two cycles motivated by the ET. Rather, I argue that because the ET evaluated coaches based on student rather than teacher growth, these challenges were left unaddressed as there was no real incentive for the coaches to ensure the teachers were truly getting something out of these cycles in particular.

Teacher's Choice Model

In his book, Knight (2007) discusses a "Choice Partnership" coaching structure, which the Teacher's Choice model adopted in District A is loosely based on. According to Knight (2007), traditional professional development frequently fails because teachers typically do not choose what they will learn, which ultimately detracts from teachers' professionalism. Hence, in theory, the benefits of such a partnership coaching structure are that "teachers have a great deal of choice in *what* and *how* they learn" (p. 25). Although these benefits certainly make sense, the

partnership model also comes with a host of challenges, some of which were unearthed in this study. Primarily, the coaches struggled to gain access to classrooms, and once they did, they primarily engaged in what Mangin (2005) refers to as *non-threatening leadership* as they positioned themselves as trustworthy peers who failed to consistently engage in direct, difficult conversations with teachers when needed. Hence, the Teacher's Choice model created some difficulties for the coaches as they engaged in the modeling and co-teaching cycles, as discussed further in the following sections.

Heightened difficulties associated with getting access to teachers' classrooms. Prior coaching studies generally point to challenges associated with getting access to teachers' classrooms (Camburn, Kimball & Lowenhaupt, 2008; Mangin, 2005; Matsumura et al., 2009). This was no different in the current study, in part, due to the fact that many teachers perceived the instructional coaches in District A as administrators (which they were not) and feared that they would be evaluated. Coach Claire discussed this idea in her baseline interview:

> It's such a grey area between administration and teaching, and it's really hard sometimes
> to ride that fence…Some teachers view me more as administration and are closed off to
> it. Whereas other teachers are like, oh my gosh, no come in! Like, this is awesome. So,
> it's really, it's a hard position to navigate sometimes.

Furthermore, Claire's principal, Mr. Stacey, also reflected on this challenge in his baseline interview:

> But some teachers are more willing to have Claire come in and help them because, I think
> it is still for some people, they might see it as this person is coming in to observe me and
> then they are going to run back and tell administration what they saw. Because the

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instructional coach is like that person kind of floating in the middle. They're not a

classroom teacher, they are not in administration, but they work really closely with me.

Thus, getting access to classrooms was challenging, in part, as many teachers viewed the coaches

as administrators and did not want to open up their classrooms only to be critiqued.

The Teacher's Choice model seemed to make access even more difficult for the coaches

as they had to wait to be approached by teachers for help. Coach Meg mentioned the following:

"I think that the biggest challenge…with this Teacher's Choice…is making them [the teachers]

feel comfortable enough to approach me, 'cuz nobody wants to look stupid, you know?"

Furthermore, Meg described how she practically begged teachers to let her support them: "I feel

like I'm trying to…pimp myself out. I'm like please, please…please let me in your room. I'll

do anything...I was…sort of laying myself in front of their doors." By pleading with teachers in

such a way, Meg feared this possibly diminished her in the teachers' eyes: "I have to be looked

upon as someone… that… is… considered a master teacher…But if I'm out there begging to get

into rooms, that takes away from the validity of that." Meg perceived that district-level

administrators were unaware of these issues:

> There's a disconnect between what the powers that be think is going on and what is
>
> actually going on…they think…all these teachers want these coaches in their
>
> rooms…and then they get back to their schools and teachers are, like, not wanting them
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> in their rooms.

Thus, to overcome the dual hurdles to classroom access—being perceived as administrators and

the Teacher's Choice model—Coaches Meg and Claire primarily engaged in *non-threatening*

leadership (Mangin, 2005) as they (1) positioned themselves as trustworthy peers and (2)

avoided engaging in direct and difficult conversations with teachers.

Coaches positioned themselves as trustworthy peers. To help alleviate teachers'
concerns that the coaches were secretly evaluating them during intensive, one-on-one
professional development sessions and to encourage teachers to actually approach the coaches
for help (as stipulated by the Teacher's Choice model), the coaches focused on building trusting
relationships with the teachers. Claire talked about this in her baseline interview: "I'm still
pretty new, and establishing relationships and it's huge." Furthermore, both principals
underscored the importance of building relationships. Mr. Stacey stated, "I think on Claire's end
is trying to establish some relationships with people so they allow her to come in and do some
coaching cycles" while Mr. Smith said, "The coach has to have that level of trust to be effective
at her job with everybody." Additionally, this was mentioned by nearly all coaches and teachers
as a necessary condition to bring about positive and productive modeling and co-teaching cycles
(see Table Q.4 in Appendix Q). However, while building trusting relationships may be
important in some ways, it comes with challenges. For example, in her study, Mangin (2005)
found that when teacher leaders focused on developing relationships with teachers to get access
to their classrooms, this did little to reinforce their roles as experts with important knowledge to
be shared, and instead positioned the coaches as trusting peers. Hence, it is possible that Meg's
and Claire's focus on building trusting relationships with their teachers detracted from their
ability to position themselves as instructional experts, thus limiting their capacity to truly help
their teachers transform their mathematics instruction.

Coaches struggled to engage in uncomfortable conversations with teachers. While
enacting non-threatening leadership, Meg and Claire focused on building trusting relationships
and appeared to avoid engaging in direct, challenging conversations with their teachers – another
facet of non-threatening leadership. This underscores findings from a previous study that found

teacher leaders avoided giving "hard feedback" to maintain trusting relationships with teachers when working one-on-one (Lord et al., 2008):

> In order to preserve trust and strengthen relationships with their clients, teacher leaders often avoid giving hard feedback. Instead, they opt for less direct, tactful commentary that, while easier and less threatening to deliver, may leave difficult issues unaddressed and unresolved (p. 72).

Consistently engaging in tough conversations with teachers seemed to be more of a challenge for Meg than it was for Claire. For example, Meg did not directly talk with Michelle and Mackenzie about their off-task behaviors during the modeled lessons. Instead, she came up with other ways to get the teachers on task, such as asking them to work with students who didn't necessarily need the individualized support: "I had to…request more out of Michelle. Like, hey, can you work with this kiddo or hey can you help with that?" Furthermore, Meg did not directly talk with Michelle about her concerns that she wouldn't continue with Calendar Math after the modeling cycle ended. Instead she developed other strategies that would alert her to whether or not Michelle was still teaching Calendar Math: "I can just pop in there and know if it's being done to fidelity. The days in school line…it's an easy check…quick visual. 'Cuz I know what day it stopped on."

It seemed as though Claire, too, struggled to engage in challenging conversations with teachers. For example, she acknowledged that one emergent challenge from her co-teaching cycle with Cecilia was keeping Cecilia focused during their planning meetings: "Honestly, like being able to stay on task during planning…Trying to hone her in…without being a hard ass about it." This is consistent with the Direct Engagement codes as, in comparison to the other co-teaching coach-teacher pairs, Claire and Cecilia had the highest percentage of off-topic

conversations during their planning meetings. There were a few examples, however, that did

demonstrate Claire could have direct conversations with Cecilia. For example, during the second

observed planning meeting, Claire told Cecilia that she needed to focus.

Claire: Focus!
Cecilia: Alright. I'm focused.

During that same planning meeting, Claire had a direct conversation with Cecilia where she told

her not to always expect that she would be able to pull a small group.

Cecilia: But you'll be in here, so why can't you take one and I'll take the other?
Claire: Well, I can. I just don't want you to get used to that.
Cecilia: Well, why not?
Claire: Because I won't be able to do it all the time.

However, overall, these examples were rare.

An additional question worth raising is whether the coaches' avoidance of difficult

conversations might also relate to the lack of depth in the coach-teacher talk. That is, it is

possible that the coaches did not want to expose or probe the teachers' lack of understanding

about mathematics and teaching mathematics, which in turn restricted the conversations to more

surface-level topics, such as procedures and materials. Although this is a hypothesis that would

require additional testing, the point is certainly worth exploring.

Thus, the current study adds additional evidence to findings from previous research that

generally describe how getting access to teachers' classrooms was a challenge for coaches

(Camburn, Kimball & Lowenhaupt, 2008; Mangin, 2005; Matsumura et al., 2009). Furthermore,

this study illuminates how, similar to Mangin's (2005) teacher leaders, Coaches Meg and Claire

enacted non-threatening leadership by positioning themselves as trusting peers and avoiding

difficult conversations to gain and maintain access. However, unlike previous research, in doing

so, this study unearths challenges associated with the Teacher's Choice coaching structure.

Coach Spread Too Thin

Prior studies discuss competing demands imposed on coaches by principals, as well as district-level administrators (Camburn, Kimball & Lowenhaupt, 2008; Campbell, 2012; Chval et al., 2010; Coburn & Russell, 2008; Neufeld & Roper, 2003). These include principals requiring coaches to substitute teach and/or monitor the cafeteria and/or playground (Camburn et al., 2008); regularly work with a group of students that failed an assessment (Coburn & Russell, 2008); complete paperwork and prepare materials for the state mathematics test (Chval et al., 2010); and function as a test coordinator (Campbell, 2012). Camburn et al. (2008) found that the coaches in their study were called upon to support district-level initiatives, as they were asked to "deliver district mandates for school level curriculum alignment, facilitate school improvement planning, and develop classroom formative assessments" (p. 140). In the current study, Coaches Meg and Claire, too, were spread quite thin as they were asked to juggle multiple responsibilities by district-level administrators, as well as their own principals. However, unlike previous studies, below, I illustrate how this negatively impacted Coach Meg's and Claire's modeling and co-teaching cycles, compromising their work with teachers.

Lead professional development at district-level. To recall from Chapter 3, the coaches in District A were expected to lead professional development for the teachers at their own school sites. However, a new trend was that the coaches were being asked to take on even more of a leadership role by facilitating professional development across the district for teachers who weren't necessarily at their schools. Claire was discouraged by this: "It was a little frustrating as a coach because…you know we lead PDs in our building, but it's never been…part of our job description." Furthermore, Claire found this problematic as it removed her from her school for hours at a time, thus limiting the amount of time she could spend engaging with teachers:

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It was a lot of extra time because you were working with another coach in a different

building and so you had to find time to meet and plan and so it took me out of my

building for…probably a good 4-5 hours of planning time…And five hours out of your

building can be…two whole coaching cycles…They started to really spread us thin.

Substitute teach. In addition to being called upon to lead professional development at

the district-level, the coaches were frequently asked to substitute teach if other teachers in their

school were absent. Ultimately, this limited the coaches in supporting teachers and engaging

them in meaningful professional development. This impacted both Meg and Claire. For

example, Meg talked about how she spent the first three days of the school year teaching

physical education as they did not have a teacher for that class yet: "I was in P.E. for those [first]

three days. I was not in my office to get things done." This was also a common practice the

previous school year: "I found that to be entirely too frequent last year. I don't think I went a

solid week without being put in a classroom." Meg was frustrated by this ("That's a waste of my

time…I did not spend 21 years refining my craft to be a full-time substitute teacher. I find it

somewhat demeaning") and found it to be at odds with district expectations ("I think the district

expectation is do not use coaches as internal subs. And I think that's not being held to fidelity").

This also impacted Claire as she was, at times, removed from working with teachers to substitute

teach: "I missed some co-teaching sessions because I got pulled away to sub and that is always a

challenge." Cecilia confirmed this: "She's being pulled to sub and she can't plan with me, so

that was definitely a challenge." This appeared to be such a common practice at Claire's school

that teachers even approached Claire, asking her to substitute teach.

Cecilia: Speaking of a doctor's appointment real quick, 'cuz I don't think I'll end up
                getting a sub. I'm leaving at 2 'cuz I have a doctor's appointment. All we have is
                that assembly from 2-3 on Friday, so…
Claire: I might be able to. I need to look at my…

Cecilia: They just need, I can even take them down there.

Claire: I'll wait to see what Mr. Stacey wants to do. If I'm in here, they need to pay me. If they cover it, then they don't. One of them may just say we'll take care of it. (2nd planning meeting, 10/14/16)

Supporting various district-initiatives. Last, at times, Meg and Claire were called upon to use their modeling or co-teaching cycles to support district-initiatives. Overall, at the time of the study, District A seemed to be focused on a number of literacy initiatives. For example, District A was working in partnership with a literacy consultant to support teachers in helping students navigate nonfiction texts. In addition, District A expected teachers to implement a specific guided reading template. Hence, before attending district-wide professional development on these topics, Meg and Claire often shifted their focus with teachers to help them get ready for these meetings. For example, Meg discussed how teachers asked her to model in their classrooms, not for the purpose of learning a new, ambitious instructional strategy, but rather to accumulate the required student artifacts for the upcoming district meeting:

> With some PD expectations that they needed to have done in the classroom and the week before they had to go to the PD and bring the artifacts are like well can you come in and model this, and then I'm in there doing it for them.

In summary, as Coaches Meg and Claire accepted additional responsibilities from their principals and district-level administrators, it ultimately decreased the amount of time they had to engage in modeling and/or co-teaching cycles with their teachers, and – at times – dictated the focus of their coaching cycles. It may be that Coaches Meg and Claire were unsure of how to negotiate, rather than accept, additional duties from their principals and district-level administrators (Campbell, 2012), which will be discussed below in the implications section.

Story #2: Differences Between Modeling and Co-Teaching as Described in the Literature and as Observed in this Study

There is a small, yet emerging, body of literature describing how coaches can effectively implement modeling and co-teaching so they can be powerful opportunities for teacher learning, rather than places where coaches "essentially 'show and tell' teachers how to change" (Lord, Cress & Miller, 2008). Below, I describe how key recommendations in the literature contrasted with the enactment of modeling and co-teaching observed in this study. Furthermore, I explore several potential reasons why this occurred, often looping back to the external conditions described above. I begin by discussing common implementation issues to both modeling and co-teaching, and then describe issues specific to modeling.

Modeling and Co-Teaching

Across the modeling and co-teaching literatures, it is recommended that the coach and teacher together co-plan lessons, and consistently set aside time to engage in reflection (Campbell & Griffin, 2017; Gallo-Fox & Scantlebury, 2016; Guise, Habib, Robbins, Hegg, Hoellwarth & Stauch, 2017; Scantlebury, Gallo-Fox & Wassel, 2008; West & Staub, 2003). According to the literature, these recommendations should not be ignored as they have the potential to increase the teacher's involvement (which may be especially important during modeling), and to help the coach better understand what the teacher is learning. Furthermore, in the absence of co-planning and reflecting, Campbell and Griffin (2017) question whether teachers' instructional practice can truly change: "Without co-planning for subsequent instruction and subsequent debriefing, how can co-teaching be a route for…changing teachers' instructional practice?" (p. 10). In the space that follows, I begin by discussing how issues related to co-planning seemed to play out differently in the modeling and co-teaching cycles, and then consider the lack of reflection conversations that permeated both cycles.

Co-planning. Co-planning issues seemed to impact the modeling and co-teaching cycles differently. I begin by discussing the modeling cycles, and then talk about co-teaching.

Modeling. As mentioned above, it may be especially important for the coach and teacher to plan all modeled lessons together to increase the teacher's involvement and provide him or her with a sense of ownership of the lesson. Patti, the district-level administrator in charge of supporting the coaches in District A, also stressed this point: "If you don't plan it together, you don't own it." Although I was invited to observe one planning meeting each for Teachers Michelle and Mackenzie[55], instead of co-planning the modeled lessons with her teachers during these meetings, Meg discussed her intentions to provide them with an outline of what she would do during Calendar Math instruction: "I'm gonna make my list of what I hit first, what I hit second, so you'll have a skeleton outline when I do this." Furthermore, as discussed in Chapter 4, although Teacher Mackenzie described engaging in additional planning meetings with Coach Meg, the purpose was not to co-plan the modeled lessons, but rather discuss mathematics stations students would complete outside of Calendar Math time.

The absence of intentional co-planning during the modeling cycles can potentially be explained by a number of factors. First, as described in Chapter 4, during daily Calendar Math instruction, Coach Meg cycled through the same series of activities in each lesson. The only thing that changed was the Number of the Day. Thus, it is likely that Coach Meg thought it was unnecessary to sit down and plan all Calendar Math lessons with Teachers Michelle and Mackenzie as the basic structure didn't change. Second, and this can only be applied to Meg's cycle with Michelle, it is possible that due to the fact that Coach Meg was completing her Evaluation Tool (ET), as described above, this created the perverse incentive for Coach Meg to

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[55] See Chapters 4 and 5 for more details about each planning conversation, including the duration, as well as prevalence and examples of topics discussed.

primarily concern herself with getting good student data, rather than ensuring that Teacher Michelle learned something from the experience. Third, structural factors at the school-level, including issues related to scheduling, as well as difficulties associated with the coaches being spread too thin (see above) may have created barriers that prevented the coach and teachers from co-planning. Last, it is possible that Coach Meg was unaware of the importance of co-planning for modeled lessons, and more about this will be discussed in the implications section below as I outline coaches' professional development needs.

The lack of intentional co-planning during Meg's modeling cycles potentially contributed to two emergent challenges. First, it is possible that the teachers felt less invested in the modeled lessons as they did not take an active role in planning them. This could have influenced their off-task behaviors (see Chapter 4) during the modeled lessons, which primarily consisted of organizing their classrooms and engaging with technology. Second, by failing to co-plan the modeled lessons with Teachers Michelle and Mackenzie, Coach Meg decreased her teachers' opportunities to engage in more substantive pedagogical conversations, as discussions about pedagogy only surfaced in 26-29% of the planning conversations, and when they did, they were more logistical. In comparison, pedagogical conversations were not only more prevalent during the co-teaching planning meetings (range of 42-52%), but they were also more substantive as the coach and teachers monitored student learning and used student data to inform their instructional decisions. This is likely due to the fact that the coach and teachers had to discuss more substantive pedagogical issues as they came together to jointly plan lessons they would ultimately co-teach. Thus, it is possible that more pedagogical conversations could have taken place during the modeling planning conversations if the coach and teachers actually co-planned

the modeled lessons, which in turn could have provided Teachers Michelle and Mackenzie with richer learning opportunities.

Co-Teaching. Unlike the modeling planning meetings where the coach and teachers did not co-plan the modeled lessons, during the co-teaching cycles, the coach and teachers did consistently co-plan their co-taught lessons. However, two specific issues seemed to emerge that potentially impacted the quality of the co-planning sessions. First, in her post-cycle interview, when reflecting on how her co-teaching cycle with Coach Claire could have been improved, Teacher Caroline wished that their planning conversations were more intentional. Specifically, she wished that they consistently did more than just monitor student learning, but instead took additional steps to discuss how they would alter their own actions to better support student learning in light of the data.

> Maybe after a week of teaching, or two weeks…Claire and I did not do this well, I think we should have really sat down and…not just looked at student papers, but okay, where are we going?...We focus on what they [the students] need a lot, which is great, but sometimes we aren't sure what we're doing for them. So, I think had we really been thoughtful about it, or myself, I can only speak for myself. Had I really been thoughtful about it, I would have done that. I would have changed that after my first week.

Issues related to the intentionality behind co-teaching co-planning could certainly be related to the lack of professional development that was provided to coaches about the practices of modeling and co-teaching. In other words, it could be that the coaches did not know how to effectively co-plan with teachers and move conversations in the high-depth direction. This is certainly supported by evidence of the overall lack of high-depth coach-teacher talk. More on

this will be taken up below when discussing implications about coaches' professional development needs.

In addition to Caroline's desire to be more intentional during her planning meetings with Coach Claire, it seemed as though Cathy and Cecilia struggled to consistently find the time to co-plan with Claire. In her exit interview, when reflecting about what could have strengthened her co-teaching experience with Claire, Cathy said that developing a consistent co-planning schedule would have helped: "Maybe setting up a set schedule for co-planning, so like you know every Tuesday at 10:30 or every Wednesday before school…we can always block out that time and schedule around that." Cecilia, on the other hand, stated that finding the time to co-plan was such a struggle that she and Claire would often finish planning through text message: "Claire is…pulled in so many different directions and she's only one person…A lot of times we would have to plan like half the lesson, and then we'd have to talk on the phone and then plan and talk through text." Many of the external conditions described in Story #2, namely that the coaches were spread too thin due to the piling on of additional responsibilities by their principals and district-level administrators, can explain why it was so challenging for Cathy and Cecilia to find the time to co-plan with Claire.

Reflection. Across both modeling and co-teaching cycles, it seemed as though Coaches Meg and Claire struggled to consistently engage their teachers in informal and formal reflection conversations about the modeled and co-taught lessons. As described in Chapter 4, I never observed formal or informal reflection conversations during Meg's modeling cycles with Teachers Michelle and Mackenzie. However, during an interview, Coach Meg did reference several informal reflection conversations she had with Teacher Mackenzie. Furthermore, as discussed in Chapter 5, I only observed brief, informal reflection conversations lasting less than

five minutes between Coach Claire and Teachers Cathy, Caroline and Cecilia, and one formal reflection conversation between Claire and Caroline. Similar to the planning meetings, it is possible that structural conditions at the school-level made it such that finding the time to reflect was nearly impossible for the coaches. It is also possible that, again, due to a lack of professional development, the coaches did not understand (1) the importance of consistently engaging in reflection conversations with their teachers, or (2) how to facilitate a meaningful reflection conversation. This will be further discussed below in the implications section.

Modeling Only

The literature points to a number of practices that a more experienced other should implement while modeling lessons to maximize the learning experience for the individual observing instruction. In the space that follows, I discuss three specific practices that were not evident during the modeling cycles observed, and describe potential challenges that may have resulted from the absence of these practices.

Teacher as active observer. During the modeled lesson, it is recommended that the teacher actively observe instruction (West & Staub, 2003). This is also something that Meg expected: "I would have liked to see some kind of notes or ideas or thoughts being recorded somewhere." However, as previously discussed in Chapter 4, Michelle never took notes while observing, and Mackenzie only did so during the first two (out of six total) modeled lessons.

Use in combination with other strategies. Furthermore, it is suggested that modeling be used in combination with other strategies (Clarke et al., 2014; West & Staub, 2003). Meg also acknowledged the importance of not exclusively modeling for teachers:

I wouldn't suggest modeling in isolation…I would say it's easier to do co-teaching in

isolation because you each have responsibilities, so it kind of has that accountability

piece. Where modeling…is too easy to lend towards you do it for me.

Although Meg understood the importance of using modeling in conjunction with other strategies,

she solely modeled for Michelle and Mackenzie and both cycles never progressed into co-

teaching.

     Make pedagogical choices explicit to the teacher. Lunenberg and colleagues (2006)

identified four types of modeling that a more experienced other may use during the modeled

lesson (see Table 6.3).

Table 6.3
Four Types of Modeling

Modeling Type	Description
Implicit	Coach does not make explicit connections to pedagogical choices.
Explicit	Coach does make explicit connections to pedagogical choices while teaching and explains why.
Explicit and Facilitating the Translation to Teachers' Own Practices	Coach helps teachers see how the modeled lesson can be applied to different teaching scenarios.
Connecting Exemplary Behavior with Theory	Coach establishes the link between teaching practice and theory.

     At one end of the spectrum with Implicit Modeling, the coach does not make explicit

connections to her pedagogical choices, leaving the teacher to make those connections on his or

her own. At the other end of the spectrum, the coach consistently and explicitly establishes the

link between her teaching practices and theory, which likely provides a richer learning

environment for the teacher. The latter three modeling types would have been captured in

instances of Direct Engagement between Meg, Michelle and Mackenzie, which were previously

described in Chapter 4. However, across the two cycles, I only found one example of Direct

Engagement (out of a total of 151) where Meg provided a rationale for her pedagogical choices.

Mackenzie: Yes, I did it different from you on Monday when you were at your professional development and they were very quick to say no, no. I said, ok.
Meg: Well, the reason we do it that way, like I said, there's a very particular math language. And when you say one dollar, one dollar could be a dollar bill, it could be four quarters, it could be two half dollars, it could be ten dimes. So when you're specifically handing out change, you need to make sure you understand the difference between the coins and the actual dollar bills. (4th lesson, 12/1/16)

By rarely connecting her pedagogical teacher moves to any broader principles or theory, Meg

left it up to chance that Michelle and Mackenzie would make these connections themselves, thus

limiting the potential of the modeling cycles to provide powerful professional development

opportunities for both teachers.

Admittedly, I was surprised that I did not observe more intentionality behind Meg's

interactions with Michelle and Mackenzie during the modeled lessons. Hence, in the exit

interview, I asked Meg what guided her interactions with the teachers during instruction. She

shared two points. First, Meg tried to find strategies that enabled the observing teachers to notice

what she wanted them to notice without tipping off the students and stopping the lesson. For

example, during one lesson in particular, Meg wanted students to model the multiplication

problem "7 x 3" by having seven students hold up three fingers each. Meg pointed to the seven

students whom she wanted to participate, but as all students were sitting close to one another on

the floor, they were confused about who she was pointing to. As a result, many students thought

they were supposed to hold up three fingers.

Meg: *(To students)* Alright, when we are doing multiplication groups, and I want to get into this a little bit deeper. When you are doing seven times three, you have seven groups with three in each group. Ok? So, let me see. I'm going to count off here. 1, 2, 3, 4, 5, 6, 7. Hold up three fingers. If I pointed to you. If I pointed to you. I did not point to you. I did not point to you. I did not point to you. *(To Mackenzie)* Really?

Mackenzie: Yeah.

Meg: *(To students)* Hands down. If I point to you, put up three fingers. Wow. Please listen. If I point to you now hold up three fingers. *(To Mackenzie)* I feel like I'm talking to a bunch of Roses from Golden Girls. *(To students)* If I point to you now, okay, you will put up three fingers. Ok? 1, 2, 3, 4, 5, 6, 7. There. Hold up three fingers, just those people. K. Put it down. Thank you.

Mackenzie: Wow.

In her exit interview, Meg stated that she did this because she knew students would not know who Rose from the Golden Girls was and yet it was a reference Mackenzie would understand and they could later reflect about it: "I'm trying to interact with the teacher…in a way that students don't know. Like, I knew that most of the students in there wouldn't know…Rose from the Golden Girls." Second, Meg did not enter her modeled lessons with a pre-determined idea about what, if anything, she wanted to draw teachers' attention to: "It wasn't anything that I could consciously say I went in there to do, like to stop and be like notice how I…no." Instead, it was "kind of whatever it was…off the cuff." More will be explained later as I hypothesize about why Meg adopted these strategies while modeling, instead of briefly stopping to explain her pedagogical teacher moves to promote a richer learning environment for Michelle and Mackenzie.

Hence, in many ways, Coach Meg did not appear to leverage modeling as an effective vehicle for individual professional development. She hoped that Michelle and Mackenzie would notice and understand the implicit rationale behind her pedagogical teacher moves. To recall from Chapter 3, an integral component of Lave and Wenger's Theory of Legitimate Peripheral Participation is access, as the old-timer (coach) intentionally provides the newcomer (teacher) with access to carefully scaffolded experiences that ultimately enable the newcomer to learn the norms and practices of the experts in the community. As illustrated above, by not encouraging the teachers to take notes while observing, using modeling in isolation, and rarely explaining the

rationale behind her pedagogical choices, Coach Meg unintentionally limited her teachers' access to learn how to independently implement Calendar Math.

The lack of articulation of the principles guiding Meg's instruction made the teachers feel like they had to imitate Meg's instruction. This seemed to impact Michelle more than Mackenzie: "I'm trying to imitate her, also, as far as her expectations and my expectations so that it is consistent." However, in her post-cycle interview, Meg said that she did not want Michelle to simply mimic her. Yet, Meg also noted that parts of Calendar Math instruction may warrant at least some imitation:

> I think the biggest thing I've seen with Michelle is she has observed me doing this so
> much now that she probably could do it in a very similar way to the way that I do it…not
> that she has to be a clone of me…but there is a pace that you have to keep and there is
> some questionings that you have to throw in, you need to know when to say explain that
> answer and when to just move on…so I think that she will be able to do that.

A lack of professional development? Overall, it appeared as though Meg lacked the knowledge to leverage modeling so it could be used as a vehicle for intensive professional development for both Michelle and Mackenzie. This could, in part, be explained by the fact that the coaches in District A had not been provided with targeted professional development on modeling and co-teaching. When I asked Patti what kinds of professional development she provided for the coaches around these two practices, she stated, "Specifically, I would say it's not a topic that we've really worked on." More will be discussed on this below in the implications section as I outline instructional coaches' professional development needs.

<div align="center">

Story #3: Where is the Mathematics?

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In Chapters 4 and 5, I examined the most prevalent topics that *were* addressed during Meg's and Claire's modeling and co-teaching cycles, discussing sub-themes when necessary and providing multiple examples to help illustrate what the coach-teacher talk was like. In addition, above, I summarized the most prevalent themes to, again, give a sense of what *was* discussed as Meg and Claire engaged teachers in individualized professional development. Furthermore, through Stories #1 and #2, I sought to set the stage at a macro-level to help explain why the coach-teacher talk focused on some topics over others. While it is interesting to get a sense of what *was* discussed in the 11 planning meetings, 23 modeled or co-taught lessons, and 4 reflection conversations, it may be even more eye-opening to examine what *wasn't* discussed.

Coach-Teacher Talk About Mathematics[56]

In 2004, Hill attended and observed a sample of 13 K-6 *group* mathematics sessions facilitated by consultants, university staff, district officials, and teachers to determine the extent to which they met eight standards[57] of high-quality professional development. Hill found that some of the sessions contained little information about mathematics. "In some cases, the mathematics was barely evident among the cutting and pasting teachers did; in others, procedurally focused mathematics was presented as conceptually based standards" (p. 227). Hence, Hill's study raised questions about the extent to which mathematics was consistently and meaningfully incorporated into *group* professional development experiences for elementary teachers, and if these trends would continue in more intensive, *one-on-one* forms of professional development, led by a more experienced coach.

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[56] As a reminder, I flagged coach-teacher math talk in two ways. I used the Mathematics code to draw attention to conversations about mathematics, and the Mathematics Indicator when the coaches and teachers used mathematical words/phrases while talking about other topics, such as assessment and the curriculum, without attending to the meaning of those words/phrases.
[57] To develop the eight standards, Hill completed an extensive review of the literature regarding professional development standards and created a list of eight for the purpose of her study.

In this study of two coaches and five elementary teachers, I found that a lack of conversations about mathematics content permeated all modeling and co-teaching cycles (see Table 6.4 below). As a reminder from Chapters 4 and 5, coach-teacher interactions during modeling more often focused on materials, assessment logistics, and classroom management, while interactions during co-teaching more often focused on the curriculum, monitoring student learning, utilizing data to inform teaching, and engaging in pedagogical talk. This was even true for the two cycles that were, in part, motivated by the teachers' desire to gain exposure to grade-level mathematics concepts. To recall, as Mackenzie and Cecilia had never taught in the intermediate grades before, they both hoped that by working with Meg and Claire, they would deepen their understanding of fourth-grade mathematics concepts. From their pre-cycle interviews, Mackenzie shared that, "Working with Meg will give me some math concepts that I can bring into 4th grade," while Cecilia perceived she needed help addressing the "lack of understanding on my part with math."

Table 6.4
Prevalence of Talk Coded as "Mathematics" Across All Modeling and Co-teaching Cycles

	Planning Conversations	Modeled or Co-Taught Lessons	Reflection Conversations
Modeling			
Meg and Michelle	0%	2%	n/a
Meg and Mackenzie	7%	3%	n/a
Co-teaching			
Claire and Cathy	0%	4%	0%
Claire and Caroline	2%	2%	0%
Claire and Cecilia	4%	2%	0%

As a reminder from Chapters 3, 4 and 5 all data that received a Mathematics code was also sorted into Coburn and Russell's (2008) low-, medium-, and high-depth categories. Table 6.5 below displays the depth of all mathematical coach-teacher talk across both modeling and co-teaching cycles. There are two trends worth highlighting. First, when medium- and high-depth

mathematical coach-teacher talk did occur, they were more likely to take place during the planning meetings rather than the modeled or co-taught lessons. Second, primarily low-depth mathematical discussions occurred during the modeled and co-taught lessons, while medium and high-depth interactions rarely happened. This can, in part, be explained by the fact that during the modeled and co-taught lessons, with an audience of students in front of them, the coaches and teachers likely felt pressured to move forward with the lesson and did not want to stop to engage in deep discussions about the mathematics content. During the planning meetings, in the absence of students, the coaches and teachers perhaps had more time to delve into mathematical meanings.

Table 6.5
Depth of Mathematical Talk Across All Modeling and Co-Teaching Cycles

	Low	Medium	High
Modeling			
Planning Meetings			
n (Segments)	3	0	3
n (Characters)	502	0	945
Overall Percentage (Character-level)	35%	0%	65%
Meg-Michelle	n/a	n/a	n/a[58]
Meg-Mackenzie	34%	0%	66%
Modeled Lessons			
n (Exchanges)	3	0	1
Overall Percentage (Exchange-level)	75%	0%	25%
Meg-Michelle	100%	0%	0%
Meg-Mackenzie	50%	0%	50%
Co-Teaching			
Planning Meetings			
n (Segments)	7	2	3
n (Characters)	1,037	1,390	795
Overall Percentage (Character-level)	32%	43%	25%
Claire-Cathy	n/a	n/a	n/a
Claire-Caroline	0%	0%	100%
Claire-Cecilia	51%	26%	23%
Co-Taught Lessons			
n (Exchanges)	7	0	0
Overall	100%	0%	0%
Claire-Cathy	100%	0%	0%
Claire-Caroline	100%	0%	0%
Claire-Cecilia	100%	0%	0%

[58] Not applicable (n/a) is used to indicate that no discussion coded as Mathematics occurred.

Mathematics Indicator

As was formerly discussed in Chapters 3, 4 and 5, instead of having discussions about mathematics, the coaches and teachers used mathematical words and phrases while talking about other topics without attending to the mathematical meaning. Such instances were tagged with a Mathematics Indicator. The Mathematics Indicator most frequently surfaced as the coaches and teachers named mathematical words and phrases while discussing the Curriculum, Activities and Materials, Assessment and General Pedagogy.

Three hypotheses may help to explain why conversations about mathematics were rare to non-existent. First, the coaches in District A were instructional, rather than content, coaches. In other words, Meg and Claire were generalists without specialized mathematics training expected to provide professional development for all teachers across the K-5 spectrum in all content areas. Hence, it is possible that teachers did not perceive Meg and Claire to be content-experts, which in turn shifted their focus away from mathematics when engaged in professional development with their coaches. This current study adds evidence to existing studies that generally found teachers did not access some teacher leaders as a resource due to the teacher leaders' lack of mathematics content knowledge (Mangin, 2008; Manno & Firestone, 2008). However, these prior studies did not specifically examine how this impacted modeling and co-teaching cycles, which is a gap the current study seeks to fill.

Second, it is possible that the coaches in District A received insufficient and inadequate mathematics professional development, which rendered them ill-equipped to help teachers deepen their mathematics content knowledge. The extent to which this hypothesis was true for the coaches in District A is unknown. I had the opportunity to attend one professional development session for the coaches, and only a short portion of the two-hour meeting focused

on mathematics instruction, as the coaches read and discussed an article about equity in the mathematics classroom. Furthermore, in my interview with Patti, she briefly referenced attending a regional NCTM conference and sharing information from various sessions with the coaches. More about professional development for the coaches will be discussed in the implications section below.

Third, it is possible that – despite their strengths – modeling and co-teaching forms of professional development have no inherent mechanism for pushing coaches and teachers to have substantive conversations about mathematics. Although coaches may be told in professional development, for example, that they should engage in mathematical conversations with teachers, the format of the professional development with their immediate, urgent focus on getting through the lessons during a busy school day does not lend itself well to deep reflection about mathematical concepts. In the implications section below, more will be discussed about the need to develop a protocol for coaches and teachers to use during modeled and co-taught lessons to ensure there is a mathematics focus.

Reflection

The three stories presented above are related in important ways. The external factors described in Story #1 created a set of structural conditions that made it very difficult for the coaches to enact high-quality modeling and co-teaching cycles with their teachers (as described in Story #2). As the coaches were not adequately supported to implement meaningful modeling and co-teaching cycles with their teachers, it is understandable that the focus of the coach-teacher talk was on procedures, materials, and surface-level structures, rather than engaging in more substantive discussions about how students learn mathematics and underlying mathematical concepts. In some ways, I resisted recognizing and telling these three stories

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because I am a firm believer in the power of coaching, especially in one-on-one settings, and I want to honor the hard work, dedication and expertise of Coaches Meg and Claire. However, I hope that Stories #1 and #2 can help the research and school-district communities better understand how coaches need to be supported and protected if they are to live up to our very high (perhaps even unrealistic) expectations of them.

Furthermore, these three stories have had a profound impact on me as I have reflected on my prior experiences as an instructional coach. I see so much of Coaches Meg and Claire in my former instructional coach self. Story #1 made me think about the evaluation system that was used on coaches in my old school district. Similar to the Evaluation Tool, I could select any teacher, classroom and subject, and go in for one class period and teach the class while being evaluated. There was no incentive for me to engage with the teacher during that lesson or ensure that he/she learned something from it. Instead, I was primarily concerned with getting good student data and painting myself in a positive light so I could get excellent evaluation marks, as was expected of an instructional coach. Story #2 made me reflect a great deal about my prior experiences modeling. Looking back, I can see that I exhibited many of the same behaviors as Coach Meg. I rarely stopped to explain my pedagogical choices to the teacher, I did not co-plan with the teacher ahead of time, and as the teacher engaged in off-task behaviors, I struggled to directly address this as I didn't want to create tension in our relationship. My assumption was that, through osmosis, the teacher was learning something and that we were on the same page. Furthermore, I had no idea what constituted "effective modeling" as we never discussed it in professional development. In reaction to Story #3, I truly wonder what would happen if someone had recorded me while I modeled and co-taught lessons and paid very close attention to all of my verbal interactions with teachers. I am unsure of the extent to which my interactions

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with teachers would map onto Coburn and Russell's (2008) low-, medium- and high-depth categories. I hypothesize that like Coaches Meg and Claire, a majority would have been low- and medium- depth as I lacked the specialized coaching knowledge of how to effectively and consistently steer conversations in the high-depth direction. To say I have been impacted and touched by these three stories is an understatement. As previously discussed above, my hope is that districts can start to seriously consider what it will take to support instructional coaches in the way they deserve to be supported, so that these stories do not need to be told again.

Limitations

This study was situated in one school district that had some particularities, such as the Teacher's Choice model as well as district initiatives such as the Evaluation Tool (ET). Furthermore, there was a small sample size (two coaches and five teachers) and the coaches and teachers were both White females. Thus, as with any qualitative study, the results should not be assumed to generalize to other places. Qualitative researchers, however, would argue that this is not the primary purpose of qualitative research (Merriam, 2009), nor was it the purpose of my study. Rather, the purpose of my study was to illuminate the ways in which teachers and coaches can engage in coaching and modeling together, to understand the potential challenges and benefits that can occur, and to examine the potential impact of external factors, such as the Teacher's Choice model and ET, on modeling and co-teaching cycles.

As with any study, I acknowledge my own set of biases. As a former classroom teacher and instructional coach, I have a very particular lens and beliefs about high quality mathematics instruction, as well as how I think coaches should support teachers. For example, prior to this study, I believed that modeling and co-teaching were powerful forms of professional development that coaches could leverage to target teachers' individualized needs. To a certain

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extent, these beliefs likely impacted how I viewed and interpreted the data. However, I tried to overcome these biases by following an established interview protocol, consistently focusing my observations on aspects of classroom instruction that would enable me to answer my research questions, and engaging in the process of peer debriefing with my advisor and two mathematics education doctoral students. Furthermore, as my study comes out fairly critical of modeling and co-teaching as I demonstrate what can go wrong when implementing these forms of professional development, it is clear that my previous bias about the power of modeling and co-teaching clearly did not prohibit me from critically analyzing the data collected.

As I did not complete pre- and post-cycle observations of the teacher's instruction, I was unable to describe the extent to which classroom instruction was impacted by the modeling and co-teaching, which is a general critique of professional development literature. While the interviews did provide some rich data, it would have been nice to compliment them with actual observations. However, as a one-person research team juggling multiple sites, this was outside the scope of what I could reasonably accomplish in a dissertation.

While video-recording all modeled and co-taught lessons would have enabled me to pick up more on the non-verbal interactions between the coaches and teachers, I avoided this because I did not want to inconvenience or intrude on the teachers more than absolutely necessary, and being able to move forward with passive consent helped with this. In other words, although Coaches Meg and Claire agreed to participate in the study, I was at the teachers' mercy as to whether or not they would let me in, and if every parent had to sign a consent form, it would have made it significantly more difficult to gain access to all classrooms. However, in an attempt to make up for not being able to video-record the lessons, I did the best I could through

field notes to capture such non-verbal interactions, but I acknowledge this still painted a somewhat incomplete picture.

Initially, I made the decision to follow multiple instructional coaches instead of partnering with just one. I did this to maximize my chances of observing modeling or co-teaching cycles in the mathematics classroom as the coaches and I did not have control over what teachers would ultimately ask them to do. The cost of this choice is that I know I missed, for example, informal reflection conversations that took place along the way at each site as these were unscheduled and often occurred spontaneously.

Last, in my original plans, I had hoped to attend grade level collaborations to better understand how (if at all) what occurred at these meetings influenced the ways in which the coaches supported the individual teachers through modeling and co-teaching. Despite asking Meg multiple times, I could never get access to Michelle's and Mackenzie's grade level collaborations. At Claire's school, it was difficult finding grade level collaborations that focused on mathematics. For the ones we selected that did focus on mathematics, they ended up getting cancelled for various reasons. I now turn to describe implications for researchers, as well as school districts.

Implications

In this section, I begin by describing implications for administrators, principals, coaches and teachers in school districts, and then turn to discuss implications for researchers.

School Districts

There are four implications from this study for school district personnel, and each is explored in the following sections.

Professional development for coaches. Administrators, principals and coaches must critically examine professional development being provided to instructional coaches at the elementary level to ensure that two needs are addressed. First, professional development for coaches should focus on topics that would help boost coaches' specialized knowledge for coaching, such as best practices for modeling and co-teaching, as well as how to engage in difficult conversations with teachers and administrators at the work place. Meg's struggle to leverage her modeling cycles to be places of intensive learning, and both Meg and Claire's apparent avoidance of facilitating challenging discussions with their teachers underscore the need for professional development for coaches. Second, as elementary instructional coaches are generalists, they are expected to support all teachers in grades K-6 across all content areas. Hence, there must be a focus on mathematics content, including topics such as common math misconceptions as well as how to consistently connect mathematical procedures and concepts, so that coaches, themselves, possess a deep understanding of the mathematics content across the developmental spectrum so they can appropriately support all teachers. This is aligned with recommendations from mathematics education and professional development scholars who argue that teachers must understand the mathematics they teach, and that professional development must have a content focus. Furthermore, given the lack of mathematical conversations during both modeling and co-teaching cycles observed in this study, this recommendation seems especially salient.

Impact of external pressures. The literature describes how principals and district-level administrators can potentially use instructional coaches in ways that take them away from enhancing teaching and learning in classrooms by asking them to substitute teach, serve as the test coordinator, or take on additional recess and/or lunch time duties. Furthermore, the current

study illustrates how these challenges negatively impacted Coaches Meg and Claire as they enacted modeling and co-teaching cycles. Thus, administrators and principals must be aware of how external pressures can negatively impact coaches as they work with teachers. In particular, coaches' roles need to be respected and additional responsibilities that fall outside the scope of being an instructional leader need to be limited to the extent possible. Coaches should also be aware of how external pressures can potentially negatively impact their work and use this information to advocate for themselves.

Coach evaluation. Little attention has been given in prior research to exploring the ways in which coaches' evaluation systems impact their day-to-day work with teachers. The current study illuminates how the Evaluation Tool (ET) served as a perverse incentive, encouraging the coaches to circumvent, instead of help develop, the teachers. Thus, administrators and principals must critically examine how coaches are being evaluated to ensure a system is in place that doesn't solely focus on student growth that occurs during the coaching cycle. Instead, the evaluation measure should take into account teacher growth so that coaches are rewarded for providing the teachers with meaningful professional development that helps teachers implement ambitious instructional practices that will enhance student understanding of mathematics after the coach leaves the classroom.

Coaching structure. Two implications are discussed here regarding the type of coaching structure school districts should consider adopting. First, as coaching is gaining acceptance and being implemented at elementary schools, administrators should consider implementing *content coaching* at elementary schools, which is primarily utilized at the middle and high school levels. As a reminder from Chapter 2, in a content coaching structure, coaches are content-experts as they only coach in one content area, such as mathematics, as opposed to being generalists and

coaching in all content areas. As with any coaching structure, there are potential drawbacks to content coaching, primarily that coaches would likely be shared between schools instead of stationed at just one. However, the benefits, chiefly that the coaches would be content experts instead of being spread so thin across multiple content areas, would hopefully outweigh the drawbacks. Given the lack of deep conversations about both mathematics content and pedagogy observed in the present study, and given prior research describing how teachers did not seek out teacher leaders for content support if they were non-content experts, this seems like an important consideration for elementary schools.

Second, as previously mentioned, in the Teacher's Choice coaching structure adopted in District A, teachers were charged with setting their own professional development agendas as they selected what they wanted to focus on in their individual coaching cycles. As illustrated in Chapters 4 and 5, as well as the depth discussion above, this was accompanied by primarily low-depth coach-teacher talk, which research has demonstrated provides little opportunity for teachers to learn how to implement ambitious instructional practices. However, as I argue above, as these low-depth discussions were aligned with what the teachers wanted and met the teachers where they were, there may be benefits the result from teachers dictating their own professional development needs. Thus, as school districts consider what type of coaching structure to adopt, I contend that they should explore implementing a blended approach where teachers have the opportunity to select the topics they would like to focus on, and coaches have the freedom to initiate professional development with teachers and set the professional development agenda. By incorporating a balanced model, the hope is that the coaches may be better positioned to set a professional development agenda and facilitate more medium- and high-depth conversations. I now turn to discuss implications for research.

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Research

Four implications for researchers interested in studying instructional coaching are discussed.

Campbell and Griffin's (2017) Conceptual Model. Two modifications to Campbell and Griffin's (2017) conceptual model are suggested based on the findings from this study. First, the conceptual model does not appear to take context into account and/or acknowledge how contextual factors may shape the co-learning of the coach and teacher as they engage in the modeling and co-teaching cycles. As discussed above, the findings from the current study suggest that contextual factors can have a powerful (positive and negative) impact on the modeling and co-teaching cycles and influence how the coaches and teachers engage in them. Thus, one potential modification to Campbell and Griffin's (2017) model is that it should somehow accommodate contextual factors as they can have an influence on the coaching cycle. As such, this suggested modification is illustrated in blue on the original diagram (see Figure 6.1 below.)

Figure 6.1
Proposed Modifications to Campbell and Griffin's (2017) Conceptual Framework of Coach and Individual Teacher Co-Learning
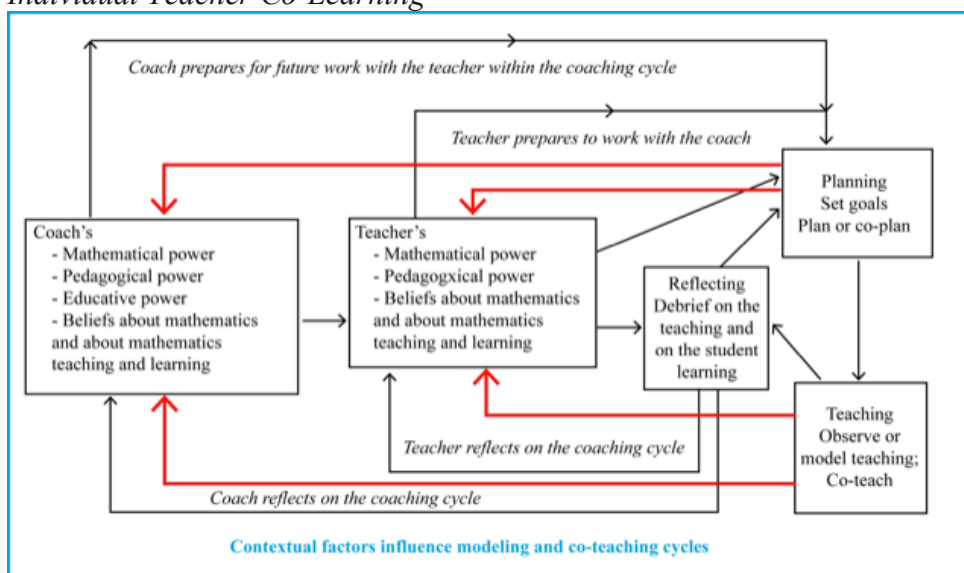
Second, according to the original model, it appears as though the coach's and teacher's knowledge and beliefs are only impacted after they progress through the *entire* cycle where they co-plan, model and/or co-teach, and then reflect. Specifically, on their diagram, the only arrows indicating an impact on the coach's and teacher's mathematical/pedagogical power and beliefs stem from the reflection box. However, evidence from the current study indicates that coach and teacher learning may occur at various stages of the coaching cycle. In particular, when high-depth discussions did occur– which scholars agree have the potential to help teachers learn how to implement ambitious instructional approaches – they most frequently took place during the planning meetings. Furthermore, although low-depth discussions permeated most of the coaching cycles, as I argue above, teachers still perceived that they gained something valuable from these interactions. Thus, as an additional modification to Campbell and Griffin's (2017) conceptual model, I suggest that additional arrows (which can be seen in red in figure 6.1) originating at the "planning" and "teaching" boxes also lead to the boxes encompassing the coach's and teacher's knowledge and beliefs. If these two modifications are made to the model, additional research with a larger sample size of a more diverse group of coaches and teachers is warranted to empirically test the new model.

Protocol to guide coach-teacher talk. As evidenced by the prevalence of low-depth coach-teacher talk about surface-level features such as materials and curriculum, findings from the current study indicate that the coaches struggled to leverage their modeling and co-teaching cycles (as a whole) as vehicles for intensive professional development. The low-depth talk, however, seemed to be especially prevalent during the modeled and co-taught lessons, as opposed to the planning and reflection conversations. As discussed above, this can potentially be explained by a number of factors, including that the teachers set their own professional

development agendas, the coaches were forced to enact non-threatening leadership, and that the coaches did not receive adequate professional development to rigorously enact modeling and co-teaching. While various protocols exist that guide coach-teacher talk during planning and reflection conversations (which usually consists of a list of questions the coach and teacher cycle through), I could find no protocol designed to guide coach-teacher talk during modeled and co-taught lessons. Thus, an additional implication for scholars interested in coaching is to develop and empirically test a protocol to guide coach-teacher talk during the modeled and co-taught lessons with the goal of prompting higher-depth interactions, including explicit attention to mathematics.

Coaching evaluation. A surprising finding from the current study was how the Evaluation Tool (ET) created perverse incentives for the coaches to circumvent the teachers and, instead, focus on getting good student growth data rather than ensuring the teachers were consistently engaged in meaningful, high-impact professional development. Given that this was an unexpected finding, only after data collection and analysis did I search for literature describing coaching evaluation systems to help make sense of and situate these findings, and to my surprise I could not locate any studies describing how coaching evaluation contexts impact coaches' work with teachers. Thus, additional research is needed to better understand how evaluation contexts influence coaches and teachers, with special attention towards unearthing and/or proposing evaluation systems that are more effective.

Impact of modeling and co-teaching on teacher's instruction and student achievement. The primary purpose of this study was to address a gap in the literature by describing the focus and depth of coach-teacher talk during all aspects of modeling and co-teaching cycles. The purpose wasn't to determine the extent to which teachers' instruction was

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impacted as a result of the modeling and co-teaching cycles, or how student achievement and/or understanding of mathematics was influenced. Despite the contributions this study makes to the literature on one-on-one coaching activities implemented during mathematics instruction, questions still remain regarding how teachers and students were impacted. Thus, as a follow up study, researchers interested in studying the effects of individual coaching on students and teachers could use pre/post surveys and observations, as well as student achievement data from district and/or state testing, to attempt to answer these important, lingering questions.

Coding scheme. The coding schemes I developed in the present study could be useful to other researchers interested in studying coach-teacher talk during individual and group settings. In particular, my coding scheme for instances of Direct and Indirect Engagement (see Chapter 3) could be helpful for examining the ways in which coaches and teachers engage during modeled and co-taught lessons.

Conclusion

The purpose of this study was to provide an up-close view of how two coaches and five teachers enacted modeling and co-teaching cycles during mathematics instruction. The findings revealed that the coaches and teachers primarily engaged in low-depth conversations about logistics, materials, and the curriculum, while discussions about mathematics rarely surfaced. This can, in part, be explained by the fact that the teachers set their own professional development agendas, and the coaches in this particular school district were generalists, rather than content-experts. Furthermore, several external conditions in the district – including the Evaluation Tool (ET), Teacher's Choice coaching structure, and principals' and district-level administrators' expectations of the coaches – created perverse incentives for the coaches to provide less than high-quality, rigorous individual professional development for the teachers as

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they, instead, enacted non-threatening leadership and/or focused on getting good student data. Given the high cost of this intensive professional development model, and given the findings of this study showing the many reasons why this model may not be implemented as intended, we need to understand if and how these barriers to good implementation can be addressed.

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APPENDIX A

RECRUITMENT E-MAIL TO INSTRUCTIONAL COACHES

Greetings _____,

My name is Stephanie and I am a doctoral student at the University of Illinois at Urbana-Champaign. I noticed that you are listed as an Instructional Coach on the _____ page.

For my dissertation, I am very interested in studying certain aspects of coaching as it relates to supporting mathematics instruction and learning and am looking for coaches with whom I might partner for my research.

I'm curious if you might have time to talk on the phone or meet in person? I could even come to your school site if you have a 15 minute chunk of free time. I understand how busy you are (I used to be an instructional coach in a Title I district) and want to be very respectful of your time.

I look forward to speaking with you,

Stephanie

Table B.1

Data Collection Timeline from 2016

	Aug.	Sept.	Oct.	Nov.	Dec.
Modeling					
Pre-Interviews		Michelle (9/8/16)		Mackenzie (11/14/16)	
Post-Interviews				Michelle (11/1/16)	Mackenzie (12/15/16)
Planning Meetings	Meg-Michelle (8/22/16)			Meg-Mackenzie (11/10/16)	
Lessons		Meg-Michelle #1 (9/6/16) Meg-Michelle #2 (9/7/16) Meg-Michelle #3 (9/8/16) Meg-Michelle #4 (9/20/16) Meg-Michelle #5 (9/21/16) Meg-Michelle #6 (9/23/16)	Meg-Michelle #7 (10/14/16)	Meg-Mackenzie #1 (11/17/16) Meg-Mackenzie #2 (11/18/16) Meg-Mackenzie #3 (11/21/16)	Meg-Mackenzie #4 (12/1/16) Meg-Mackenzie #5 (12/5/16) Meg-Mackenzie #6 (12/6/16)
Co-Teaching					
Pre-Interviews		Cathy (9/6/16)	Cecilia (10/17/16) Caroline (10/21/16)	Caroline (11/4/16) Cecilia (11/21/16)	
Post-Interviews			Cathy (10/20/16)		
Planning Meetings	Claire-Cathy #1 (8/29/16)	Claire-Cathy #2 (9/6/16) Claire-Cathy #3 (9/19/16)	Claire-Caroline #1 (10/6/16) Claire-Caroline #2 (10/13/16) Claire-Cecilia #1 (10/13/16) Claire-Cecilia #2 (10/14/16)		

Table B.1
Data Collection Timeline from 2016

Lessons	Claire-Cathy #1 (9/1/16) Claire-Cathy #2 (9/17/16) Claire-Cathy #3 (9/19/16)	Claire-Cecilia #3 (10/19/16) Claire-Cecilia #4 (10/24/16) Claire-Caroline #1 (10/17/16) Claire-Caroline #2 (10/19/16) Claire-Caroline #3 (10/24/16) Claire-Cecilia #1 (10/17/16) Claire-Cecilia #2 (10/19/16) Claire-Cecilia #3 (10/21/16)	
Reflection Meetings	Claire-Cathy Informal (9/19/16)	Claire-Cecilia Informal (10/17/16) Claire-Caroline Informal (10/24/16) Claire-Caroline Formal (10/24/16)	

Other Interviews

Coach Baseline	Meg (8/22/16) Claire (8/22/16)		
Coach Exit			Meg (12/28/16) Claire (12/5/16)
Administrators	Principal Stacey (8/8/16) Principal Smith (8/26/16)		Patti (12/11/16)

APPENDIX C

INTERVIEW GUIDES

Beginning of Semester Coach Interview Questions

1) What are the different strategies you use to support individual teachers at your school?

2) Generally speaking, what makes you decide to use one strategy over another while supporting individual teachers? Specifically, what makes you decide whether to use co-teaching or modeling while supporting individual teachers?

3) What challenges do you encounter while trying to support individual teachers at your school?

4) Would you say that you draw upon certain strategies, over others, whether you are coaching a teacher in mathematics versus literacy? If so, describe why and give specific examples. If not, describe why and give specific examples.

End of Semester Coach Interview Questions

MODELING QUESTIONS
1) In thinking about the practice of modeling, what do you think are the main benefits of using this practice with teachers?

2) What are the main challenges of using this practice with teachers? What are some strategies you have used to overcome these challenges?

3) What do you expect the teacher's role to be during model lessons? Do teachers you work with typically have the same expectations? What do you do when expectations are not the same? Is there anything you do before or during the modeling cycle to try to get aligned expectations?

4) Do you expect the teacher's role to change during the cycle. (If yes) Can you talk about how you would want a teacher's role to change? How did Michelle's change? How did Mackenzie's change?

5) I watched you work with Michelle and Mackenzie in the context of Calendar Math model lessons. I noticed that during each model lesson, you had a number of interactions with each classroom teacher. Please go through and for each teacher, talk about whether there were particular things you focused on in your interactions with them during the model lessons.

6) Do you typically have a reflection conversation with the classroom teacher? How often? How do you find the time to do it?

5) Is there anything else you'd like to share with me? Do you have any final reflections?

6) Is it okay if I contact you with 1-2 questions and possibly come back later?

CO-TEACHING QUESTIONS
1) In thinking about the practice of co-teaching, what do you think are the main benefits of using this practice with teachers?

2) What are the main challenges of using this practice with teachers? What are some strategies you have used to overcome these challenges?

3) What do you expect the teacher's role to be during co-taught lessons? How do you ensure that you and the teacher are on the same page in regards to his or her role? What do you do if you notice that the teacher is not meeting his/her expectations in regards to the role?

4) I watched you work with Cathy, Caroline, and Cecilia in the context of co-taught lessons. With Cathy, you were working on implementing guided math. With Caroline, you were working on refining one of her guided math centers. And with Cecilia, you were working on restructuring her math block to incorporate Number Talks and whole group instruction, but also refining the activities students worked on at their seats while she pulled small groups.

I noticed that during each co-taught lesson, you had a number of interactions with each classroom teacher. Please go through and for each teacher, talk about whether there were particular things you focused on in your interactions with them during the co-taught lessons.

5) Is there anything else you'd like to share with me? Do you have any final reflections?

6) Is it okay if I contact you with 1-2 questions and possibly come back later?

Sample Coach Interview Questions Pre/Post Cycle

Note: Some questions have been adapted from Eike, Ware, and Williams (2003).

PRE-CYCLE INTERVIEW
1) Why did you decide to co-teach a lesson with _____/model a lesson for _____?

2) How do you hope that this co-taught/modeled lesson will be beneficial to _____?

3) How do you hope to benefit from this co-taught/modeled lesson?

4) What are some challenges you anticipate might arise during the co-taught/modeled lesson?

5) Why did you decide to provide this type of one-on-one support as opposed to a different form, such as co-teaching, modeling, observing, engaging in the coaching cycle, etc.?

POST-CYCLE INTERVIEW
1) How do you think co-teaching/modeling was beneficial to _____ in helping him/her learn to _____? Be specific and cite examples.

2) Do you think _____ learned anything else from co-teaching/modeling? If so, be specific and cite examples.

3) As an instructional coach, did you learn anything new from participating in this co-teaching/modeling cycle? If so, be specific and cite examples.

4) You just mentioned some of the reasons why you perceived co-teaching/modeling to be beneficial to _____ and your own growth as an instructional coach. What conditions needed to be in place so that co-teaching/modeling could be a beneficial experience for both of you? Be specific and cite examples.

5) How could your experience with co-teaching/modeling be improved in helping you? Be specific about any problems you encountered with specific examples as well as suggested solutions.

6) What were some of the emergent challenges you experienced during the co-teaching/modeling cycle?

Sample Classroom Teacher Interview Questions Pre/Post Cycle

Note: Some questions have been adapted from Eike, Ware, and Williams (2003).

PRE-CYCLE INTERVIEW
1) Why did you decide to ask (coach's name) to come and co-teach a lesson with you/model a lesson for you?

2) How do you hope that this co-taught/modeled lesson will be beneficial?

3) Why did you decide to ask for that type of one-on-one support from your coach as opposed to a different form, such as co-teaching, modeling, observing, engaging in the coaching cycle, etc.?

4) In the past, have you ever asked your coach to come and co-teach a lesson with you/model a lesson for you? If so, why did you ask for that type of support from your coach as opposed to a different form?

4) What are some challenges you anticipate might arise during the co-taught/modeled lesson?

POST-CYCLE INTERVIEW
1) How was co-teaching/modeling beneficial in helping you learn to _____? Be specific and cite examples.

2) Did you learn anything else from co-teaching/modeling? If so, be specific and cite examples.

3) You just mentioned some of the reasons why you perceived co-teaching/modeling to be beneficial to your growth as a teacher. What conditions needed to be in place so that co-teaching/modeling could be a beneficial experience for you? Be specific and cite examples.

4) How could your experience with co-teaching/modeling be improved in helping you? Be specific about any problems you encountered with specific examples as well as suggested solutions.

6) What were some of the emergent challenges you experienced during the co-teaching/modeling cycle?

District-level Administrator Interview Questions

1) Can you tell me a bit about the history of the coaching program in Champaign?

Probe: How long has the coaching program been in place for? Has every school always had its own coach? Did the coaching program start by only having literacy coaches before expanding?

2) Can you describe how, at the district level, the coaches' ongoing professional development is supported?

Probe: What opportunities are there at the district level for the coaches to receive professional development?

3) Have you had any recent professional development for the coaches that focus on mathematics instruction and learning? If so, please describe.

4) Can you tell me a bit about the history of the ET in Champaign?

5) What are some of the challenges you foresee with this process?

6) How does the ET impact instructional coaches? Principals?

Principal Interview Questions

1) How long have you been a principal at _____? Can you tell me a little bit about how your path in education led you to become principal at _____?

2) How long have you been working with the instructional coach at your school?

3) Describe the ways in which you work with the instructional coach to support teaching and learning at your school.
- Prior to school starting/beginning of the school year
- Continued/ongoing support throughout the school year
- End of the year
- Challenges you encounter while working with the instructional coach to support teachers on your campus

4) Describe the ways in which district level policy guides how you work with the instructional coach to support teaching and learning at your school.
- Teacher's Choice

5) If you were asked to observe a teacher's math classroom for one or more lessons, what would you look for to decide whether the mathematics instruction is high quality?

6) Why do you think it is important to use/do _____ in a math classroom? Is there anything else you would look for? If so, what? Why?

7) Do you have any goals for your school this year that are related to the teaching and learning of mathematics? If so, would you mind sharing them? How do you plan on working with the instructional coach to help achieve these goals?

8) Are there any final thoughts you'd like to share in regards to our interview?

9) Do you have any questions for me?

PRE-DETERMINED CODES

Table D.1
Motivation Pre-determined Codes

Code	Description
Pedagogy	
Implement Pedagogical Strategy	Coaches may decide to co-teach and/or model to help teachers implement a new pedagogical strategy, such as differentiation. (Bean et al., 2010; Poglinco et al., 2003)
Demonstrate Effective Teaching	Coaches may decide to co-teach and/or model to provide a living example of the type of solid instruction they wish to promote. (Feiman-Nemser, 2001; West & Staub, 2003)
Management	
Enhance Behavior Management	Coaches may decide to co-teach and/or model to get to know challenging students and help with behavior management. (Bean et al., 2010)
Other	
Establish Own Credibility	Coaches may decide to co-teach and/or model as a way of establishing their own legitimacy. (West & Staub, 2003)

Table D.2
Pre-determined Codes for How the Coaches and Teachers Engaged in the Modeled and Co-taught Cycles

Code	Description
Mathematics Content	As high-quality professional development must have a content-focus, the coaches and teachers will discuss the mathematics content related to the modeled and co-taught lessons during their cycles (Ball & Cohen, 1999; Desimone, 2009; Elmore, 2002; Hawley & Valli, 1999; Wilson & Berne, 1999).
Pedagogy	As pedagogical teacher moves, such as orchestrating a classroom discussion and making data-informed instructional decisions, are thought to positively impact student achievement, the coaches and teachers will engage in pedagogical discussions during the modeling and co-teaching cycles (Ball & Forzani, 2011a; 2011b; Ball, Sleep, Boerst & Bass, 2009; NCTM, 2014; Martin, 2007).

Table D.3
Perceived Benefits Pre-determined Codes

Code	Description
Content	
Students Improved Math Affect	Benefits to students may include an enhanced enjoyment of the content (Murphy et al., 2004).
Students Improved Math Understanding	Students enhanced their understanding of the content presented during the modeled or co-taught lessons (Murphy et al., 2004).
Teachers Improved Math Affect	Affective reasons reflect the teachers' and coaches' feelings and attitudes, and may include an increase in confidence, assertiveness, and/or comfort with the mathematics content (Eick et al., 2003; Murphy & Beggs, 2005).
Teachers Improved Math Understanding	Participants may describe an increase in their mathematics content knowledge (Murphy & Beggs, 2005).
Pedagogy	
Gain Pedagogical Strategies	Participants may describe learning new pedagogical strategies, such as questioning and explaining ideas to children (Lunenberg et al., 2006; Murphy & Beggs, 2005; Vanderburg & Stephens, 2010).
Contextual Factors	
Strengthened Relationships	The modeling and co-teaching cycles strengthened the relationship between the participating teachers (Murphy & Beggs, 2005).
Other	
Developed Learning Communities	Participants may describe learning from one another in the context of learning communities (Scantlebury et al., 2008).
Reflect on Teaching	Participants may describe being able to reflect on their own teaching (Eick et al., 2003; Lunenberg et al., 2006; Murphy & Beggs, 2005).

Table D.4
Challenges Pre-determined Codes

Code	Description
Planning and Logistics	
Time	Teachers' and coaches' limited time may put a strain on the modeling and co-teaching cycles, and restrict their ability to engage in reflection conversations, for example (Bean et al., 2010; Scantlebury et al., 2008).
Contextual Factors	
External Factors	External factors, such as school politics and prolonged teacher absences, may negatively impact the modeling and co-teaching cycles (Murphy & Beggs, 2005).
Relationship Challenges	The teachers and coach may perceive that the roles were not equal as one individual did not pull his or her own weight (Murphy & Beggs, 2005).
Other	
Difficulty Showing Vulnerability	The coach may have difficulty showing her own vulnerability to the teacher when modeling (Lunenberg et al., 2006).
Ineffective Use of Modeling	The coach may lack the knowledge and skills to use modeling effectively by, for example, not making explicit connections between pedagogical choices and theory (Lunenberg et al., 2006).
May Encourage Imitation	Modeling may encourage the teacher to simply imitate what he or she observes from the coach during instruction (Lunenberg et al., 2006).
Moving to Collective Practice	Co-teaching may be difficult for teachers who are accustomed to teaching in isolation, rather than sharing an instructional space as part of a collective practice (Scantlebury et al., 2008).

Table D.5
Conditions Pre-determined Codes

Code	Description
Management	
Help with Behavior Management	The coach and teacher must actively share responsibility for managing student behaviors during the lesson (Eick et al., 2003).
Planning and Logistics	
Support with Materials	The coach and teacher must help one another collecting, passing out, and setting up materials for the lesson (Eick et al., 2003).
Time for Co-planning	The coach and teacher must set aside time to co-plan to develop shared goals for students and a common instructional vision (Eick et al., 2003; Scantlebury et al., 2008; West & Staub, 2003).
Contextual Factors	
Trusting Relationship	The coach and teachers must have a trusting relationship (West & Staub, 2003).
Other	
Co-Respect	The coach and teacher must demonstrate respect for one another (Scantlebury et al., 2008).
Equal Roles	The coach and teacher must have equal roles, which includes, for example, planning, teaching and reflecting on all modeled and co-taught lessons together (Murphy & Beggs, 2005; Scantlebury et al., 2008).
Excellent Communication Skills	The coach and teacher must have exemplary communication skills, including open conversations (Eick et al., 2003; Murphy & Beggs, 2005; Scantlebury et al., 2008; West & Staub, 2003).
Teacher Actively Observed	During the modeled lesson, the teacher must actively observe instruction (West & Staub, 2003).
Modeling Used With Other Strategies	To optimize results, modeling should be used in combination with other strategies, such as co-teaching (Clarke et al., 2014; West & Staub, 2003).

DIRECT ENGAGEMENT CODES

Table E.1
Direct Engagement Codes

Code	Description	Example
Management		
Classroom Composition and Attendance	<u>Lessons & Planning/Reflection Conversations:</u> The interactions focus on students who are absent, present, or tardy to class that day. It may include the following examples: the coach asks the classroom teacher if a student is absent or present, one of the facilitators clarifies for the other who a present student is and/or the pronunciation of the student's name, and the facilitators talk about students who are getting pulled out of class to receive services or be disciplined. Last, this code may encompass instances where the teacher and coach have more general discussions about students in the teacher's class.	<u>Lessons:</u> *Meg*: Stephanie? Where's Stephanie? *Mackenzie*: Right here. <u>Planning/Reflection Conversations:</u> *Claire:* What's her name? *Cathy:* Salome.
Classroom Management	<u>Lessons:</u> Among one another, the coach and teacher praise a student and/or talk about issues related to classroom management. Furthermore, it includes discussions about organizing and/or managing the materials needed to enact the incentive system, such as Meg Bucks or the Treasure Box. <u>Planning/Reflection Conversations:</u> The coach and teacher discuss various student behaviors in the classroom, consequences, as well as incentives to help manage behaviors.	<u>Lessons:</u> *Cecilia:* Here's the problem, Claire. It's always the same kids and then those same kids are gonna come back here and interrupt my group because they're not gonna know what to do. <u>Planning/Reflection Conversations:</u> *Claire:* I will say, though, that your class did really well today. They always do really well for me. *Caroline:* Oh, that's good. Glad they act right for somebody.

Table E.1
Direct Engagement Codes

Pedagogy

Grouping

Lessons:
The coach and teacher talk about whether they want students to work independently, with a partner, or in a group. It also refers to discussions about who will take which small group during guided math centers, how to coordinate group movement, and where small and whole groups will meet in the classroom. The facilitators may also talk about the amount of time they want to spend working in small groups. Furthermore, this code may include conversations where the coach and teacher reflect on how the small groups went that day, refer to the general act of pulling a small group, and/or talk about organizational resources for groups (e.g., the folder where they keep the group rotation schedule, binders, etc.). If the facilitators refer to the act of pulling a small group in a seriated list of other activities, this is coded as Curriculum, Activities and Materials. If the facilitators discuss the district-provided activities they want students to work on while in small groups, this is coded as Curriculum, Activities and Materials. If the facilitators create original activities for students to work on while in small groups, this is coded as General Pedagogy.

Planning/Reflection Conversations:
The coach and teacher discuss whether they want students to work independently, with a partner, in small groups, or as a whole group. In other words, if the coach and teacher talk about which grouping structure is best for a particular lesson, this is coded as Grouping. In making such decisions, the facilitators may or may not provide in-depth reasons for selecting a particular grouping structure. Additionally, it includes instances where the facilitators, without reference to assessment data and primarily taking into account behaviors, create small groups and discuss which students should be in each group. If the facilitators name the district-provided activities they want students to work on while in their small groups, or if they name the district-provided activities they want students to work on who are not pulled

Lessons:
Grouping Logistics Example:
Claire: We didn't think about this. Where do you want me to pull my group?
Cathy: You can do it over there and I'll do it by the sink.
Claire: Oh, okay. Are you sure? I can do it by the sink.
Cathy: Nope, it's alright.
Claire: Okay.

Planning/Reflection Conversations:
Grouping Structures Example:
Claire: So, looking at that lesson. Where do you think…is this gonna be a whole group lesson or a small group lesson?
Cecilia: Small group lesson for sure.

into a small group, this is coded as Curriculum, Activities and Materials. If the facilitators have in-depth discussions where they create original activities for students to work on while in small groups, this is coded as General Pedagogy. Last, the facilitators may discuss the following: who will take each group, the amount of time they will spend pulling small groups, the days on which they will pull small groups, how many groups the teacher will get to during a class period, whether or not the coach will pull a small group, how they think students will do/did with small groups, organizational resources for groups (e.g., the folder where they keep the group rotation schedule, binders, etc.), their feelings about small group, and how they predict students will react to working with one particular teacher over another in the context of small groups. Furthermore, if the facilitators talk about how they used assessment data to group students, this is coded as Assessment.

Sub-codes
- *Pulling small groups*: The coach and teacher simply refer to the general act of pulling small groups without providing additional details.
- *Grouping logisss:* The coach and teacher discuss the amount of time they will work in small groups, the days on which they will/won't pull small groups, the number of groups they will see, where in the room they will work with their groups, the grouping rotations, who will work with which group, as well as organizational resources to assist with small groups.
- *Grouping structures*: The facilitators talk about whether they want students to work individually, with a partner, in small groups, or as a whole group.
- *Creating groups*: The coach and teacher refer to the act of creating groups or create groups and discuss the number of students who should be in each group without reference to data, primarily taking

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Table E.1
Direct Engagement Codes

into account behaviors.

Assessment	Lessons & Planning/Reflection Conversations: The coach and teacher use student data to inform their planning, teaching, grouping and/or how they differentiate for students. In other words, if the facilitators explicitly talk about how they are using formative and/or summative assessment data to plan whole or small group instruction, as well as how they differentiate for students, this gets coded as Assessment rather than General Pedagogy. Regarding differentiation, if the conversation seems to have moved away from discussing data and the facilitators are instead creating original materials and/or activities for students in an effort to differentiate, this is coded as General Pedagogy. Furthermore, it includes instances when the coach and teacher design an assessment, discuss when to give an assessment and how long it might take, create goals for individual and/or groups of students using data, name students' scores, and discuss student performance on the content, activity, curriculum, and/or assessment. In addition, the facilitators may make predictions about whether students will be ready to participate in the content, activity, and/or curriculum, as well as predicting what certain students will and will not be able to do. Last, conversations between the facilitators about district and/or state assessments, such as PARCC or MAPP, are coded as Assessment.	Lessons: *Data Informing Instruction Example:* *Cathy:* So I think they get the 1-digit thing, but now we should do a 2-digit one. Planning/Reflection Conversations: *Monitoring Student Learning Example* *Claire*: So our student work is showing that, I mean, 80% or more of the class is getting it. *Caroline*: Yeah.

Sub-codes
- *Assessment logistics*: The coach and teacher refer to the general act of giving an assessment and discuss how long it will take, which ones to give, and list/name the topics on the assessment.
- *Monitoring student learning*: The facilitators talk about student mastery and understanding of the content, curriculum, and/or activity. This includes inferential remarks about whether students "get it." In additional, they may discuss or predict student readiness to engage in the content, curriculum, and/or activity.

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	• *Data informing instruction*: The coach and teacher use data and/or their informal observations to inform the following: general instructional plans, small group plans, student placement in small groups, how to challenge students, goal creation for groups of students. • *Assessment creation*: The coach and teacher created original assessments.	
General Pedagogy	Lessons: This includes conversations between the coach and teacher regarding teacher moves that can be enacted to help students access and learn the mathematics content. The teacher may ask the coach a pedagogical question during the lesson, or the teacher and coach may thoughtfully sequence, select, and/or plan the mathematical examples and/or activities they plan on completing during class. Planning Conversations: This encompasses conversations about instructional methods that can be used to teach mathematics. When discussing how to implement an activity and/or problem, a generalizable teaching principle can be extracted. Whereas, if when discussing how to implement a specific activity and/or problem and no generalizable teaching principle can be extracted, this is coded as Curriculum, Activities and Materials. If the coach and teacher create examples or an original activity in addition to the already existing district-provided curriculum to help students learn mathematics, this is coded as General Pedagogy. If the facilitators discuss graphic organizers or lesson plans, or refer to the act of modeling; plan an original review, Number Talk or extension; discuss how to help students review; and/or have a theoretical/philosophical discussion about homework, student centers, Calendar Math, or a different topic, this is coded as General Pedagogy.	Lessons: *Claire*: K, now instead of going backwards to subtraction, since we're just doing multiplication, go to another page and put another one up with a multiplication fact. *Cecilia*: Any multiplication fact? *Claire*: Yeah. Planning Conversations: *Caroline*: So should I take this away and then just put a word bank? But still do number sentence, turn around, but take this out then? *Claire*: No, I'd leave this here. I'd leave that here and maybe just if you can add a word bank in up here and shift those over. You see what I'm saying?

Table E.1
Direct Engagement Codes

Regarding efforts to differentiate instruction, if the coach and teacher have in-depth discussions where they create original materials and/or activities for particular and/or groups of students without explicit reference to data, this is coded as General Pedagogy. If the facilitators talk about how they will use the school-provided curriculum to help students review a mathematical concept, challenge students who need to be pushed and/or differentiate their instruction, this is coded as Curriculum, Activities and Materials rather than General Pedagogy.

Sub-codes
- *Pedagogical resources*: The coach discusses pedagogical resources she plans on sharing with the teacher to help her learn, such as books, templates, etc.
- *Gradual release process:* The facilitators discuss how they will scaffold their instruction so that students eventually assume responsibility for completing tasks independently. This encompasses conversations about modeling and the "I Do, We Do, You Do" process.
- *Planning and/or creating:* The coach and teacher plan and/or create original games, activities, small group work, extensions, graphic organizers, templates, reviews, and warm ups that go beyond the district-provided curriculum. In addition, they may discuss how they predict students will respond to what they planned.
- *Differentiation:* The facilitators plan how they will differentiate their instruction to meet the needs the diverse learners in their classroom. This also includes general talk about the need to differentiate instruction that is not explicitly tied to data.
- *Pedagogical principles and practices*: The coach and teacher engage in conversations about pedagogical principles and practices including, but not limited to, the following topics: how to structure small group work, student-led independent work, Number Talks,

Table E.1
Direct Engagement Codes

	whether or not to implement Calendar Math, etc.	
Content		
Curriculum, Activities and Materials	Lessons: The interaction is about the curriculum, activities and materials needed for the modeled and/or co-taught mathematics lesson. In talking about the materials needed for the lesson, the facilitators may discuss notebooks, small white boards, the big white board, homework, paper clips, dry erase markers, wipes needed to clean the board, etc. with one another. Furthermore, conversations about the rigor (ease/difficulty) of the curriculum and/or activities as well as how the facilitators and/or students perceive the curriculum and/or activities may be included here. In addition, this code encompasses conversations where the facilitators discuss the order in which they will complete the curriculum, activities and/or problems. If the facilitators have more thoughtful discussions about why they are sequencing the curriculum, activities and/or problems in a particular way, this is coded as General Pedagogy. Planning/Reflection Conversations: The coach and teacher may discuss the Every Day Mathematics 4 Curriculum (EDM4), which includes the following: Mental Math, Open Response & Re-Engagement, textbook sections (1.3, 1.4, etc.). They may also discuss other activities, such as using white boards, Multiplication in Seven Days, Number Talks, or homework. Furthermore, the coach and teacher may discuss materials (notebooks, binders, paperclips, etc.) needed to enact the curriculum and/or activities, and when certain materials will arrive. Last, the facilitators may discuss what has been done/covered, what needs to be done/covered, the order in which they will complete the curriculum and/or activities, and/or what they will do on a particular day; how much time they plan on spending on specific parts of the curriculum and/or activities and if they think it will go slow/fast; the rigor of the curriculum and/or activities (whether they are easy/difficult for students);	Lessons: *Cecilia*: Hold on. You know what? I didn't even look to see. We're not on 2.8. 2.6, day one. *Claire*: Right there. Planning/Reflection Conversations: *Claire*: Okay. So, you're going to do the whole Open Response and Re-engagement on Wednesday? *Cathy*: I really don't think it, especially with one problem, I just have a hard time spending two days on it. I really do. Especially, we're in the third week of school and I'm only on... *Claire*: I know. Well, and I think as they progressively get harder they might need more than that, but… *Cathy*: 1.3.

Table E.1
Direct Engagement Codes

and how they perceive the curriculum and/or activities. If the teacher and coach have in-depth discussions regarding why they are choosing to sequence the curriculum, activities and/or problems in a certain way, this is coded as General Pedagogy. Last, if the coach and teacher discuss whether or not already existing curriculum, such as Teachers Pay Teachers, Osmo and Everyday Mathematics 4, is differentiated and/or how to use already existing curriculum to differentiate for students, this is coded as Curriculum, Activities and Materials.	*Claire*: Okay.

Sub-codes

- *Curriculum*: The coach and teacher discuss the Everyday Mathematics 4 curriculum, including the following: workbook pages; textbook problems, sections, lessons, chapters, and units; Open Response and Re-Engagement; Mental Math; games embedded in the curriculum; Math Boxes, math journal pages, and the student reference book.
  - **Curriculum Sub-themes**
  - *Timing*: The coach and teacher discuss the order in which they plan on completing the curriculum and activities within a lesson, how long they anticipate it will take, the days on which they plan on completing various parts of the curriculum, etc.
  - ***What students in groups work on***: The facilitators discuss what students in small groups (working with and without the teacher) should work on, as well as the days on which they want students to complete particular games/activities in their small groups.
  - ***Rigor:*** The coach and teacher discuss the ease and/or difficulty of the district-provided curriculum.
  - ***Perceptions of the curriculum***: The facilitators talk about their perceptions of the curriculum, including whether they

	like or dislike it. ○ ***Seeking to understand/navigate the curriculum***: The coach and teacher either seek to understand exactly what the curriculum requires of students, or the coach helps the teacher navigate the curriculum. Furthermore, this encompasses instances where the coach and teacher read through the curriculum together in an effort to comprehend it. • *Activities:* The facilitators discuss activities, such as Number Talks, a hundreds chart coloring activity, Extra Math, fact practice, Multiplication in Seven Days, Prodigy, homework, and stations. • *Materials*: The coach and teacher discuss materials needed for the lesson, including white boards, cards, slides, crayons, paper clips, and books.	
Mathematics	<u>Lessons</u>: The Mathematics code encompasses in-depth conversations about the lesson's content. It refers to instances where the facilitators explicitly draw attention to the mathematical language and/or vocabulary being used in the lesson. It may also reflect discussions about the facilitators' and/or students' mathematics attitude and/or confidence.	<u>Lessons</u>: *Mackenzie*: Yes, I did it different from you on Monday when you were at your professional development and they were very quick to say no, no. I said, ok. *Meg*: Well, the reason we do it that way, like I said, there's a very particular math language. And when you say one dollar, one dollar could be a dollar bill, it could be four quarters, it could be two half dollars, it could be ten dimes, so when you're specifically handing out change, you need to make sure you understand the difference between the coins and the actual dollar bills.

Table E.1
Direct Engagement Codes

		Planning/Reflection Conversations:	Planning/Reflection Conversations:
		The coach and teacher discuss the content related to the lesson, including instances where they make sure they understand exactly the mathematical content they intend to teach students. They also might discuss how they anticipate students will solve particular problems.	*Claire*: And then we'll have to define what a multiple is. *Cecilia*: What is it? *Claire*: A multiple are all of the answers to a multiplication problem with numbers. So, you have 4. The multiples of 4 are 4, 8, 12, 16 because 4 x 1 is 4, 4 x 2 is 8, 4 x 3 is 12... *Cecilia*: Alright, so fact families? *Claire*: Yeah, it all goes back.
Planning and Logistics	Technology	Lessons & Planning/Reflection Conversations: Technology encompasses discussions about technology in the room, such as the laptop, SMART board, cell phones, Chromebooks, etc. This code also includes conversations between the coach and teacher about how the students engage with technology. Furthermore, if the facilitators discuss games and/or activities students will play on their Chromebooks, this is coded as Curriculum, Activities and Materials.	Lessons: *Cecilia*: Sorry. I was trying to get this hooked up, but my computer ran an update. *Claire*: Yeah, so did Caroline's. *Cecilia*: That took the whole lunch time. *Claire*: Yeah. Why? Probably because I unplugged it. Planning/Reflection Conversations: *Cecilia:* We should probably set up my doc camera. I don't know how to do it.

Table E.1
Direct Engagement Codes

General Plans for Coaching Cycle	Lessons & Planning/Reflection Conversations: This code includes conversations the coach and teacher have about general goals for the coaching cycle and/or progress towards those goals; Common Core standards that will be targeted through the cycle; instances where the teacher diagnoses her own teaching strengths and/or areas for growth; and/or the teacher's and/or coach's feelings about the coaching cycle. If the facilitators have in depth conversations about items they will create for the coaching cycle to help enact their goals, this is coded as General Pedagogy.	Planning/Reflection Conversations[59]: *Claire*: Ok. So what I'm hearing is that our focus is going to be the math writing as far as differentiating for the groups and the kids. *Caroline*: Or even coming up with something besides just writing. *Claire*: Ok. *Caroline*: You know what I mean? *Claire*: And maybe coming up with a quarter long, a quarter-by-quarter plan?
Facilitator's Role	Lessons: The interaction is about how the facilitators negotiate the role each of them plays in relation to the other. This may include instances where one of them prompts the other to get things started or proceed with a particular problem. This may encompass instances where one facilitator asks the other to perform a certain function, such as scribing or calling on students. It also includes instances where one facilitator clarifies who taught something. Planning/Reflection Conversations: The facilitators *specifically* discuss how they will co-teach and/or model, and who will take the lead during each segment of the lesson.	Lessons: *Claire*: Do you just want me to get started with this? *Caroline*: Sure. Planning/Reflection Conversations: *Claire*: Do we want to um one of us do Mental Math and one of us do lesson? Is that how you want to? Or do you just want to kind of play off each other?

[59] This code never surfaced during any of the modeled or co-taught lessons for any coach-teacher pairing.

Table E.1
Direct Engagement Codes

		Cathy: Um, I don't care. *Claire*: I don't think this is a lesson that we would really need to split. *Cathy*: We can just kind of go with the flow and see how it goes. *Claire*: Sounds good.
Time and Schedule	Lessons: This refers to the ways in which the facilitators discuss the timing of their lesson, including *general* conversations about the lesson being too long/going over or a certain segment taking less time than they anticipated. It also refers to discussions about the time of day at which the modeling or co-teaching will take place, how often the coach will be in the classroom to model or co-teach, and when the coach and teacher will meet to co-plan. This code also includes conversations regarding how many days school has been in session for. Planning/Reflection Conversations: This encompasses discussions about the teacher's schedule for teaching math (times she will/will not be there, how many days per week, amount of time per day, time of day) and the coach's schedule (times she will/will not be there). Furthermore, it includes discussions between the coach and teacher about when they will start the coaching cycle, the length of the coaching cycle, their plans for gradual release, as well as when they will meet to co-plan, co-teach, etc. Last, it reflects conversations about how much time the coach and teacher want to spend on the main segments of the lesson, for example whole group instruction.	Lessons: *Michelle*: Um, I'm putting it in that you're coming in… *Meg*: Tomorrow? *Michelle*: Tomorrow, since I won't be here. *Meg*: Yeah, put it in from 9 - 9:30, just to give me enough time. 'Cuz I know I'm going over a little bit. Planning/Reflection Conversations: *Claire*: Can we meet tomorrow during your plan time to look at these? Is that ok? *Cecilia*: I don't know. What's tomorrow? The 24th? We're still in October? I'm ready to be done with October. Look at this. Tomorrow during plan time is fine. *Claire*: So, and I don't have 1st grade tomorrow so it will be 9:00 - 9:30.

Contextual

Table E.1
Direct Engagement Codes

Factors		
Relationship Building	Lessons & Planning/Reflection Conversations: Relationship building refers to interactions between the facilitators where they showcase their relationship. This may involve the facilitators joking around and laughing at something the other said, or it may refer to conversations where they check in on one another, catch up, or compliment one another. This also encompasses interactions where one does something for the other and is met with a quick "Thank you" in response. Additionally, it could include moments where the facilitators are gossiping and/or commiserating sarcastically about a particular incident and/or talking about their families.	Lessons: *Claire*: Are you good? *Cecilia*: Yeah, I'm good. Planning/Reflection Conversations: *Meg*: Now we got a little Journey going? *Mackenzie*: I know, I'm all over it. You would say it's Journey, and I'm like who? It's okay, I still love you. That's why it works. Mackenzie and her rap music and Meg and like 80s.
External Requirements	Lessons & Planning/Reflection Conversations: External Requirements refers to discussions the facilitators have about external requirements mandated by the school district that impact the coaching cycle, such as the Evaluation Tool (ET), the coaching document coaches are required to maintain, and/or formal/informal observations conducted by administrators.	Lessons: *Michelle*: Yeah, we'll definitely change the time. *Meg*: Yeah, we'll have to change 'cuz this is my ET time. Planning/Reflection Conversations: *Claire*: I need to go back in and like put in all of our plans from previous weeks. And I'm just kind of afraid to do that because a lot of 'em will say No Claire due to, No Claire due to... *Cathy*: For what? *Claire*: In my coaching cycle document that I have to keep. *Cathy*: Oh.

Table E.1
Direct Engagement Codes

		Claire: That's where I typed all of these plans so I could keep up with stuff. I'm so far behind. *Cathy*: That's alright.
Other External Individuals	Planning/Reflection Conversations[60]: External Individuals encompasses short conversations either the teacher or coach had with individuals outside of their coaching cycle, such as janitors, student teachers, interventionists, students etc. during the planning or reflection conversations.	Planning/Reflection Conversations: *Cathy*: Hey there. *Janitor*: Do you want your vents opened back up? *Cathy*: Is that the issue? I don't know how they're supposed to be. But it's very loud. *Janitor*: That's the issue. *Cathy*: Ok. *Janitor*: It will cut that air flow way down. So it's pullin' more air in. That's why it's running so loud. *Cathy*: Got ya. I mean, whatever makes it cooler. I can deal with the noise if this makes it cooler.
Other	Lessons & Planning/Reflection Conversations:	Lessons:

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[60] During the modeled and co-taught lessons, I only coded for instances of Direct and Indirect Engagement, and these did not involve external individuals. When external individuals interrupted the planning and reflection conversations and engaged in brief conversations with the coach and/or teacher, I did not feel comfortable simply deleting these portions of the transcript. However, it did not make sense to code the substance of these conversations as it would not help me answer my research questions regarding how the coach and teacher engaged in the modeled or co-taught lesson cycles. Hence, I created this External Individuals code to acknowledge that either the coach or teacher engaged in a conversation with an external individual and that it accounted for a portion of that transcript.

Table E.1
Direct Engagement Codes

Other describes anything that does not map onto the other categories, including conversations about, but not limited to the temperature in the room, the weather outside, going to the bathroom, student teachers, classroom volunteers, etc. It may also include discussions about previous coaching cycles between the teacher and coach that are unrelated to the current coaching cycle, and/or curriculum, activities, materials and/or pedagogy for a content area other than mathematics, such as literacy, science, social studies, etc. Furthermore, it may include conversations that reference lesson plans where either the teacher or coach says they are simply going to access a lesson plan without further detail about the lesson plans. Last, it includes times when the coach asks the teacher if she needs anything else before ending a planning conversation.	*Michelle*: E kind of looks like a corn husk from yesterday with the thing they put on our hand. Focus, focus, focus. Planning/Reflection Conversations: *Claire*: So... *Cathy*: I need to start teaching science today, too. That's what I'm going to spend my lunch hour doing. Alright.

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DEPTH CROSSWALK

Table F.1
Depth Crosswalk

Depth	Level-2 Codes	Level-3 Sub-Codes
Low	Assessment	• Assessment Logistics
	Classroom Composition and Attendance	
	Classroom Management	
	Curriculum, Activities and Materials	• Navigating and/or Understanding • Perceptions • Rigor • Timing • What Students in Groups Work On
	External Conditions	
	External Individuals	
	Facilitator's Role	
	General Pedagogy	• Pedagogical Resources
	General Plans for Coaching Cycle	
	Grouping	• Creating Groups • Grouping Logistics • Pulling Small Groups
	Mathematics	• Procedural
	Other	
	Relationship Building	
	Technology	
	Time and Schedule	
Medium	Assessment	• Assessment Creation • Data Informing Instruction • Monitoring Student Learning
	General Pedagogy	• Differentiation • Gradual Release Process • Planning/Creating
	Grouping	• Grouping Structures
High	General Pedagogy	• Pedagogical Principles and Practices
	Mathematics	• Conceptual

APPENDIX G

INDIRECT ENGAGEMENT CODES

Table G.1
Indirect Engagement Codes

Code	Description	Example
Classroom Management	This code refers to how the coach or teacher manages student behaviors, including redirecting student behavior and giving out consequences, as well as providing academic and behavioral praise. This may also include instances where either facilitator engages with students about his or her materials, requesting that they perform certain functions/behaviors with their materials. Moreover, this includes instances where the facilitators demonstrate respect for students by using phrases such as "Thank you" and "Bless you." Last, if the exchange is about asking a student if they have their notebook/pencil or to take out/put away their notebook/pencil or helping students find their notebook/pencil, it gets coded as Classroom Management. Comments where students are told to use their notebooks to take notes are coded as Helping Students Learn Mathematics. **Sub-codes** • *Incentives:* The coach or teacher discusses incentives with students, such as the Meg Bucks and Treasure Chest. • *Materials*: The coach or teacher asks students to perform specific behaviors in relation to their materials. • *Talking*: The coach or teacher attempts to control talking and/or the noise level in the room. • *Kind words and praise*: The coach or teacher praises students for their efforts and/or use kind words of appreciation. • *Seating*: The coach or teacher manages seating in the classroom, often by asking students to move or sit on their bottoms.	*Michelle*: You know what? Sorry, sit down. You guys knew that you needed these pencils and stuff before we even left.
Helping	This code includes instances where the coach or teacher helps the students	*Cathy*: Think about what the word

Table G.1
Indirect Engagement Codes

Students Learn Mathematics	learn mathematics and/or stay focused on the mathematical task at hand. It includes teacher moves to help students participate in class discussions, such as revoicing/amplifying a student's, coach's, or teacher's response for the rest of the class, or asking a student to revoice/amplify their response so others can hear. It also includes times where the coach or teacher asks students a question about the mathematics content, or makes a statement about the mathematics content. Last, it encompasses exchanges where the coach or teacher makes a statement about the mathematical task at hand, clarifying what students should do.	expanded means. What does the word expand mean? Student shares. *Cathy*: To stretch it out, right? So you're kind of stretching that number out, k?

Sub-codes
- *Asking student to revoice/amplify response*: The coach or teacher asks students to revoice their response.
- *Revoicing/amplifying*: The coach or teacher revoices a student's or teacher's response.
- *Copying*: The coach or teacher asks students to copy notes into their notebooks.
- *Clarifying the mathematical task*: The coach or teacher clarifies certain aspects of the mathematical task in an effort to help students complete it.
- *Hint*: The coach or teacher provides students with a hint to help them engage with the mathematical content.
- *Statement about content*: The coach or teacher makes a statement about the mathematical content.
- *Question about content*: The coach or teacher asks students a question about the mathematical content.

Other	Other encompasses exchanges with students that do not map onto the other categories.

APPENDIX H

TEACHER'S ROLE CODES

Table H.1
Teacher's Role Codes

Code	Description
Observe	The classroom teacher observes instruction, watching the classroom teacher and students.
Take Notes	While observing, the classroom teacher records notes in a notebook about what she is observing. Ideally, the teacher can refer back to these notes while reflecting with the coach about the lesson.
Interact with Students	During the lesson, the teacher engages in academically focused interactions with students where she either helps them focus on the mathematics and/or the mathematical task at hand.
Participate in Lesson	The teacher participates in the lesson as a student would. As an example, this entails responding to questions the coach poses to students.
Assist with Classroom Management	The teacher assists the coach with classroom management.
Help Manage Materials	The teacher helps the coach manage the materials needed for the lesson.
Engage in Off-Task Behavior	The teacher engages in off-task behaviors unrelated to the lesson, such as using laptops and cell phones and organizing and cleaning the classroom.

CO-TEACHING MODELS CODES

Table I.1
Co-teaching Models Codes

Code	Description
One Teach, One Observe	Students stay in one group. One teacher provides lead instruction and the other compiles observational data on an individual student, a particular group of students, or the whole class.
One Teach, One Assist	Students stay in one group. The teacher not providing lead instruction may also "briefly interact with students individually, answering their questions, re-explaining concepts, focusing attention, and so on" (Friend, 2016, p. 18).
Parallel Teaching	Students are separated into two groups and each teacher delivers instruction to one of the groups. The teachers may provide identical instruction (both teachers teach a lesson on the partial products multiplication strategy), or different instruction (teachers present different strategies students can use when multiplying whole numbers).
Station Teaching	Students are separated into different groups. Each teacher works with a different group of students at his/her station. Students then rotate through the stations.
Alternative Teaching	Most of the students stay with one teacher while the other teacher provides instruction for a small group of students.
Team Teaching	Students stay in one group and the teachers provide co-instruction, "integrating their contributions throughout the lesson" (Friend, 2016, p. 18). Teachers are sharing responsibility for whole group instruction.
Beginning of Lesson	At the beginning of the lesson, academic instruction had not yet begun. The coach and teacher worked together to get students ready for the lesson.
End of Lesson	At the end of the lesson, academic instruction had ended and the coach and teacher shared responsibility for closing out class.

APPENDIX J

MOTIVATION CODES

Table J.1
Motivation Open Codes

Code	Definition
Coach Learned About Different Teachers	The coach wanted to learn more about working with different types of teachers.
Completed Evaluation Tool	The coach and/or teacher wanted to complete the Evaluation Tool (ET) by engaging in the modeled and/or co-taught cycle.
Enhanced Teacher's Pedagogical Knowledge	The coach and/or teacher wanted to enhance the teacher's overall pedagogical content knowledge for teaching mathematics.
Experienced Previous Success Co-Teaching	The coach and/or teacher were motivated to engage in the current modeling and/or co-teaching cycle because they wanted to replicate success from previous cycles.
Gained Exposure to Grade-level Content	The teacher wanted to gain exposure to grade-level content and as a result, deepen her own understanding of grade-level mathematical concepts.
Helped Teacher Navigate Curriculum	The teacher needed help navigating the district-provided curriculum.
Implemented Gradual Release Process	The coach and/or teacher wanted to implement the gradual release of responsibility process to shift responsibility from the teacher to the learner.
Increased Students' Math Confidence	The teacher and/or coach hoped the cycle would help increase students' confidence as mathematical learners.
Needed Assistance with Differentiation	The teacher wanted help differentiating various aspects of her instruction.
Played to Coach's Strengths	The coach was eager to participate in the cycle as she perceived mathematics to be a strength of hers and felt the cycle played to that strength.
Provided Student Data	The intervention would provide the teacher with lots of data on her students.
Students Heard Multiple Strategies	Students would get to hear multiple strategies from the coach and teacher for learning mathematics.

Table J.1
Motivation Open Codes

Teacher Was on Improvement Plan	The teacher was on an official improvement plan, which motivated her participation in the cycle.
Wanted to Implement Strategy	The coach and teacher wanted to implement a particular strategy that was in addition to the district-provided curriculum.
Wanted to Make Math Instruction Fun	The coach and teacher wanted to make mathematics instruction fun for students as it currently wasn't that way.

APPENDIX K

PERCEIVED BENEFITS CODES

Table K.1
Perceived Benefits Open Codes

Code	Definition
Calendar Math Notebooks	The teacher used the Calendar Math notebooks as a pedagogical tool to determine student growth.
Coach Broadened Impact	The coach was broadened her impact by supporting teachers and students across an entire school.
Coach Deepened Understanding of Assessment	The coach deepened her understanding of assessment by creating original pre- and post-assessments.
Coach Deepened Understanding of Student Goal Setting	The coach deepened her understanding of student goal setting by implementing this strategy with students in the classroom prior to the post-assessment.
Coach Engaged in Reflection	The coach was able to engage in deep reflection, which often does not occur during coaching cycles due to time constraints.
Coach Gained Exposure to New Grade Level	The coach gained exposure to a new grade level that she previously hadn't taught.
Coach Got Back Into Classroom	The coach was able to get back into the classroom and teach.
Coach Learned About Different Teachers	The coach learned more about working with different types of teachers at the school.
Coach Learned New Teaching Methods	The coach deepened her pedagogical toolset and learned new general teaching methods.
Enhanced Teacher's General Pedagogical Knowledge	The teacher deepened her pedagogical toolset and learned new general teaching methods.
Exposed Teacher to Grade Level Content	The teacher gained exposure to grade-level content by participating in the coaching cycle.
Held Teacher Accountable	The cycle held the teacher accountable to implement the strategy and complete her fair share of the work.
Improved Students' Math Confidence	Students improved their confidence as

Table K.1
Perceived Benefits Open Codes

	mathematicians.
Improved Students' Perception of Mathematics	Students improved their perceptions of mathematics.
Improved Students' Understanding of Math	Students improved their understanding of grade-level mathematical concepts.
Improved Teacher's Mathematics Confidence	The teacher reported improved her mathematics confidence as a result of participating in the modeling or co-teaching cycles.
Small Groups Increased Student Engagement	Students increased their sense of engagement as a result of participating in the small groups.
Students Benefitted from Gradual Release Model	The gradual release model benefitted students as they ultimately assumed responsibility for completing a task independently.
Students Enjoyed Small Group Movement	Students enjoyed the movement afforded by small groups.
Students Got to Know More Adults in the School	By engaging with the coach through the cycle, students got to know one more adult in the school.
Students Heard Multiple Strategies	Students heard multiple strategies from the coach and teacher for learning mathematics.
Students Received Individualized Instruction	Students received individualized instruction that was specifically tailored to meet their needs.
Teacher Differentiated Instruction	The teacher differentiated her instruction to meet the diverse community of learners in her classroom.
Teacher Enjoyed Having Adult Contact	The teacher enjoyed having adult contact with the coach as a byproduct of participating in the cycle.
Teacher Gained a Different Vision of Instruction	The teacher gained a different vision of instruction by watching how someone else taught something.
Teacher Gained Exposure to Math Vocabulary	The teacher improved her understanding of grade-level mathematical vocabulary.
Teacher Gained Exposure to	The teacher improved her pacing and realized the

Table K.1
Perceived Benefits Open Codes

Slower/Faster Pacing	benefits of either going at a quicker or slower pace.
Teacher Implemented a Strategy	The teacher implemented a new strategy in her classroom that was in addition to the district-provided curriculum.
Teacher Improved Classroom Management	The teacher improved her classroom management.
Teacher Improved Questioning Strategies	The teacher enhanced her questioning strategies and asked students deeper, more thoughtful questions.
Teacher Learned How to Navigate Curriculum	The teacher learned how to better navigate the district-provided curriculum.
Teacher Planned More Effectively	With the assistance of the coach, the teacher more effectively planned her instruction.

EMERGENT CHALLENGES CODES

Table L.1
Emergent Challenge Open Codes

Code	Definition
Coach and Teacher Had Different Teaching Methods	The coach and teacher had different teaching methods that, at times, clashed during the modeled or co-taught lesson.
Coach and Teacher Had Different Teaching Personalities	The coach and teacher had different teaching personalities that, at times, clashed during the modeled or co-taught lesson.
Coach Did Too Much for Teacher	The coach perceived that she did too much for the teacher during the coaching cycle.
Coach Needed In-depth Knowledge of Students	The coach needed to possess in-depth knowledge about the social, emotional and academic needs of students in the teacher's classroom.
Cycle Length	The modeled or co-taught cycle was too long and lasted longer than it should have.
Differentiating Instruction	Differentiating instruction and consistently meeting the needs of the diverse community of learners in the teacher's classroom was difficult.
Ensuring Teacher Follow Through	Ensuring that the teacher continued to implement the strategy initiated by the coach during the modeled or co-taught lesson cycle after the cycle ended and the coach left was a challenge.
Establishing Relationships with Students	Quickly establishing relationships with students was difficult for the coach.
Getting Calendar Math Up and Running	Getting Calendar Math up and running with all of the necessary materials and pieces was challenging.
Keeping Teacher on Task During Planning Meetings	It was difficult for the coach to consistently keep the teacher on task and focused during the planning meetings.
Lack of Student Engagement	At times, students were not engaged during instruction, which proved to be difficult.

Table L.1
Emergent Challenge Open Codes

Lack of Teacher Engagement	At times, the teacher was not engaged during the modeled or co-taught lessons, which was challenging for the coach.
Managing Classroom Behaviors	Managing classroom behaviors for the coach and teacher was difficult during the modeled or co-taught lessons.
Next Steps for Students	Determining next steps for struggling and gifted students after the cycle had ended was a challenge for both the coach and teacher.
Releasing Calendar Math	It was difficult for the coach to release the cycle back to the teacher at the very end.
Scheduling	The coach and teacher needed to coordinate their schedules, which included finding the time to co-plan and enact the modeled or co-taught lessons.
Students in Small Groups Might Get Distracted	Students who were working in a small group with the coach or teacher had a difficult time focusing.
Students Struggled with Content	Some students struggled to understand the mathematical concepts.
Teacher Having Less Flexibility	The teacher had less flexibility as she had to discuss her instructional decisions with the coach.
Teacher Needed Help Navigating Curriculum	The teacher was unfamiliar with the curriculum and needed help from the coach navigating it.
Teacher's Negative Attitude Towards Mathematics	The teacher's negative attitude towards mathematics was a challenge that the coach had to overcome.
Teacher Struggled to Shift Pedagogy Mindset	The coach struggled to help the teacher shift her mindset regarding pedagogy.
Teacher Wanted Help Organizing Materials	It was difficult for the teacher to organize the materials and she wanted help from the coach.
Using Materials Not Provided by District	It was challenging for the coach and teacher to use materials not provided by the district.

APPENDIX M

CONDITIONS CODES

Table M.1
Conditions Open Codes

Code	Definition
Adequate Knowledge About Calendar Math	It was integral that the coach had in-depth background knowledge about Calendar Math as it was in addition to the district-provided curriculum and the teacher was not familiar with the program.
Behavior Management System Needed to be in Place	The teacher needed to implement a behavior management system prior to the start of the modeled or co-taught cycle.
Being Open Minded	The teacher needed to enter the modeled or co-taught cycle with an open mind, willing to try new things.
Coach and Teacher Coordinated Schedules	The coach and teacher needed to coordinate schedules so they could consistently co-plan and enact the modeled or co-taught lessons.
Coach and Teacher Had Consistent Expectations	The coach and teacher needed consistent expectations regarding how to implement the strategy or intervention.
Coach and Teacher Had Trusting Relationship	The coach and teacher had a trusting relationship.
Coach Had In-depth Knowledge of Students	The coach needed in-depth knowledge of the social, emotional and academic needs of the students in the teacher's classroom.
Consistent Expectations for Behavior Management	The coach and teacher needed to have consistent expectations regarding behavior management.
Continuously Engaging in Reflection	The coach and teacher needed to continuously engage in reflection throughout the modeled or co-taught cycle to discuss how things were going with students and next steps.
Getting Guided Math Groups Up and Running	The coach and teacher needed to spend time up front at the beginning of the cycle getting materials and structures in place for guided math

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Table M.1
Conditions Open Codes

	groups.
Having Two Adults in the Room	There needed to be two adults in the room so the cycle could be beneficial.
Materials Needed to be in Place	The coach and teacher needed to ensure that all materials were in place at the start of the modeled or co-taught cycles.
Students and/or Parents Knew About Cycle	The teacher needed to tell her students, and her students' parents about the cycle at the start to ensure everyone was on the same page and no one was confused or taken by surprise.
Teacher Accountability System in Place	The coach wanted to implement a teacher accountability system to ensure that the teacher continued to implement the strategy or intervention after the cycle ended and the coach left.
Teacher Committed to Continue with Intervention	The coach wanted to ensure the teacher was fully committed to continue implementing the intervention after the cycle had ended and the coach left.
Teacher Motivated by Right Reasons	The coach wanted to ensure the teacher was motivated to participate in the modeled or co-taught cycle by the right reasons, as opposed to being forced to participate or being there for wrong reasons.

APPENDIX N

MODELING CYCLE SUB-CODE TABLES

Planning Conversations

Table N.1
Planning Conversation Sub-Codes for Curriculum, Activities and Materials

	Meg-Michelle Cycle	Meg-Mackenzie Cycle
	Percent Coverage	Percent Coverage
Curriculum, Activities and Materials		
Materials	47%	96%
Curriculum	44%	4%
Activities	9%	0%

Table N.2
Planning Conversation Sub-Codes for Assessment

	Meg-Michelle Cycle	Meg-Mackenzie Cycle
	Percent Coverage	Percent Coverage
Assessment		
Assessment Logistics	58%	42%
Student Learning	35%	21%
Data Informing Instruction	7%	36%
Other	0%	1%

Direct Engagement

Table N.3
Direct Engagement Sub-Codes for Curriculum, Activities and Materials

	Meg-Michelle Cycle	Meg-Mackenzie Cycle
n (Exchanges)	16	19
Curriculum, Activities and Materials		
Materials	100%	89%
Curriculum	0%	11%
Activities	0%	0%

APPENDIX O

CO-TEACHING CYCLE SUB-CODE TABLES

Claire and Cathy

Planning Conversation Sub-codes

Table O.1
Planning Conversation Assessment Sub-codes for Claire and Cathy

	Overall	1	2	3
Data Informing Instruction	54%	39%	82%	42%
Student Learning	33%	37%	18%	43%
Logistics	11%	21%	0%	11%
Assessment Creation	0%	0%	0%	0%
Other	2%	2%	0%	4%

Table O.2
Planning Conversation Curriculum, Activities and Materials Sub-codes for Claire and Cathy

	Overall	1	2	3
Curriculum	65%	76%	42%	78%
Other	16%	1%	44%	3%
Activities	13%	17%	14%	8%
Materials	11%	6%	0%	11%

Table O.3
Planning Conversation Curriculum Sub-themes for Claire and Cathy

	Overall	Meeting 1	Meeting 2	Meeting 3
What Students in Groups Work On	51%	18%	100%	35%
Timing	16%	33%	0%	14%
Seeking to Understand and Navigate	15%	29%	0%	17%
Other	11%	5%	0%	28%
Perceptions	4%	12%	0%	2%
Rigor	3%	4%	0%	5%

Direct Engagement Sub-codes

Table O.4
Direct Engagement Curriculum, Activities and Materials Sub-codes for Claire and Cathy

	Overall	1	2	3
n	27	18	3	6
Curriculum and Activities	67%	61%	100%	67%
Materials	33%	39%	0%	33%

Table O.5
Direct Engagement Curriculum Sub-themes for Claire and Cathy

	Overall	1	2	3
n	18	11	3	4
Timing	44%	35%	67%	50%
Rigor	33%	45%	33%	0%
What Students in Groups Work On	11%	0%	0%	50%
Other	6%	9%	0%	0%
Seeking to Understand and Navigate	6%	9%	0%	0%
Perceptions	0%	0%	0%	0%

Table O.6
Direct Engagement Grouping Sub-themes for Claire and Cathy

	Overall	1	2	3
n	21	1	13	7
Grouping Logistics	95%	0%	100%	100%
Grouping Structures	5%	100%	0%	0%
Creating Groups	0%	0%	0%	0%
Pulling Small Groups	0%	0%	0%	0%

Claire and Caroline

Planning Conversation Sub-codes

Table O.7
Planning Conversation Assessment Sub-codes for Claire and Caroline

Lesson Number	Overall	1	2
Student Learning	54%	76%	32%
Data Informing Instruction	39%	24%	54%
Logistics	7%	0%	14%
Assessment Creation	0%	0%	0%
Other	0%	0%	0%

Table O.8
Planning Conversation General Pedagogy Sub-codes for Claire and Caroline

Lesson Number	Overall	1	2
Planning and Creating	41%	82%	0%
Pedagogical Principles and Practices	22%	0%	44%
Differentiation	17%	15%	18%
Gradual Release Process	16%	3%	29%
Other	4%	0%	8%
Pedagogical Resource	0%	0%	0%

Direct Engagement Sub-codes

Table O.9
Direct Engagement Assessment Sub-codes for Claire and Caroline

	Overall	1	2	3	4
n	14	3	4	2	5
Data Informing Instruction	57%	67%	75%	50%	40%
Student Learning	29%	33%	25%	50%	20%
Logistics	14%	0%	0%	0%	40%
Assessment Creation	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%

Table O.10
Direct Engagement Curriculum, Activities and Materials Sub-codes for Claire and Caroline

	Overall	1	2	3	4
n	11	3	1	5	2
Materials	82%	67%	100%	80%	100%
Curriculum and Activities	18%	33%	0%	20%	0%

Table O.11
Reflection Conversation Assessment Sub-codes for Claire and Caroline

Codes	Overall	Informal	Formal
Student Learning	73%	77%	69%
Data Informing Instruction	15%	0%	29%
Logistics	13%	23%	2%
Other	1%	0%	1%

Table O.12
Reflection Conversation General Pedagogy Sub-codes for Claire and Caroline

Codes	Overall	Informal	Formal
Differentiation	89%	91%	86%
Other	12%	9%	14%
Gradual Release Process	0%	0%	0%
Pedagogical Resource	0%	0%	0%
Planning and Creating	0%	0%	0%
Pedagogical Principles and Practices	0%	0%	0%

Claire and Cecilia

Planning Conversation Sub-codes

Table O.13
Planning Meeting General Pedagogy Sub-codes for Claire and Cecilia

Sub-code	Overall	1	2	3	4
Planning and/or Creating	39%	18%	63%	39%	34%
Differentiation	25%	51%	9%	10%	30%
Pedagogical Principles and Practices	24%	21%	0%	51%	24%
Pedagogical Resource	8%	8%	19%	0%	4%
Gradual Release Process	3%	0%	8%	0%	4%
Other	2%	4%	0%	0%	3%

Table O.14
Planning Conversation Curriculum, Activities and Materials Sub-codes for Claire and Cecilia

	Overall	1	2	3	4
Curriculum	78%	75%	81%	68%	86%
Activities	13%	23%	3%	22%	2%
Materials	9%	2%	16%	6%	12%
Other	1%	0%	0%	4%	0%

Table O.15
Planning Conversation Curriculum Sub-themes for Claire and Cecilia

	Overall	Meeting 1	Meeting 2	Meeting 3	Meeting 4
Seeking to Understand and Navigate	44%	22%	555	22%	76%
What Students in Groups Work On	28%	33%	14%	64%	0%
Timing	14%	31%	0%	5%	19%
Perceptions	10%	10%	20%	8%	0%
Other	5%	4%	11%	2%	5%
Rigor	0%	0%	0%	0%	0%

Direct Engagement Sub-codes

Table O.16
Direct Engagement Curriculum, Activities and Materials Sub-codes for Claire and Cecilia

	Overall	1	2	3
n	19	5	8	6
Curriculum and Activities	53%	40%	50%	67%
Materials	47%	60%	50%	33%

Table O.17
Direct Engagement Curriculum Sub-themes for Claire and Cecilia

	Overall	1	2	3
n	10	2	4	4
Timing	60%	50%	50%	75%
What Students in Groups Work On	30%	50%	50%	0%
Other	10%	0%	0%	25%
Perceptions	0%	0%	0%	0%
Rigor	0%	0%	0%	0%
Seeking to Understand and Navigate	0%	0%	0%	0%

Table O.18
Direct Engagement General Pedagogy Sub-codes for Claire and Cecilia

Planning Meeting	Overall	1	2	3
n	11	3	5	3
Planning and/or Creating	55%	100%	60%	0%
Pedagogical Principles and Practices	36%	0%	40%	67%
Differentiation	0%	0%	0%	0%
Pedagogical Resource	0%	0%	0%	0%
Gradual Release Process	0%	0%	0%	0%
Other	9%	0%	0%	33%

CO-TEACHING SUMMARY TABLES

Table P.1
Coach-teacher Engagement Codes for All Pairs

Lesson Number	Overall	1	2	3	4
n					
Claire-Cathy	151	51	55	45	n/a
Claire-Caroline	72	27	9	14	22
Claire-Cecilia	138	42	52	44	n/a
Direct Engagement					
Claire-Cathy	71%	75%	69%	69%	n/a
Claire-Caroline	68%	56%	89%	71%	73%
Claire-Cecilia	64%	67%	69%	55%	n/a
Indirect Engagement					
Claire-Cathy	29%	25%	31%	31%	n/a
Claire-Caroline	32%	44%	11%	29%	27%
Claire-Cecilia	36%	33%	31%	45%	n/a

Table P.2

Co-taught Lesson Indirect Engagement Substance Codes for All Pairs

	Claire-Cathy Cycle	Claire-Caroline Cycle	Claire-Cecilia Cycle
n	44	23	50
Helping Students Learn Mathematics	55%	26%	34%
Classroom Management	39%	70%	60%
Other	7%	4%	6%

Table P.3
Reflection Conversation Substance Codes for All Pairs

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Percent Coverage	Math Indicator	Percent Coverage	Math Indicator	Percent Coverage	Math Indicator
Content						
Curriculum, Activities and Materials	16%	0% (0%)	1%	0% (0%)	3%	0% (0%)
Mathematics	0%	n/a	0%	n/a	0%	0% n/a
Total	16%	0% (0%)	1%	0% (0%)	3%	0% (0%)
Pedagogy						
Grouping	45%	0% (0%)	0%	0% (0%)	9%	0% (0%)
Assessment	0%	0% (0%)	35%	39% (14%)	38%	19% (7%)
General Pedagogy	0%	0% (0%)	33%	30% (10%)	7%	0% (0%)
Total	45%	0% (0%)	68%	21% (24%)	45%	16% (7%)
Management						
Classroom Composition and Attendance	0%	0% (0%)	1%	0% (0%)	0%	0% (0%)
Classroom Management	0%	0% (0%)	0%	0% (0%)	0%	0% (0%)
Total	0%	0% (0%)	1%	0% (0%)	0%	0% (0%)
Planning and Logistics						
Facilitator's Role	0%	0% (0%)	1%	20% (0%)	0%	0% (0%)
General Plans for Coaching Cycle	0%	0% (0%)	0%	0% (0%)	20%	0% (0%)
Technology	0%	0% (0%)	1%	25% (0%)	0%	0% (0%)
Time and Schedule	3%	0% (0%)	9%	0% (0%)	11%	0% (0%)
Total	3%	0% (0%)	11%	0% (0%)	31%	0% (0%)
Contextual Factors						
Relationship Building	9%	0% (0%)	1%	0% (0%)	0%	0% (0%)
External Conditions	0%	0% (0%)	0%	0% (0%)	0%	0% (0%)
Total	9%	0% (0%)	1%	0% (0%)	0%	0% (0%)
Other						
External Individuals	18%	0% (0%)	9%	0% (0%)	0%	0% (0%)
Other	9%	0% (0%)	12%	0% (0%)	11%	0% (0%)
Total	27%	0% (0%)	21%	0% (0%)	11%	0% (0%)

Table P.4
Co-teaching Cycle Perceived Benefits for All Pairs

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content						
Deepened Teacher's Content Knowledge					x	
Improved Students' Perception of Mathematics					x	
Increased Teacher's Mathematics Confidence					x	
Teacher Gained Exposure to Math Vocabulary						x
Teacher Learned How to Navigate Curriculum						x
Pedagogy						
Coach Learned New Teaching Methods	x					
Enhanced Teacher's General Pedagogical Knowledge					x	
Small Groups Increased Student Engagement		x				
Students Benefitted from Gradual Release Model			x	x		
Students Enjoyed Small Group Movement		x				
Students Heard Multiple Strategies	x					
Students Received Individualized Instruction		x				
Teacher Differentiated Instruction			x	x		
Teacher Gained Exposure to Slower Pacing						x
Teacher Implemented a Strategy					x	x
Teacher Planned More Effectively		x	x			
Other						
Coach Engaged in Reflection					x	
Coach Gained Exposure to New Grade Level			x			
Coach Got Back Into Classroom				x		x
Coach Learned About Different Teachers	x					
Held Teacher Accountable				x		

Table P.5
Co-teaching Cycle Challenges for All Pairs

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content						
Students Struggled with Content					x	
Teacher's Negative Attitude Towards Mathematics					x	
Teacher Wanted Help Organizing Materials				x		
Pedagogy						
Coach and Teacher Had Different Teaching Methods	x					
Next Steps for Students			x	x		
Teacher Struggled to Shift Pedagogy Mindset					x	
Planning and Logistics						
Scheduling	x	x	x	x	x	x
Cycle Length	x					
Other						
Coach Did Too Much for Teacher	x					
Ensuring Teacher Follow Through	x	x				
Teacher Having Less Flexibility		x				

Table P.6
Co-teaching Cycle Conditions for All Pairs

	Claire-Cathy Cycle		Claire-Caroline Cycle		Claire-Cecilia Cycle	
	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Management						
Consistent Expectations for Behavior Management						x
Planning and Logistics						
Coordinating Schedules		x		x	x	
Contextual Factors						
Being Open Minded	x	x	x			
Coach and Teacher Had Trusting Relationship	x		x	x	x	x
Other						
Coach Had In-depth Knowledge of Students				x		
Continuously Engaging in Reflection				x		
Getting Guided Math Groups Up and Running		x				
Students and/or Parents Knew About Cycle					x	x

CROSS-CUTTING SUMMARY TABLES BY RESEARCH QUESTION

Table Q.1
Motivating Reasons for All Coaches and Teachers

	Modeling Cycles				Co-teaching Cycles					
	Meg-Michelle		Meg-Mackenzie		Claire-Cathy		Claire-Caroline		Claire-Cecilia	
	Meg	Michelle	Meg	Mackenzie	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content										
Gained Exposure to Grade-level Content[61]				x					x	x
Helped Teacher Navigate Curriculum										x
Increased Students' Math Confidence				x						
Pedagogy										
Enhanced Teacher's Pedagogical Knowledge									x	
Implemented Gradual Release Process							x			
Needed Assistance with Differentiation							x	x		
Provided Student Data			x							
Students Heard Multiple Strategies										x
Wanted to Implement Strategy	x	x	x	x	x					
Wanted to Make Math Instruction Fun										x
Contextual Factors										
Completed Evaluation Tool	x				x	x				
Teacher Was on Improvement Plan		x								
Other										
Coach Learned About Different Teachers				x						
Experienced Previous Success Co-teaching								x		
Played to Coach's Strengths			x							

---

[61] Highlighted rows contain a motivating factor that was mentioned across both modeling and co-teaching cycles.

Table Q.2
Perceived Benefits for All Coaches and Teachers

	Modeling Cycles				Co-teaching Cycles					
	Meg-Michelle		Meg-Mackenzie		Claire-Cathy		Claire-Caroline		Claire-Cecilia	
	Meg	Michelle	Meg	Mack	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content										
Exposed Teacher to Grade Level Content									x	
Improved Students' Math Confidence			x							
Improved Students' Perception of Math									x	
Improved Students' Understanding of Math		x	x	x						
Improved Teacher's Math Confidence									x	
Teacher Gained Exposure to Math Vocabulary										x
Teacher Learned How to Navigate Curriculum										x
Pedagogy										
Coach Learned New Teaching Methods					x					
Coach Deepened Knowledge of Student Goal Setting	x									
Coach Deepened Understanding of Assessment	x									
Enhanced Teacher's General Pedagogical Knowledge									x	
Small Groups Increased Student Engagement						x				
Students Benefitted from Gradual Release Model							x	x		
Students Enjoyed Small Group Movement						x				
Students Heard Multiple Strategies					x					
Students Received Individualized Instruction						x				
Teacher Differentiated Instruction							x	x		
Teacher Gained a Different Vision of Instruction		x								
Teacher Gained Exposure to Slower/Faster Pacing[62]			x							x
Teacher Implemented a Strategy									x	x

[62] Highlighted rows contain a perceived benefit that was mentioned across both modeling and co-teaching cycles.

Table Q.2

Perceived Benefits for All Coaches and Teachers

Teacher Improved Questioning Strategies	x	x	x						
Teacher Planned More Effectively					x	x			
Other									
Coach Broadened Impact			x						
Coach Engaged in Reflection								x	
Coach Gained Exposure to New Grade Level						x			
Coach Got Back Into Classroom	x						x		x
Coach Learned About Different Teachers				x					
Held Teacher Accountable							x		

Table Q.3
Emergent Challenges for All Coaches and Teachers

	Modeling Cycles				Co-teaching Cycles					
	Meg-Michelle		Meg-Mackenzie		Claire-Cathy		Claire-Caroline		Claire-Cecilia	
	Meg	Michelle	Meg	Mack	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content										
Getting Calendar Math Up and Running		x								
Students Struggled with Content									x	
Teacher's Negative Attitude Towards Math									x	
Teacher Wanted Help Organizing Materials								x		
Using Materials Not Provided by District			x							
Pedagogy										
Coach and Teacher Had Different Teaching Methods					x					
Next Steps for Struggling Students							x	x		
Teacher Struggled to Shift Pedagogy Mindset									x	
Management										
Establishing Relationships with Students			x							
Managing Classroom Behaviors				x						
Planning and Logistics										
Scheduling[63]		x	x	x	x	x	x	x	x	x
Cycle Length					x					
Other										
Coach Did Too Much for Teacher					x					
Ensuring Teacher Follow Through	x	x			x	x				
Lack of Teacher Engagement	x									
Releasing Calendar Math	x		x							
Teacher Having Less Flexibility								x		

---

[63] Highlighted rows contain an emergent challenge that was mentioned across modeling and co-teaching cycles.

Table Q.4
Conditions for All Coaches and Teachers

	Modeling Cycles				Co-teaching Cycles					
	Meg-Michelle		Meg-Mackenzie		Claire-Cathy		Claire-Caroline		Claire-Cecilia	
	Meg	Michelle	Meg	Mack	Claire	Cathy	Claire	Caroline	Claire	Cecilia
Content										
Adequate Knowledge About Calendar Math		x		x						
Materials Needed to be in Place		x		x						
Management										
Behavior Management System Needed to be in Place	x			x						
Consistent Expectations for Behavior Management										x
Planning and Logistics										
Coach and Teacher Coordinated Schedules[64]				x		x		x	x	
Coach and Teacher Had Consistent Expectations				x						
Contextual Factors										
Being Open Minded					x	x	x			
Coach and Teacher Had Trusting Relationship				x	x		x	x	x	x
Other										
Coach Had In-depth Knowledge of Students								x		
Continuously Engaging in Reflection								x		
Getting Guided Math Groups Up and Running						x				
Student and/or Parents Knew About Cycle									x	x
Teacher Accountability System in Place	x									
Teacher Committed to Continue with Intervention			x							
Teacher Motivated by Right Reasons			x							

---

[64] Highlighted rows contain a condition that was mentioned in both modeling and co-teaching cycles.

APPENDIX R

IRB APPROVAL

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Office of the Vice Chancellor for Research

Office for the Protection of Research Subjects
528 East Green Street
Suite 203
Champaign, IL 61820

May 16, 2016

Sarah Lubienski
Curriculum and Instruction
390 Education Bldg.
1310 South Sixth Street
Champaign, IL   61820

RE: *Co-Teaching and Modeling: The Work of Coaches and Teachers as They Engage in One-on-One Mathematics Professional Development*
IRB Protocol Number: 16841

Dear Dr. Lubienski and Ms. Saclarides:

Thank you for submitting the completed IRB application form for your project entitled *Co-Teaching and Modeling: The Work of Coaches and Teachers as They Engage in One-on-One Mathematics Professional Development*. Your project was assigned Institutional Review Board (IRB) Protocol Number 16841 and reviewed. It has been determined that the research activities described in this application meet the criteria for exemption at 45CFR46.101(b)(1).

This determination of exemption only applies to the research study as submitted. Please note that additional modifications to your project need to be submitted to the IRB for review and exemption determination or approval before the modifications are initiated.

Copies of the attached, date-stamped consent form(s) are to be used when obtaining informed consent. If there is a need to revise or alter the consent form(s), please submit the revised form(s) for IRB review, approval, and date-stamping prior to use.

Please supply the OPRS office with copies of letters of email messages of support from an administrator at each participating school/school district once the participating schools are confirmed.

Exempt protocols will be closed and archived five years from the date of approval. Researchers will be required to contact our office if the study will continue beyond five years. If an amendment is submitted once the study has been archived, researchers will need to submit a new application and obtain approval prior to implementing the change.

We appreciate your conscientious adherence to the requirements of human subjects research. If you have any questions about the IRB process, or if you need assistance at any time, please feel free to contact me at OPRS, or visit our website at http://oprs.research.illinois.edu

Sincerely,

Ronald Banks, MS, CIP
Human Subjects Research Coordinator, Office for the Protection of Research Subjects

Attachment(s): approved consent letters

APPENDIX S

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