Becoming an Instructional Leader for Elementary Mathematics: Transforming Principal Learning through a Research-Practice Partnership

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Abstract

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Principals across the country are increasingly called on to support teacher learning and instruction as instructional leaders. As a result, districts are faced with the challenge of supporting principals to take on fundamentally new forms of leadership practice. However, there is limited understanding of (a) how principals might engage in learning those forms of practice, (b) the design of effective supports for principal learning, or (c) the processes by which effective supports might be designed. This study reports on a Design-Based Implementation Research approach to supporting principal learning in the context of a district effort for instructional improvement at scale. The context of the study involved an instructional improvement initiative across five elementary schools that included a vision of principal leadership that required principals to take on fundamentally new forms of practice. This vision of leadership was developed in relationship to particular goals for students' mathematical learning and, arising from those goals, new expectations for teachers' instructional practices. A Research-Practice Partnership (RPP) consisting of school district leaders and university-based researchers collaborated to support principals in developing these forms of practice and implementing the instructional improvement initiative. The study

consists of three related analyses that examine the process of supporting principal learning from three different angles. The first analysis examines how principals engaged in learning new forms of leadership practice. I argue that principal learning was best conceptualized as an interwoven process of knowing, doing, and becoming, and that principals engaged in reconciling different expectations for the principalship in different ways. The second analysis examines the characteristics of the learning supports for principals that appeared to foster principals' becoming a new kind of leader in relation to particular goals for student and teacher learning. I propose a set of design principles that might be useful to others engaged in supporting principal learning of new ways of being a principal. Finally, the third analysis zooms in on one specific design process involve in the initiative: the decomposition of principal practice in effort to specify what mattered for principals to learn to enact. I examine the tensions within this design task and describe how the partnership responded to the tensions in productive ways. Taken together, these analyses contribute to understanding how to support principal to become fundamentally different school leaders. In particular, the analyses examine how supports might be designed to be responsive to local contexts and specific goals for principal, teacher, and student learning.

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CHAPTER 1: INTRODUCTION

The role of the principal in supporting school reorganization for significant improvement in instruction is generally recognized as crucial (e.g., Cobb & Jackson, 2011; Hallinger, 2005; Hubbard, Mehan, & Stein, 2006; Leithwood, Louis, Anderson, & Wahlstrom, 2004). The past few decades have seen a shift in expectations for what this leadership role might entail; principals increasingly are expected to be more actively involved with teachers, students, and instruction as instructional leaders. As part of this shift, the traditional role of principal as building manager shifted to include responsibilities like growth-oriented evaluation of teaching practice and organization of teacher professional development.

In this dissertation, I argue that existing research on instructional leadership is limited because despite an emphasis on the principal role in relation to student and teacher learning, studies of principal leadership tend to not specify goals, or design of supports for, student and teacher learning (e.g., Barnes, Camburn, Sanders, & Sebastian, 2010; Dana, Tricarico, & Quinn, 2009; Grissom, Loeb, & Master, 2013; Huff, Preston, & Goldring, 2013; Youngs & King, 2002). This disconnect is problematic as scholars increasingly argue that instructional leadership needs to be understood in relation to particular instructional goals; how principals effectively enact instructional leadership will differ based on the student and teacher learning they are trying to support. A significant body of research has developed robust theories of how to best support rigorous student learning, and how teachers might learn to enact the necessary forms of practice to foster that learning (e.g., Ball & Cohen, 1999; Grossman, Compton, Igra, & Williamson, 2009; Lampert et al., 2013; Thompson, Windschitl, & Braaten, 2013). This body of research suggests that the visions of instruction reflected in expectations for rigorous, student-centered learning goals[1] involve more than just setting up professional development for teachers or providing feedback on instruction; rather, principals need to set up and engage in particular interactions in order to support teacher learning (e.g., Cobb & Jackson, 2011; Coburn, 2005; Nelson & Sassi, 2005). Engaging in these ways likely requires significant learning on the part of principals, however there is limited

[1] For example, the goals reflected in the Common Core State Standards for Mathematics and Literacy and the Next Generation Science Standards.

understanding of (a) how principals need to enact particular practices to support specific teacher and student learning, (b) how principals might engage these new learning needs, and (c) how to design effective supports for such principal learning.

The existing literature does suggest that principal learning to engage differently as a leader will involve development of new knowledge and ways of spending time or enacting practice (e.g., Barnes et al., 2010; Boston, Henrick, Gibbons, Berebitsky, & Colby, 2016; Katterfeld, 2013; Mangin, 2007; Steele, Johnson, Otten, Herbel-Eisenmann, & Carver, 2015). Research also suggests that how principals see themselves and their role will matter for how they engage as leaders in school contexts (Barnes et al., 2010; e.g., Browne-Ferrigno, 2003; Rigby, 2016; Scribner & Crow, 2012; Young, O'Doherty, Gooden, & Goodnow, 2011). How knowledge, ways of enacting practice, and ways of conceptualizing one's role might interact as learning unfolds, however, is not well understood.

Research on supporting principal learning suggests that in order to develop new leadership practice, principals will need more than traditional professional development experiences that center on delivery of information outside of school contexts. Instead, principal learning needs to include job-embedded, or field-based experiences (e.g., Augustine et al., 2009; Drago-Severson, 2012; Fink & Resnick, 2001; Honig, 2012). In addition, the literature suggests that principals will need to be supported to make sense of new knowledge about teaching, learning, and leadership in relation to expected forms of leadership practice (Boston et al., 2016; Nelson & Sassi, 2005; Steele et al., 2015). Examples of principal learning supports often feature the following limitations: (1) supports are designed around vague learning goals (e.g., Honig & Rainey, 2014; Hubbard et al., 2006), or (2) supports are designed to support development of particular forms of knowledge or isolated skills (e.g., Boston et al., 2016; Steele et al., 2015). In both cases, researchers find that while there might be changes in principal knowledge or talk about practice in the professional development setting, that learning does not often translate into a change in leadership practice in schools. Thus, there is a need to more deeply understand how to support principal learning for enactment of leadership in fundamentally different ways in school settings.

This study examines a case of principal learning of a particular vision of instructional leadership in the context of specific goals for student and teacher learning. In this case, principals were expected to significantly transform their practice to support deep changes, beginning with teaching and learning of mathematics in elementary classrooms. The instructional improvement approach was grounded in research on both (a) the instructional pedagogies that best support students to make sense of mathematics in rich, discourse-centered classroom environments (e.g., Cazden, 2001; Franke, Kazemi, & Battey, 2007), and (b) teacher learning pedagogies that best support teachers to collectively experiment with, and develop, new ways of engaging students in such learning (e.g., Cochran-Smith & Lytle, 1999; Darling-Hammond & Richardson, 2009; Kazemi, 2008; McDonald, Kazemi, & Kavanagh, 2013). In this way, the case provides an opportunity to examine principal learning of fundamentally new forms of practice in direct relationship to specific goals for teacher and student learning.

Existing research and theoretical arguments suggest the importance of supporting principal learning of fundamentally new leadership practice in ways that are responsive to local context (e.g., Hubbard et al., 2006; Spillane, Halverson, & Diamond, 2011). These arguments connect to broader, growing attention to the need for educational innovations to be adapted to local contexts to be supported at scale (e.g., Coburn, 2003). Increasingly, there is a call for districts and researchers to collaborate in Research-Practice Partnerships (RPP) to design and research supports for educational improvement (Coburn, Penuel, & Geil, 2013). Through RPPs, the aim is to transform the traditional, distant relationship between research and practice into long-term, mutually transformative partnerships (Coburn & Penuel, 2016; Fishman, Penuel, Allen, Cheng, & Sabelli, 2013).

One partnership approach to this is Design-Based Implementation Research (DBIR), which involves researchers and practitioners collaborating to design, refine, and research educational interventions *during implementation* so that they can be effective in local contexts (Penuel, Fishman, Cheng, & Sabelli, 2011). The approach has the potential to design more powerful educational systems that have the capacity to adapt over time while also building theory about learning, teaching, and organizational change (Penuel et al., 2011; Russell, Jackson, & Frank, 2013; Sabelli & Dede, 2013).

However, while DBIR approaches are increasingly recognized as a potentially powerful shift in the work of districts and researchers in supporting educational improvement, understanding of how partnerships might effectively engage in design processes is in its infancy. In addition, there is a need to more deeply understand how lessons learned in one specific context might be usefully communicated, applied, and adapted to other contexts. Thus, districts and researchers lack guidance about both how to engage in design processes and, more specifically, how to effectively design learning supports for principals.

This dissertation was designed to respond to these two gaps in existing literature: (1) understanding how to support principals in developing fundamentally new forms of leadership practice, and (2) understanding how districts and researchers might collaborate to iteratively and responsively design – and learn from – the implementation of education improvement initiatives. I examine a case of a district-university partnership's design-based approach to supporting five principals' learning in relation to a particular instructional improvement initiative. In this case, expectations for changes in principal practice were grounded in a particular vision of instructional leadership related to specific goals for both student and teacher learning. These expectations represented a fundamentally new vision for leadership for the five principals. I examine how the case can inform understanding of how principal learning might unfold within this context of shifting institutional expectations for competent practice. My retrospective analysis of this case was grounded in a sociocultural perspective on learning and sought to understand not just how principals developed new knowledge or skills as leaders, but how they engaged in *becoming* fundamentally new kinds of leaders in their schools.

In designing analysis, I aimed to examine the case from multiple angles. As a result, I examined what was involved in this process of *becoming* for principals, the design of the related learning supports, and how practitioners and researchers collaborated to design the supports. In doing so, the goal was not to report on the specifics of one effort, in one place, to support principal learning. Rather, I aimed to build theory that might be useful more broadly – to others engaged in supporting principal learning of fundamentally new ways of leading. As Edelson (2002) puts forth, retrospective analyses of design-based approaches should not just about evaluating a program to see if it works, but should also aim to develop

theories about what matters for the content, form and process of that particular class of designs. In particular, Edelson describes three kinds of theory that analyses of design-based approaches can support development of: (a) domain theories, (b) design frameworks, and (c) design methodology. As shown in Table 1, Edelson's three types of theories informed my design of the analyses reported on in this dissertation. First, domain theories contribute knowledge about the intended learning at the center of a design process. In Analysis 1, I investigated how learning unfolded for principals in the context of significant shifts in expectations for leadership practice. Second, design frameworks, or what van den Akker (1999) refers to as *substantive design principles*, describe what was learned about the effective characteristics of the design of the intervention or innovation itself. In Analysis 2, I examined what was learned about the effective design of principal learning supports. Finally, design methodologies develop guidelines about the process of design itself, including steps taken, expertise involved, and roles played by different partners. In Analysis 3, I aimed to build theory about one particular design process the design team engaged in: specifying forms of principal practice. All three of these kinds of theory have the potential to contribute usable guidance to other districts or design-teams engaged in designing supports for principal learning in other contexts.

Table 1. Overview of three analyses.

Analysis 1	**Analysis 2**	**Analysis 3**
Domain theory	*Design framework*	*Design methodology*
How do principals engage in learning fundamentally new forms of leadership practice?	What supports and features of those supports appeared to foster principal learning of fundamentally new forms of practice?	What, if any, tensions emerge in the design process of decomposition of relational practice in the context of an instructional improvement initiative? Given these tensions, what design principles might guide researchers and practitioners to effectively decompose relational practice for practitioner learning?

The remainder of this dissertation is organized into five chapters. First, in Chapter 2, I provide a description of the overall study context and approach to data collection. The following chapters take up the three analyses that I conducted, shown in Table 1. Each chapter provides specific framing, reviews relevant literature, details the specific data sources and analytic methods, and discusses the findings for the individual analysis. As each chapter is written to stand as an individual manuscript, there are some redundancies in framing. In Chapter 3, I report on the analysis of how principals engaged in learning a fundamentally new approach to leadership practice. In Chapter 4, I build off of the first analysis by examining how the design of supports fostered principals' learning. In Chapter 5, I examine the design process for one particular task that the RPP engaged in: decomposition of principal practice. Finally, Chapter 6 offers a discussion of the findings across all three analyses.

CHAPTER 2: STUDY CONTEXT AND APPROACH TO RESEARCH

In this chapter, I provide a description of the overall study context and the approach to research. It's important to note that while the overall improvement initiative aimed at improving instruction across the content areas, my focus will primarily be on the mathematics-related elements of the initiative. This focus on mathematics arises from my background as a mathematics education researcher and teacher educator, as well as the fact that the design-team focused primarily on mathematics instruction during the year that this study examines. However, at times descriptions of the context include references to other content areas, such as literacy, as it is impossible to completely separate out the mathematics-related work. First, I describe key elements of the study context by documenting the evolution of both the RPP and the approach to instructional improvement. Second, I describe how the RPP engaged in a DBIR approach and how data was collected. I finish the chapter with a description of my positionality as a researcher. In subsequent chapters, I will report on specific approaches to data analysis.

Evolution of the Partnership and Instructional Improvement Approach

The study is part of a long-term (2011- present) RPP between university-based researchers and mathematics teacher educators, and the leaders of a district's (referred to as Roosevelt School District) instructional improvement initiative. The partnerships' goals, approach to instructional improvement, and collaborative process has evolved over time. Below, I provide an overview of this evolution, beginning with the initial work of the partnership at one school up to the work that unfolded in the 2016-17 school year which is focus of this particular study.

Goals for Student and Teacher Learning

As described below, the specific goals for the improvement initiative at the center of this study evolved over time, beginning with mathematics instruction and expanding to include literacy instruction. Throughout the process, these goals were consistently grounded in a particular vision of student and teacher learning. The instructional improvement work aimed to transform schools into contexts in which teachers engage in development of new content understanding and instructional practice through ongoing,

collective inquiry (Kazemi, 2008). The goals for the improvement work were grounded initially in a vision of mathematics instruction that sets out rigorous goals for students' learning. The approach emphasizes that mathematics instruction should involve student sensemaking and problem solving, and develop classroom communities in which students engage in each other's ideas (Franke et al., 2007). The role of the teacher is recast as a facilitator of learning, rather than a deliverer of mathematical knowledge (Cazden, 2001). The improvement initiative at the center of this study assumes that teachers need opportunities to learn within a community that supports inquiry, interrogation of past views on teaching and learning, and collaborative experimentation with practice (Cochran-Smith & Lytle, 1999; Darling-Hammond & Richardson, 2009; Kazemi, 2008; McDonald et al., 2013). However, these collaborative experiences often run counter to normative school cultures of isolation and privacy of practice (Ball, 1996; Cuban, 2013; Lortie, 1975; Tyack & Cuban, 1995). Particular forms of learning structures and approaches to leadership are believed to be necessary for supporting teachers to de-privatize their practice and collectively develop new approaches to instruction.

Early Years: Hilltop Elementary

Beginning in 2011, the partnership engaged in design of a model of school-wide professional learning. The partnership's goal at that point was to support development of rigorous, discourse-based mathematics instructional practices across one school in the district, Hilltop Elementary[2]. Hilltop serves a high percentage of students living in poverty and was labeled a "failing" school in 2011 due to mathematics test scores that fell in the bottom 5% of schools across the state. The school partnered with the university-based team to reorganize leadership roles, teacher learning, and classroom instruction. Similar efforts across the country to tackle the complex challenge of turning around failing schools are often unsuccessful (Peck & Reitzug, 2014). However, Hilltop developed a school-wide professional community, established new forms of mathematics instructional practice across all classrooms, and demonstrated significant student learning outcomes based on multiple measures (e.g., R. Lewis, 2016).

[2] All individual and school names are pseudonyms.

By 2014, Hilltop's mathematics test scores out-performed both state and district averages and the school received a "School of Distinction" award. Research conducted at the school revealed that through particular learning structures, teachers and leaders had developed deep, mutual understanding of mathematics instruction as student centered, discourse-based, and conceptually driven (Gibbons, Kazemi, & Lewis, 2017; R. Lewis, 2016).

Instructional Improvement Approach

The instructional improvement approach developed at Hilltop involves the following system of coordinated learning structures for teachers: (1) an ongoing, job-embedded professional development (PD) strategy, (2) weekly, instruction-focused grade-level team meetings, (3) the role of a content-focused coaching, (4) frequent, instructional support in the classroom by both the coach and principal, and (5) weekly meetings between the coach and principal. As shown in Figure 1, the vision behind the approach is that these structures be implemented as one, coordinated system. Teacher learning of instructional practice is supported through a coordinated, ongoing experience, rather than within any individual structure. The different supports engage teachers in the same learning but from different angles and through different activities, and support them to develop understanding over time. A brief description of each structure is provided below.

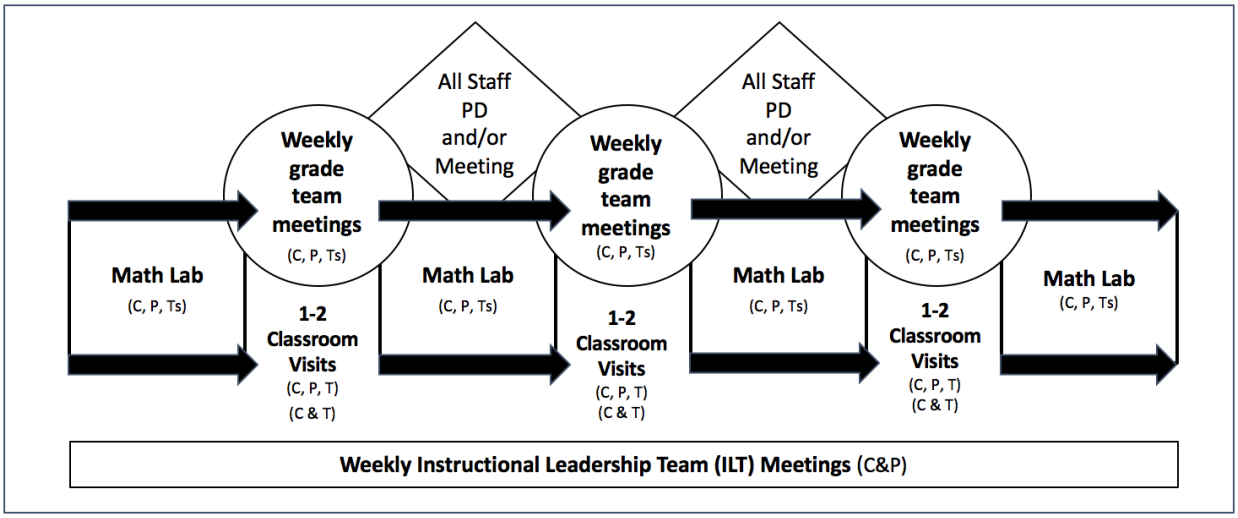

Figure 1. Diagram illustrating the coordinated system of learning supports for teachers. Letters indicate principal (P), coach (C), and teacher (T) participation in each structure.

Math Labs. The job-embedded PD structure, called Math Labs, involves a series of four full-day experiences in which small groups of teachers work with their school-based mathematics coach to collectively plan, enact, and debrief instruction with a focus on student mathematical thinking. Math Labs are led by a facilitator, who, in the case of Roosevelt District, was a school-based mathematics coach. The facilitator guides the group of teachers through a cycle that involves four phases: (1) unpacking new ideas about instruction, student thinking, and content, (2) co-planning a short lesson, (3) collaboratively enacting the lesson with students, and (4) debriefing new insights of the day (Kazemi et al., 2018). In this way, the design of Math Lab draws on a combination of teacher learning pedagogies including rehearsing new instructional practices (Lampert et al., 2013), enacting practices with children present (McDonald et al., 2013), and examining student work to plan responsive instruction (Franke & Kazemi, 2001). Math Labs are similar to Lesson Study (e.g., C. C. Lewis, Perry, & Hurd, 2009) in that teachers plan, visit classrooms, and reflect together. However, in a Math Lab, the drafted lesson plans and resulting instruction are less polished than in Lesson Study, and teachers are expected to regularly confer with one another during instruction (Gibbons, Kazemi, Hintz, & Hartmann, 2017). Math Lab lessons are seen as a collective experiment, with the emphasis resting less on the lesson plan itself and more on what teachers can learn from trying out and discussing instructional practices in the moment, in response to students.

Grade team meetings. In between Math Labs, teachers meet weekly in mathematics-specific grade-team meetings to reflect on student learning and teaching practice and make collective decisions about upcoming instruction[3]. The goal of these meetings is to support teachers to incorporate new learning into their day-to-day practice and to foster deep instructional alignment across teachers' classrooms. Crucial to the design of these meetings is that they are facilitated by the mathematics instructional coach and involve the principal's participation.

Classroom support. In addition, both the mathematics instructional coach and the principal frequently visit classrooms to support instruction. These visits are not intended to be evaluative, but rather

[3] Teachers also met weekly in a separate grade team meeting focused on literacy instruction and facilitated by the literacy instructional coach.

continue the collaborative approach to instruction developed through Math Labs and grade team meetings. The coach or principal typically joins in the mathematics lesson by engaging with students or co-teaching with the teacher. The coach and principal also use these visits for information gathering purposes; by being in classrooms, engaged in instruction, they develop a sense of how instruction is unfolding across a grade or school-level and can use that information to inform design of learning supports for teachers.

Instructional leadership team. Crucial to the effectiveness of all of these structures is the attendance and active participation of the principal and the mathematics instructional coach. To coordinate their work, the principal and coach also meet in weekly Instructional Leadership Team (ILT) meetings with other school leaders (e.g., literacy coach, assistant principal) to discuss teachers' development of the intended instructional practices across the school and what they can do to continue improvement and learning. Crucially, the leaders aim to avoid getting distracted by logistical or management-related issues in these meetings and strive to focus on supporting teacher learning in relation to the instructional improvement goals.

As the improvement work evolved at Hilltop, the focus expanded. After the first year, the school added literacy as a focus (year two) and then social-emotional learning (year three). Each addition to the focus was made intentionally and school leaders sought to align new expectations across subject areas so that teachers still experienced coherence. In doing so, they adapted what they had learned about supporting teacher learning of new approaches to mathematics instruction to teacher learning of related to literacy instruction and supporting student social/emotional learning. For instance, literacy coaches began to implement Literacy Labs and goals for teacher literacy instruction were intentionally supported across the system of learning structures.

Expanding the Instructional Improvement

Given the success at Hilltop, in the 2016-17 school year the district decided to support four additional elementary schools to implement the approach developed at Hilltop. To lead this effort, the principal of Hilltop Elementary, Julie, moved to the role of Chief of School Improvement to lead the

larger improvement initiative. The Chief of School Improvement role was conceptualized as a principal supervisor role that also involved directly supporting principal learning and the implementation of the improvement initiatives at each school. The conceptualization represented a case of recasting the principal supervisor role to be that of principals' *teacher*, rather than just manager or evaluator (Honig, 2012). For simplicity, I will use the title "principal supervisor" to refer to Julie's role. Given Julie's new role, the partnership's work shifted to focus on both (a) sustaining the improvement at Hilltop Elementary under a new principal and (b) spreading the approach to four neighboring elementary schools in the district with similar, high-poverty student populations. All four new schools opted into the improvement work with the encouragement of district leaders. However, the approach to scale and principal learning across the schools was differentiated based on school context. In general, there were two approaches to implementation, shown in Table 2. The choice of approach was related to the school's, principal's and coach's past experience with the improvement initiative, which varied as shown in Table 3.

Table 2. The two improvement approaches implemented during the 2016-17 school year.

	Improvement Approach	**District Supports**
Full Approach	• Weekly ILT meetings • Whole staff: Math Labs and coach-facilitated PLCs *for full school year.*	• principal supervisor in-school support and coaching • principal-coach sessions
Modified Approach	• Weekly ILT meetings • 1-2 grade teams: Math Labs and coach-facilitated PLCs *for second-half of school year.*	• university consultant support for coaches • principal-coach sessions

As shown in Table 3, the five schools involved in the initiative differed in terms of the teachers', principal's, and instructional coach's past experiences with the instructional improvement approach. First, the five schools had different levels of experience with the specific improvement approach (involving the set of coordinated learning structures shown in Figure 1). On one end of the spectrum, Hilltop Elementary was beginning its sixth year with the specific improvement approach. Other schools had experienced pieces of the approach (e.g., just Math Labs without systematic coordination with other learning

structures), while others were new to all aspects of the initiative. These differences meant that principals and their instructional coaches and teachers had varied past experience with the specific approach to supporting teacher learning. In addition, the principals and instructional coaches had varied levels of past experience both as school leaders and with the particular approach to instruction and teacher learning at the center of the initiative. In what follows, I examine each approach to implementation in more detail and provide brief descriptions of specific contextual factors at each school.

Table 3. Overview of the five schools.

School	**Past Implementation of Improvement Approach**	**Principal**	**Principal Experience**	**Mathematics Coach Experience**	**Implementation Approach**
Hilltop Elementary	Five years of full implementation	Olivia	1st year as principal at school, no previous experience as principal.	Experienced, sixth year leading approach with teachers	Full implementation
Buena Vista Elementary	One year of Math Labs during previous school year	Amy	3rd year as principal at school, no previous experience as principal.	Experienced, second year at school	Full implementation
Townzen Elementary	One year of Math Labs four years ago	Raquel	3rd year as principal at school, no previous experience as principal.	Experienced, first year at school	Full implementation
Hemlock Elementary	None	Larry	2nd year as principal at school, no previous experience as principal. Previously was teacher at school.	New to coaching and approach to mathematics instruction, previously taught at school	Modified implementation

Salmonberry Elementary	None	Irene	3rd year as principal at school, no previous experience as principal.	Two coaches: one new to coaching, one with experience. Both new to supporting collective teacher learning and approach to mathematics instruction.	Modified implementation

Full implementation schools. Two new schools and Hilltop elementary implemented what I will refer to as the full approach. These schools had more experienced coaches and aimed to implement Labs, weekly content-specific grade team meetings facilitated by the instructional coaches, frequent classroom support from both principal and coach, and weekly ILTs for the full school year[4]. The goal was for these structures to be a coordinated system aimed at providing responsive, aligned support for teacher learning. To support this work, Julie served as the principal supervisor in these schools, providing in-school support and coaching. The conceptualization of her role represented a case of recasting the principal supervisor role to be that of principals' *teacher*, rather than just manager or evaluator (Honig, 2012). These two schools engaged in a process during the spring of 2016 to develop a plan for implementing the approach that was specific to their school. Teachers, instructional coaches, and the principal all participated in this process and moving forward with the plan required that all teachers agree to it. In what follows, I examine specific contextual factors for each of the three schools implementing the full approach.

Hilltop Elementary. The 2016-17 school year was Olivia's first year as a principal at Hilltop Elementary. This made her situation unique in that, unlike the other principals, she was not working to change her practice within a context she already had an established practice. Hilltop Elementary had been deeply embedded in the instructional improvement approach for five years before Olivia became the

[4] In these schools, the approach went beyond mathematics to also include teacher learning supports for literacy and social-emotional learning. For the purposes of this dissertation, I focus on the mathematics-related work.

principal. However, with Julie leaving the school to become a district leader, the school was also in a significant period of change. This situation created a few specific contextual factors that appeared to interact with Olivia's leadership and learning. First, Olivia was stepping into a complete staff of teachers[5] that had established long-term relationships with Julie during the previous five years. The teachers also had a specific vision of the principal role (based on their experience with Julie) that aligned with the expectations for Olivia's practice. Second, at Hilltop, all of the learning structures were already in place. While the other schools in the initiative were working to establish Math Labs, weekly, coach-led grade team meetings, and ILT meetings for the first time, these structures were already routine. Third, teachers were in a different place in their learning than in the other schools. While in the other schools, teachers were engaged in making significant shifts in how they thought about teaching and learning in mathematics, at Hilltop teachers had been engaged in making these shifts for years and the ideas and pedagogies were not new to them. There was still more learning and improvement to support, but teachers had, in many ways, been given the message from the district that they had "made it."

Buena Vista Elementary. For Amy, the 2016-17 school year marked her third year as a principal at Buena Vista Elementary. The school implemented the full instructional approach and her goal was to support teachers at all grade levels through a coordinated system of Math Labs, weekly PLCs, and classroom visits. There had been some experimentation with these structures during the previous school year, led by the two instructional coaches who had previously coached at Hilltop Elementary. However, the 2016-17 school year marked the first year that the school worked to implement these structures intentionally, and across all grade levels. A few unique contextual elements are important to note. First, the 2016-17 school year marked a significant shift in teaching staff at Buena Vista. A number of teachers had retired or moved, resulting in more new teachers than the other schools involved in the initiative (10 out of 21 teachers were new to the school). While this provided challenges related to supporting many new teachers to effectively set up their classrooms, it also provided an opportunity for Amy to begin

[5] Upon Julie's departure from Hilltop for the district leadership position, all teachers committed to staying at the school for one full school year. The one exception was a teacher who was moving across the country for family reasons. Thus, there was only one new hire at the school for the 2016-17 school year.

building a new culture amongst the staff. Second, Buena Vista differed from other schools new to the improvement approach in that both coaches had previously worked at Hilltop Elementary. The literacy coach had served the same role at Hilltop throughout the initial years of the School Improvement Grant; the mathematics coach was a classroom teacher for the initial years and then transitioned to a coaching position at Hilltop before moving to Buena Vista. Both had significant experience with the particular instructional improvement approach, including the goals and pedagogies for both student and teacher learning. Third, the assistant principal's enactment of his role at Buena Vista interacted with Amy's learning and leadership. The vision of principal leadership at the center of the instructional improvement approach required specific division of responsibilities between principal and assistant principal. Notably, in order to open up space for the principal to participate in teacher learning spaces, the assistant principal needed to take full responsibility for student discipline and special education tasks. During the 2016-17 school year at Buena Vista, the assistant principal struggled to fully take on these responsibilities. As a result, Amy had to spend time making sure that the responsibilities were effectively taken care of. Amy described how this impacted her ability to be fully present in teacher learning experiences.

Townzen Elementary. The 2016-17 school year was Raquel's third year as principal at Townzen Elementary. The school implemented the full instructional approach and her goal was to support teachers at all grade levels through a coordinated system of Math Labs, weekly PLCs, and classroom visits. Prior to Raquel's arrival at Townzen, the school had experimented with doing some Math Labs, so some teachers had a few experiences with the learning structure. However, the initiative ended after one school year. The 2016-17 school year marked the first year that the school worked to implement these structures intentionally, and across all grade levels. One contextual factor that shaped Raquel's experience over the course of the school year was that she decided early on that it would be her last year at Townzen Elementary. This decision impacted her participation in learning supports (she stopped attending principal-coach professional development sessions after November) and affected how teachers perceived her leadership of the school. A second contextual factor that is important to note is that Raquel's assistant principal was previously the assistant principal at Hilltop Elementary for three years. This past experience

meant that the assistant principal had a deep understanding of her role in relation to the specific approach to instructional improvement, in particular her role in supporting new approaches to classroom management and discipline. The individual in the mathematics coach position at Townzen was also unique in that while she was new to the school and to the overall instructional improvement approach during the 2016-17 school year, she had experience leading teacher learning in relation to the expected shifts in mathematics instruction.

Modified implementation schools. Two principals, Larry and Irene, led modified implementation of the instructional improvement approach at their schools, Hemlock and Salmonberry Elementary. Modified implementation meant that the principals were expected to enact new expectations for practice with one or two grade teams only. The goal was for principals and coaches to make sense of the approach on a limited scale before moving to whole-school implementation. The rationale behind this partial implementation was two-fold: (1) both schools' mathematics coaches were new to the approaches to both student and teacher learning, and (2) Julie was not the supervisor for the two schools, so could not provide as much support for principals. Therefore, some of the contextual factors across the two schools were similar. In particular, the two principals had access to different learning supports than the other principals and were only working with a subset of their teachers.

First, the principals at these two schools also had access to different levels of support for their learning. Both attended and participated in the principal and coach professional development sessions with the leaders from the other three schools. However, they did not have access to Julie for support in their school contexts or through the principal groups that Julie held with the schools she was supervising. Larry and Irene's schools did have support from a university-based mathematics teacher education consultant who supported the mathematics coaches and principals to make sense of the Math Lab structure and how it might be coordinated with other teacher learning structures.

Another important contextual factor in both Hemlock and Salmonberry Elementary was that because they were only doing partial implementation, the initiative was not isolated from other district policies in the way it was in the other three schools. For instance, teachers who were involved still had to

participate in pilots of curriculum, use the district pacing guide and curriculum for mathematics (rather than the one developed at Hilltop that aligned most closely with the improvement initiative), and participate in district-wide professional development. Another important difference was that the grade teams participating in the initiative were not part of a school-wide effort. Thus, there was not the feeling, as there was in the other three schools, that everyone was engaged in the same work. As a result, both principals were also engaged in their roles in different ways with different groups of teachers. With one or two grade teams, they participated in Math Labs and grade team meetings; with the rest of the grade teams, they did not. Given that implementation was not school-wide at these two schools, planning involved the principal and instructional coaches deciding which grade team(s) to work with and how to leverage the experience of grade team to move towards whole-school work in subsequent years.

In addition to these contextual similarities, there were also differences between Hemlock and Salmonberry that I examine next.

Hemlock Elementary. The 2016-17 school year was Larry's second year as a principal at Hemlock. He entered the position as a former teacher at the school so already had deeply established relationships with teachers and staff. However, this proved to be both a strength and a challenge as he had to re-navigate relationships with former colleagues that he was now supervising. Two additional contextual factors are worth noting. First, Larry was so convinced about the value of him participating in grade team meetings alongside teachers, that he decided to attempt to participate in all grade teams starting at the beginning of the year. While Math Labs were only happening for two grade teams, Larry tried to also be in grade team meetings for all teams. Second, the mathematics coach at Hemlock was new to coaching, having moved to the position from a teaching position at Hemlock. She faced a steep learning curve as well as a need to establish new relationships with teachers as a coach.

Salmonberry Elementary. The 2016-17 school year was Irene's third year as principal at Salmonberry Elementary. Over the previous two years, she had done significant work to build relationships with teachers and was eager to begin the new approach to supporting professional learning and instructional improvement. Given the newness of the work Irene, the coaches, and the teachers, the

coordinated system of learning supports was primarily implemented with one grade team. Irene and the coaches chose the grade team because they thought they would engage fully in the work and inspire other teams to join in subsequent years. Another factor was that there were two mathematics coaches. One was an experienced coach, but new to both the approach to teaching mathematics and supporting teacher learning. The other coach was new to coaching, having only recently left the classroom. The second coach only worked part time. This situation was unique to Salmonberry and meant that the leadership team worked to adapt the coaching role across two individuals, rather than one.

It's important to note two important characteristics of both implementation approaches. First, in both cases, the learning from Hilltop was presented not as a mandate to replicate, but as one example of how to engage in reorganizing schools for teacher learning. Julie led each school team in a process of making their own plan. However, given the success at Hilltop, the school plans ended up closely matching the system of supports that developed at Hilltop. Second, in both cases, mirroring the way that mathematics was the primary focus at first at Hilltop, mathematics was emphasized in the work across the four new schools and in the supports for all coaches and principals at all five schools. The schools implementing the full approach to implementation also worked to support teacher instruction related to literacy and social/emotional learning. While Julie supported the coaches and principals in ILTs, which spanned the content areas, she also focused on supporting principals and coaches in Math Labs specifically. In the schools implementing the partial implementation, the focus was also on mathematics. The university-based consultant worked exclusively with the mathematics coaches and supported implementation of Math Labs and mathematics-focused grade team meetings. Across all five schools, and the sessions for principals and coaches focused on mathematics-related instruction and leader roles in Math Labs.

Design Team and Process

The core design team of the partnership in the 2016-17 school year involved Julie and three university-based mathematics teacher educators and researchers (including the author). Several other district leaders attended some of the design-team meetings and the events for principals and coaches. However, they were not actively involved throughout the process due to responsibilities that extended beyond the five schools. Evidence from initial studies of Hilltop indicated that the role of the principal appeared to be crucial in supporting school-wide shifts in culture, collaboration, and instruction (Gibbons et al., 2017; Gibbons, Kazemi, & Fox, 2017; Lewis, 2016). As a result, the partnership focused its efforts on designing supports for principals' development of new forms of practice in order to lead implementation in their schools. To design of supports, the design team engaged in an approach called Design-Based Implementation Research (DBIR). In this section, I provide a brief overview of DBIR and describe the design process that the team engaged in.

Design-Based Implementation Research

While only officially named more recently, DBIR evolved out of approaches taken by several RPP teams beginning in the 1990s (Penuel et al., 2011). Specifically, DBIR applies design-based research approaches to the study and refinement of implementation and diffusion of educational innovations (Fishman et al., 2013; Penuel et al., 2011). When innovations developed in one classroom, school, or district become part of policies in other contexts, challenges tend to arise (Fishman et al., 2013). These efforts are typically studied through the lens of effectiveness or implementation research. However, most effectiveness research attempts to analyze interventions in "typical" conditions, often ignoring how the *variation in local conditions* likely shapes the variation in implementation outcomes (Fishman et al., 2013). Implementation research offers insights into how and why variations occur. For example, studies examine how innovations are made sense of in different ways by practitioners and inevitably adapted to local contexts, often in unintended ways (e.g., Coburn & Stein, 2006; Honig, 2006; Spillane, Reiser, & Reimer, 2002). Thus, implementation research points to the crucial insight that attending to how, and why an innovation adapts to local context matters when bringing innovations to scale. However, education

policies tend to assume uniform conditions in schools and districts while also emphasizing fidelity to policy ideas as the goal of implementation (Penuel & Fishman, 2012). Penuel and Fishman (2012) argue that this tendency to overlook local context and unique needs of communities can reproduce inequities in education, often making it impossible for many schools to implement in a way that serves their specific leaders, teachers, and students.

DBIR seeks to bring a design-based research approaches to the study of implementation of educational innovations. In doing so, DBIR allows study of the necessary organizational routines, structures, or forms of practice for supporting effective implementation of an intervention that are hard to find already being enacted, and are under-researched (Cobb, Jackson, & Dunlap, 2014). While traditional implementation research aims to use analysis to *explain* implementation patterns, a DBIR approach applies intentional cycles of design, testing, refinement, and theory development to *iteratively adapt* implementation (Penuel & Fishman, 2012). In this way, DBIR provides a problem solving space, or test-bed in which to engage in iterative cycles of design (Cobb et al., 2014; Supovitz, 2013). Rather than viewing adaptation to local context as a problem to be solved, DBIR puts adaptation at the "heart of its inquiry" (Penuel & Fishman, 2012, p. 289). The goal, then, is to systematically design the implementation of an innovation so that it is successfully adapted to a local context. Through DBIR, researchers and school leaders partner to design and examine implementation and use research to inform immediate changes or development of new tools in order to support effective, sustainable implementation of reforms. In doing so, researchers and practitioners collaborate to develop theory about how that innovation can be adapted to specific contexts.

In this case of this study, DBIR was an appropriate approach because the RPP was trying to understand how to support the reorganization of leadership and teacher learning at one school (Hilltop) across four additional schools. Design-based approaches are appropriate given two circumstances: (1) it is not possible to conduct more traditional observational study of the intended forms of practice because they rarely occur *in situ*, and (2) existing research provides inadequate knowledge for informing the support of development of the focal practice (Cobb et al., 2014). As Honig (2013) argues, "work is not a

true design study unless it occurs in settings in which practitioners and researchers are at the limits of their knowledge, not just in the present setting, but *in the field"* (p. 263, emphasis in original). For DBIR, this means that it is an appropriate approach when the necessary organizational routines, structures, or forms of practice for supporting effective implementation of an intervention are hard to find already being enacted, and are under-researched. In this case, DBIR is appropriate because there are limited examples *in situ* of effective designs for supporting principal learning of a specific vision of instructional leadership, such as the one at the center of this particular study. There were no existing models that the design team could draw upon; thus, the team needed to take a design-based approach.

Phases of the Design Process

To engage in an effective design-based process, Cobb, Jackson, and Dunlap (2017) outline the following steps: (1) preparing for a design study, (2) experimenting to support learning, and (3) conducting retrospective analysis. In the first phase, a team must prepare for the design study. This phase involves specifying goals for learning, documenting the starting points of the particular group of learners, and delineating conjectures about how to support that learning. In the second phase, a team engages in iterative cycles of design, experimentation, and refinement as learning supports are developed, implemented, and analyzed. Throughout these cycles, data collection should aim to document all design decisions and processes, any relevant aspects of the design of learning supports or the environment around learners, and how learners engage in learning. Ongoing analysis of the data should be used to inform design of supports for the specific group of learners. Finally, following the cycles of design, the final phase of a design-based study is to conduct a retrospective analysis. A retrospective analysis examines the full data corpus with the goal of contributing understanding paradigmatic elements of the specific case.

In what follows, I describe how each of these phases was conducted in the particular design process at the center of this study.

Preparing for the design study. The design team's preparation for the design study involved (1) specifying goals for principal learning, (2) documenting starting points in principal practice in relation to those goals, and (3) developing conjectures about how to support the envisioned learning.

Development of goals for principal learning was based on both existing research and past experience at Hilltop Elementary. Broadly, the team conceptualized the role of the principal as a "lead learner" or "teacher of teachers." Previous analysis of Julie's practice as a principal at Hilltop indicated that she oriented all of her leadership practice towards supporting teacher learning. Her decisions about how to spend her time, how to run staff meetings, and how to perform other principal duties such as teacher evaluation were all grounded in how to best support teacher development of new forms of instructional practice. Similar to a teacher in a responsive mathematics classroom, the principal attended to teacher developing beliefs, knowledge, and practice and then, in partnership with the mathematics instructional coach, designed responsive learning experiences (for detailed description of her practice see Gibbons et al., 2017). Based on this conceptualization of the role, the team developed the following conjectures about how principals needed to learn to participate as school leaders:

1. Principals need to ensure that various forms of teacher professional learning (Math Labs, grade team meetings, and classroom visits) are coordinated and implemented effectively. This requires the principal to intentionally participate in each of these learning spaces in particular ways.
2. Principals need to coordinate their instructional leadership with school-based mathematics coaches. Principals and coaches need to have intentional and complementary roles in supporting teacher learning.
3. Principals need to take on the role of lead learner alongside teachers.
4. Principals need to develop practices that support them to productively frame instructional improvement work for teachers and actively narrate the work as it unfolds.

This vision of principal instructional leadership as "lead learner" or "teacher of teachers" is found in the existing literature. Given that principals are often leading instructional reforms aimed at

significantly shifting teaching and learning in their schools, acting as a lead learner is thought to support teachers to engage more deeply in learning forms of practice colleagues (e.g., Blase & Blase, 1999; Coburn, 2005; Gibbons, Kazemi, & Lewis, 2017; Nelson & Sassi, 2005). A lead learner takes on the central role of fostering a culture of learning across a school (e.g., Fink & Resnick, 2001). While what engaging as a lead learner might look like in day-to-day practice remains largely understudied, a few studies point to some potentially important forms of practice. In particular, when principals participate alongside teachers as *learners*, they can model practices such as publicly questioning previous assumptions about instruction, reflecting on experimentation with new instructional practices, and collaborating meaningfully with colleagues (e.g., Blase & Blase, 1999; Bredeson & Johansson, 2000; Coburn, 2005; Gibbons, Kazemi, & Lewis, 2017; Nelson & Sassi, 2005). Research also indicates the importance of principals approaching their own practice from a learning stance (e.g., Dana et al., 2009; Drago-Severson, 2012). However, these forms of practice have the potential to feel both uncomfortable and potentially unaligned with principals' past forms of practice that may emphasize more top-down, managerial approaches to leadership. In particular, taking an inquiry stance to their work may conflict with principals' previous conceptions of their role as a leader who has all the answers.

Multiple sources of information supported documentation of principal starting-points in relation to this vision of principal leadership practice. First, before the school year began, all principals completed a survey that aimed to understand their leadership practice in the previous school year. Survey results indicated that the goals for principal practice identified above would be largely new to all five principals. For example, principals indicated that they engaged in leadership tasks such as discussing classroom practice with teachers or looking at student work with teachers, work with groups of teachers, or attending or participating in professional development with teachers *at most* 1-2 times per month. New expectations envisioned principals engaging in such tasks multiple times a week. This difference between principals' starting points and the new expectations was also evident in principal participation in initial learning events. For example, principals conveyed that it felt challenging for them to understand how to participate

as a learner alongside their teachers, or that it was hard to conceptualize how to coordinate across teacher learning structures.

Based on the survey data, principal participation in learning events, and Julie's observations of principal practice in school settings, the design team developed a conceptualization of the differences between principals' previous practice and the new expectations the team was trying to support. As shown in Figure 2, principals' previous practice included organizing some of the learning structures for teachers (e.g., professional development, grade-team meetings, one-on-one support) but did not involve coordinating them in a cohesive, coordinated system for teachers. Principals were not used to participating as learners alongside teachers or organizing their practice around the goal of supporting teacher learning. Previously, the principals' roles had centered around management of school staff and systems, evaluation of teachers using the prescribed district program, and responding to student discipline issues. Thus, the intended forms of practice represented a significant shift in the institutional definition of principal competence.

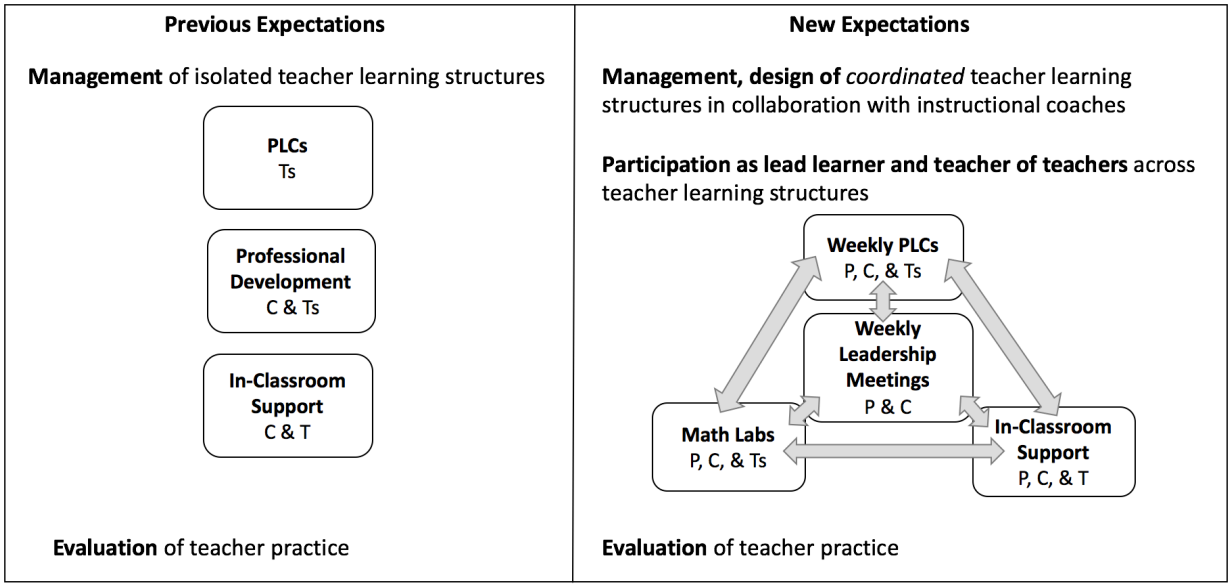

Figure 2. The comparison between the previous expectations for principal practice and the new expectations presented to principals as part of the improvement initiative. While both sets of expectations involved management of teacher learning and evaluation of teacher practice, there were significant contrasts in how those responsibilities were expected to be carried out. Letters indicate principal (P), coach (C), and teacher (T) participation in each structure.

Experimenting to support learning. The resulting design of learning support will be further explored in the analyses reported on in this dissertation. However, for context-setting purposes, I provided a brief overview here. The design involved a coordinated system of supports, shown in Figure 3. First, over the course of the year, principals attended four PD sessions with their mathematics coaches that were facilitated by design team members. Second, principals met an additional four times in principal group meetings involving just the principals, Julie, and in some cases, a design team member. Third, principals received in-school support from Julie and/or a design team member at Math Labs, ILTs, and grade-team meetings. For example, Julie would attend Math Labs or ILTs and both participate as an instructional leader and coach the principal in developing new forms of practice in that context. Finally, Julie also met one-on-one with principals to provide individual feedback and support them to strategize approaches to supporting the instructional improvement work in each school context. Across all of these settings, a common set of tools (e.g., diagrams and other documents) supported learning activities and principal conversations.

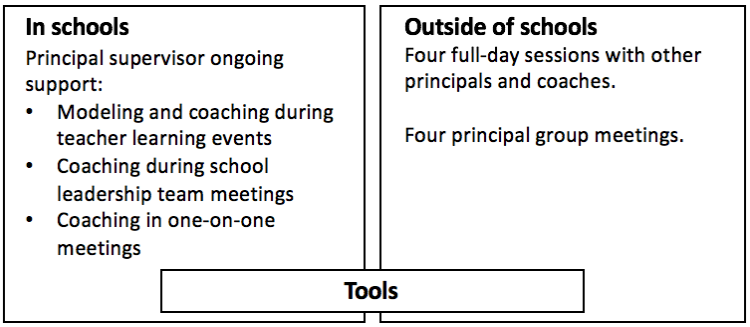

Figure 3. Overview of design of principal learning supports, which involved both in and outside of school activities and a set of tools used across both.

Experimenting to support learning. Throughout the 2016-17 school year, the design team engaged in iterative cycles of design, implementation, analysis and refinement of learning supports for principals. Through this systematic design process, the design team's aim was to test and refine conjectures about both learning goals for principals in this particular context, the design of principal learning supports, and the means of supporting implementation of the instructional improvement more

broadly. Processes for data collection during these cycles were designed to collect a diverse range of data including observational data, interviews, and artifacts to support analysis of the design process, implementation of learning supports, principal engagement in learning, and implementation in school contexts (Supovitz, 2013). The collection of data used for this dissertation spanned one full calendar year, beginning with initial design team planning of sessions through to reflection session in August 2017 in which the design team shared data with the principals and planned for the upcoming school year. Here, I describe the overall data set in relation to how the design team engaged in cycles of design. The full data set is also summarized in Table 4. Each of the analyses will examine a particular subset of the data, which will be further described in the relevant chapter.

Figure 4 illustrates the design process and the data collected in each stage of the cycle. The length of design cycles in DBIR approaches varies based on what is being implemented (Cobb et al., 2017). In this case, the design team moved through this cycle five times in alignment with the principal-coach professional development sessions. During Stages 1 and 2 of each cycle, data collection included observations of all principal PD sessions. These stages also involved observations of school events including Math Labs, grade-team meetings, and ILT meetings at each school. Events were chosen based on their centrality to the approach to teacher learning and the presence of the principal, mathematics coach, and (in some cases) the principal supervisor. All observations involved: (1) field notes that attend to teacher, principal, mathematics coach, and principal supervisor participation as well as contextual elements of either the school or PD setting, (2) collection of any relevant artifacts (e.g., session agendas, documents referenced), and (3) audio recording of all conversations to support deeper analysis of specific interactions. Field notes included verbatim scripting of participation to facilitate analysis of interactions and use of language (Patton, 2002). In addition, some observations were followed by unstructured group interviews with the principal, mathematics coach and/or principal supervisor were conducted after each observation. The goal was to capture contextual information and the complexity of leader thinking and decision-making that I was unable to observe (Merriam, 2009; Patton, 2002).

In addition to observations, I conducted design team "brain dump" conversations with the principal supervisor following events in which she had engaged as a leader at a school event. These conversations lasted between 15 minutes and an hour and aimed to capture reflections on principal developing practice, teacher instructional practice, evolving school contexts, and implementation of learning supports, including the design-team members' roles. During parts of the year, these conversations were targeted to specific aspects of the improvement approach or leadership roles that we were trying to understand as a design team. This routine is explored in more depth in Chapter 5.

During Stages 3 and 4 of each cycle, data collection involved audio recording and documentation of all meetings, phone calls, planning of learning supports, and other communication of the design team. Initial analysis also occurred in these stages as I engaged in iterative analysis of data and memo composition for the design team to inform subsequent design. These data sources supported understanding of the design process and the team's intentions behind designed learning supports.

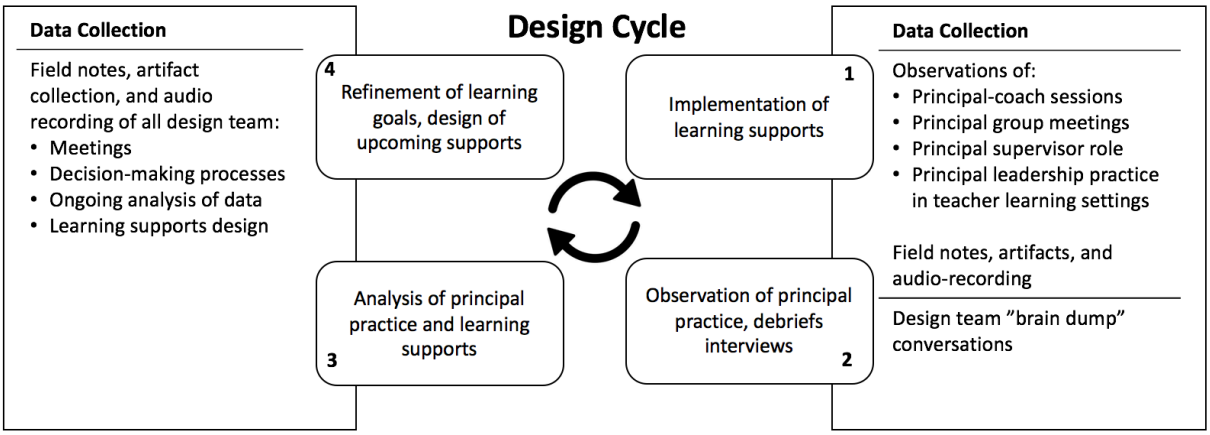

Figure 4. Sources of data during the design process. This figure shows a typical cycle of design of principal learning supports and the sources of data in each stage, including observations of principal professional development (PD), observations of both principal participation in Math Labs, Instructional Leadership Team (ILT) meetings, and grade-team meetings, weekly "brain dumps" with the principal supervisor, and the documentation of the design team's process.

Following these design cycles (late Spring 2017), I conducted interviews with the principals, mathematics coaches, and a selection of two to four teachers from each school. Selection of teachers was differentiated based on school context, with the aim of capturing a range of teaching experience levels and perspectives. In some cases, teachers were selected as typical cases in that their experience was

deemed similar to that of many teachers in the school (Patton, 2002). Some critical case teachers were also chosen to support understanding of a particularly important teacher experience (e.g., a first-year teacher; Patton, 2002). These interviews were semi-structured allowing me to respond to ideas that emerged during the conversation (Merriam, 2009). Interviews aimed to understand the following: (1) principal and coach roles, (2) principal, coach, and teacher learning, (3) experiences in structures including grade-team meetings, Math Labs, and ILTs, (4) impact of the initiative on the school, and (5) principal and coach experience with designed learning supports.

Table 4. Overview of all data sources.

Data Source	Description	Data Collected	Quantity	Total Time
Design Team Meetings	Meetings involving design team members involving reflection on recent events and observations and design of upcoming learning supports.	Field notes Artifacts Audio-recordings Selective transcription	23	35 hours
Design Team "Brain Dump" Conversations	Recorded conversations between a university-based researcher and Julie (the principal supervisor) after supporting principals in teacher learning event in a school (either a grade-team meeting or a Math Lab).		16	7 hours
Principal Learning Events	Sessions involving principals and coaches (4) or just principals (5) facilitated by principal supervisor and other design team members.		9	32 hours
School Observations	Observations of school events (ILT meeting, Math Lab, grade-team meeting, or staff meeting) by author. Included observation of either (a) principal practice, or (b) principal and principal supervisor practice. Sometimes followed by brief un-structured interviews with principal and/or mathematics coach.		18	48 hours
Interviews	Interviews conducted at the end of the school year with all principals and school-based mathematics coaches and a selection of teachers at each school.	Audio-recordings and transcription	25	33 hours

Surveys	Surveys conducted at both the beginning and end of the school year by all principals, instructional coaches, and teachers at each school.	Survey responses	256	

Conducting retrospective analysis. The analyses in the subsequent chapters report on retrospective analysis of this data set. While the ongoing analysis during the design process sought to inform the iterative refinement of learning supports, retrospective analysis aims to understand the learning and supports in a broader theoretical context (Cobb et al., 2017). I examine this particular design-based approach to supporting principal learning as a paradigmatic case of an RPP's effort to support principal learning of fundamentally new leadership practice in alignment with an instructional improvement initiative. Analysis aims to develop theory that might be useful to the support of principal learning in other contexts.

Researcher Role and Positionality

As a researcher on the design-team I played a few roles that are important to name. First, I supported the organization of, participated in, and documented all design-team meetings. Second, I took on primary responsibility for all data collection, including observations of principal leadership in school events, documentation of principal learning events, organization and development of surveys, and all interviews. For observations (both in school contexts and at learning events), I engaged as an observer as participant; while I participated in events, my participation was secondary to my role as researcher, which was known to school leaders and teachers (Merriam, 2009). My participation included contributing questions or comments to discussions. During school observations, I also frequently engaged in conversations with principals and coaches during breaks in teacher learning events that likely influenced how subsequent events unfolded. The design-based approach to research meant that I intervened in implementation. My intended role across all of these spaces was to serve as collaborator and co-learner, rather than expert.

My positionality in relation to this study is also influenced by my own history with the particular district and improvement initiative. I was a teacher at Hilltop Elementary during two years of the initial

improvement work. As a result, prior to the 2016-17 school year I had positive relationships with multiple school leaders and teachers in the district. My personal experience as a teacher with the approach to instructional improvement and teacher learning also allowed me to quickly connect with those who I was just meeting. This positionality supported me to build trust and have frank conversations with teachers and school leaders. In interviews, teachers and school leaders appeared to feel comfortable sharing about frustrating or negative experiences. In addition, as a teacher, I had a very positive experience with the approach to instructional improvement, including my experience as a teacher supported by Julie as a principal. These experiences led me to be generally favorable towards the work that Julie tried to do with the principal-coach teams. My position as a researcher and design-team member gave me access to levels of the work (such as challenges faced by school leaders) that I did not have access to as a teacher. Thus, my analysis of the initiative is influenced by my experiences from multiple positionalities in relation to the approach to improvement.

CHAPTER 3: BECOMING AN INSTRUCTIONAL LEADER: PRINCIPAL LEARNING OF FUNDAMENTALLY NEW LEADERSHIP PRACTICE

To support instructional improvement, researchers have argued that principals have to move beyond their traditional role as managers (e.g., Hallinger, 2005; Honig, 2012; Hubbard et al., 2006). However, most studies of this shift for principals do not examine principal learning and practice in relationship to specific goals, or supports, for teacher or student learning. As a result, in the current context of content-specific reforms that aim to fundamentally transform instruction and student learning in the classroom, there is limited understanding of how principals might support these specific reforms or what they might need to learn in order to do so. To this end, this manuscript takes up the question of what the process of becoming an instructional leader in relation to particular teacher and student learning goals might entail.

Most existing research on principal learning for instructional improvement primarily focuses on efforts to develop principal knowledge about content, instruction, or leadership believed to be associated with effective leadership practice (e.g., Steele et al., 2015). For example, Boston and colleagues (2016) report on an effort to support principals to engage in the practice of effectively pressing for high-quality instruction by developing their knowledge related to differentiating between high- and low-quality instruction. The study found that in a professional development context, principals demonstrated increased ability to identify high-quality instruction. However, a follow-up study found that this new knowledge did not lead to a change in principal feedback to teachers in school settings (Rigby et al., 2017). Thus, the demonstration of learning in a professional development context does not necessarily translate to new leadership practice in school settings

If we apply a sociocultural perspective on learning to the observation that a focus on new types of knowledge does not seem to support fundamental shifts in principal leadership practice, we would not be surprised. Learning is not simply the accumulation of new knowledge or skills, but the development of new forms of participation in social practice; thus, *becoming* someone new (Herrenkohl & Mertl, 2010; Holland, Lachicotte, Skinner, & Cain, 1998; Wenger, 1998). It follows that learning instructional

leadership involves not only *knowing* new knowledge and *doing* new forms of practice, but also *becoming* a new kind of principal. This is especially true given that existing expectations for principals may conflict with new expectations for instructional leadership. In engaging in this learning, principals may demonstrate new knowledge (e.g., talking about different goals for classroom instruction), or start doing new things (e.g., attending teacher professional development), but unless they also start to value and identify with the new ways of knowing and doing, they may not *become* a different kind of principal. Thus, I argue that efforts to support principal learning of instructional leadership need to focus not just on knowledge and/or skills but also aim to foster principal development towards *becoming* new kinds of leaders. However, there is a lack of understanding of what this process of becoming might entail for principals.

This chapter aims to contribute to understanding how principals might engage in becoming a new kind of leader. I ask: *How do principals engage in learning fundamentally new approaches to leadership practice?* The first goal of the chapter is to propose a framework for conceptualizing the learning of practicing principals in the context of an expected shift in leadership practice. This framework emphasizes that learning fundamentally new leadership practice will involve a process of reconceptualizing what it means to be a principal. The utility of this framework is then explored using the case of one district's efforts to support a particular transformation in principal practice towards what was characterized as being "the lead learner". The context provides a rich example of a case in which principals were supported to develop a *specific* vision of principal instructional leadership that was fundamentally different from their previous district expectations for the principalship. Crucially, this vision of leadership was situated in relation to specific goals for student and teacher learning, in this case related to improvement in mathematics instruction. This analysis examines how principals engaged with this shift in expectations over the course one academic school year. In the next sections, I review relevant literature on principal learning of instructional leadership before detailing the proposed framework and the specific context of the study.

Principal Learning of Instructional Leadership

Relatively few studies examine *principal learning* of instructional leadership (c.f., Barnes et al., 2010; Boston et al., 2016). The majority of research on instructional leadership focuses on characterization of instructional leadership behaviors or practice (e.g., Hallinger & Murphy, 1985; Robinson, 2017). For example, Hallinger and Murphy's (1985) frequently used framework for instructional leadership lays out principal behaviors such as "framing school goals", "supervising and evaluating instruction," and "promoting professional development" (p.221). Across these studies it is generally recognized that engaging as an instructional leader often represents a significant shift for principals, and that complex learning will be involved. This body of research provides three starting points for efforts to more carefully characterize how learning unfolds. First, studies suggest that this learning will involve an interaction of new ways of *knowing* and *doing*. Second, that supporting principal learning will require more than just traditional delivery of information. Third, studies suggest that learning might involve principals coming to see their roles as something fundamentally different.

First, studies of principal learning of instructional leadership suggest that is important to consider relationships between new knowledge and new ways of enacting leadership practice. Many studies draw on conceptualizations of leadership practice as informed by, or related to, knowledge (e.g., Barnes et al., 2010; Boston et al., 2016; Katterfeld, 2013; Mangin, 2007; Steele et al., 2015). In other words, these studies examine how development of particular forms of knowledge might then impact enactment of practice. For example, research indicates that a principals' vision of particular content instruction impacts the way they subsequently frame instructional expectations to teachers (Coburn, 2005; Katterfeld, 2013) and give feedback to teachers about instruction (e.g., Hubbard et al., 2006; Nelson & Sassi, 2005; Rigby et al., 2017). Coburn (2005) found that principals' understanding of the instructional content and goals of a literacy reform initiative impacted how they messaged the reform to teachers, including what they chose to emphasize about goals for instructional improvement. One important question these studies raise is what level of content-specific knowledge principals might need to develop in order to effectively support instructional improvement in classrooms. Scholars generally agree that principals need to develop content

knowledge that allows them to understand instruction beyond surface-level features so as to support teacher practice at a more nuanced level (e.g., Steele et al., 2015; Stein & Nelson, 2003).

Second, literature suggests that leadership practice itself is an important context for principal learning. There is increasing recognition that principals will not learn new practice through traditional approaches to professional development that center on delivery of information outside of school contexts. Instead, principal learning needs to include job-embedded, or field-based experiences (e.g., Augustine et al., 2009; Drago-Severson, 2012; Fink & Resnick, 2001; Honig, 2012). Without these experiences, research suggests that principals are unlikely to incorporate new knowledge into new ways of participating in leadership practice. Thus, the current literature suggests that there will be an important relationship between practice and knowledge development in principal learning.

Third, studies of principal leadership indicate that an important element of principal leadership practice is how principals conceptualize their roles. Principals receive messages from preparation programs, districts, parents, teachers, other principals, and society more broadly about what it means to be a leader. These messages significantly impact how principals both conceptualize and enact their roles (e.g., Dana et al., 2009; Mangin, 2007; Rigby, 2013, 2016). In order to significantly change leadership practice, it follow, then that principal learning must go beyond new knowledge or isolated practices. For example, Barnes and colleagues (2010) report on an initiative that aimed to support principals to develop instructional leadership practices. They document that changes in principal knowledge or time use did not always reflect deeper changes in how they envisioned their role as leader. The principals in their study who demonstrated the most significant transformation of practice also became more targeted and clear about what their role was as an instructional leader. Thus, principal learning was more significant when it was accompanied by changes in how principals conceptualized their work. This finding appears in a number of other studies (e.g., Browne-Ferrigno, 2003; Scribner & Crow, 2012; Young et al., 2011). Consequently, the existing research indicates that a reconceptualization of the role of the principal will be an important element of principals learning to enact leadership in a fundamentally new way.

Across this literature, three major limitations impede the field's understanding of principal learning of fundamentally new leadership practice. First, studies are often limited by a lack of specification of principal learning goals. This limitation is intertwined with a broader issue in the instructional leadership literature: underspecified forms of leadership practice. While studies list behaviors or practices, they are often at a broad, descriptive level, such as supervise instruction, promote professional development, build a school vision, or create a collaborative culture (e.g., Hallinger & Murphy, 1985; Leithwood et al., 2008; Murphy et al., 2007; Robinson, Lloyd, & Rowe, 2008). Articulated at this level, these descriptions of instructional leadership do not provide clear goals for principal learning. There is, after all, a wide variety in the ways in which a principal might supervise instruction, or promote professional development. Studies indicate that *how* principals enact any of these practices is what matters in terms of impact on teachers and students (e.g., Grissom et al., 2013; Nelson & Sassi, 2005; Rigby et al., 2017). Thus, there is a need for greater specification of what it is that matters about how principals enact practice – and therefore, what they must be supported to learn.

A second limitation is that the leadership literature is often separate from research on student and teacher learning. Scholars argue that to understand the day-to-day forms of leadership practice, principal leadership needs to be understood as situated within particular goals for student and teacher learning (e.g., Hubbard et al., 2006; Nelson & Sassi, 2005; Spillane et al., 2011). In other words, how principals enact practice (e.g., providing feedback to teachers) effectively needs to be understood in relation to the kind of learning they are trying to support. While there is significant research in the areas of student and teacher learning in relation to content-specific reforms, the majority of the studies of principal leadership do not consider principal learning or practice in relation to this body of research. Studies tend to generalize "instructional improvement" as increased student achievement scores without specifying goals for either student or teacher learning (e.g., Barnes et al., 2010; Dana et al., 2009; Grissom et al., 2013; Huff et al., 2013; Youngs & King, 2002). In reality, research on student and teacher learning indicates that desired changes in instruction and learning go far beyond test scores and involve complex, challenging learning. A few studies begin to explore the role of the principal, and how principal practice needs to shift in the

context of rigorous, content-specific goals for student and teacher learning (e.g., Coburn, 2005; Nelson & Sassi, 2005; Rigby et al., 2017). These studies suggest that enactment of particular practices (e.g., providing feedback) is deeply grounded in principal learning in relation to the specific goals for student and teacher learning. Consequently, there is limited understanding of how to support principal learning of *specific* kinds of practice, oriented towards *specific* goals for student and teacher learning.

A third limitation is that studies tend to isolate particular elements of principal practice and learning. Examinations of principal learning tend to isolate either knowledge or skill development (Boston et al., 2016; Steele et al., 2015) or identity formation or socialization (e.g., Browne-Ferrigno & Muth, 2004). Finally, the studies that do examine principal learning tend to identify overall changes in principal knowledge, practice, or identity by comparing data collected before and after a professional learning experience (e.g., Boston et al., 2016; Steele et al., 2015). While these studies provide initial insight into what might be possible as a result of principal professional learning opportunities, they do not contribute to an understanding of how principal learning might unfold overtime. As a result, existing studies fail to account for the process by which principal development of knowledge, practice, and identity might interact during learning processes as principals engage in fundamentally new ways of being a school leader. This lack of understanding of the process of principal learning of fundamentally new leadership practice impedes districts' ability to support such learning.

In what follows, I propose a framework for conceptualizing how this learning might unfold. I will then describe what this framework revealed about how principal learning unfolded in one specific case. Crucially, the case at the center of this dissertation provides an example of an improvement initiative in which principal learning goals were specified in relation to student and teacher learning goals. Principals were expected to engage as lead learners in relation to supporting teachers to de-privatize practice and collaborate in learning new, ambitious approaches to mathematics instruction. As explored more fully in the findings of this analysis, and subsequent chapters, what it meant to be a lead learner was specified in relation to particular teacher learning structures and contextual challenges. In addition, the case allows for analysis of how learning unfolded *over time*, as data includes principals' participation in both leader and

teacher learning events over the course of a school year. In order to understand this learning, I look beyond knowledge or practice in isolation and seek to develop a framework that captures the full complexity of learning that occurred for principals.

Conceptualizing Principal Learning

I propose a framework that conceptualizes principal learning as a process of negotiation of forms of participation in relation to social, institutional, and cultural expectations. By "forms of participation", I refer to ways in which principals might participate through actions and words in leadership contexts. In the case of contexts where principals are expected to take on instructional leadership, they face new expectations for participation that may conflict with past expectations. To conceptualize this learning, I draw on a sociocultural perspective that learning is more than just accumulation of knowledge and/or skills. Learning is inherently also a process of *becoming* (Herrenkohl & Mertl, 2010; Holland et al., 1998; Wenger, 1998). From this perspective, new knowledge does not support new practice unless individuals also develop a new way of seeing themselves in a particular context. Many scholars use the term identity to capture this conceptualizing of learning, arguing that coming to learn new ways of participating is also a process of coming to *identify* or see oneself in that participation (e.g., Holland et al., 1998; Nasir, 2002; Wenger, 1998). However, the term identity is used across the literature more broadly in vague, often conflicting ways (Herrenkohl & Mertl, 2010). In the principal literature specifically, the majority of studies that take up identity tend to not fully capture a sociocultural perspective by viewing principal identity as (1) static, rather than an ongoing, dynamic process, (2) individual, rather than socially negotiated, or (3) disconnected from learning and practice (e.g., Crow & Whiteman, 2016; Normore, 2017; Ryan, 2007; Scribner & Crow, 2012; Young et al., 2011).

To avoid these conflicting conceptualizations of identity, this study adopts Herrenkohl and Mertl's (2010) framework for understanding learning as an intertwined process of knowing, doing, and becoming. This framework provides an approach to analyzing how principals might come to participate in fundamentally new forms of practice by attending to how they come to know new information or

assumptions, enact new forms of practice, and become new kinds of principals. Drawing on Holland and colleagues (1998), Herrenkohl and Mertl argue that the development of new ways of knowing, doing, and being are inextricably linked and mutually informing.

This process of knowing, doing, and becoming does not occur within an individual, but in the negotiation between individuals and social contexts. Social and institutional contexts send strong messages about the set of obligations that an individual in a certain context is expected to fulfill in order to be recognized as competent in a particular role (Cobb, Gresalfi, & Hodge, 2009; Gee, 2000; Gresalfi & Cobb, 2011). In the case of principals, school systems have deeply ingrained, often implicit, messages about what it means to be a competent principal. Principals, teachers, students, and parents interact within this context in ways that perpetuate, and re-create these expectations (Gee, 2000; Wenger, 1998). In contexts where districts ask principals to take up instructional leadership, there is a shift in articulated expectations about what it means to be a competent principal. In such contexts, it is useful to conceptualize principals at the intersection of two conflicting sets of expectations for what it means to be a principal. While previous responsibilities of managing school structures and resources and supervising and evaluating instruction remain, instructional leadership involves the expectation that principals orient their practice towards directly supporting student learning and teacher instructional practice (e.g., Hallinger, 2005; Leithwood et al., 2008; Murphy et al., 2007; Rigby, 2013).

Very few studies examine what occurs for educational practitioners when confronted with *conflicting* social and institutional definitions of competence. Gresalfi and Cobb's study (2011), while focused on teachers, is instructive. They examined how mathematics teachers engaged with conflicting definitions messages about competent mathematics instruction (one presented by their district, one presented by their reform-oriented professional development). In their case, teachers had previously identified as deliverers of knowledge and were being supported to shift towards seeing themselves as facilitators of student sensemaking. They argue that when presented with conflicting definitions, it cannot be assumed that teachers will engage in forming the new, intended forms of practice presented in PD contexts. According to Gresalfi and Cobb, individuals may resist or consent to the new institutional

expectations. If they consent to it, it may either represent compliance or identification. In other words, while at first individuals may engage in new practice by following the rules of others (compliance), learning occurs as individuals come to identify with that practice, or develop a concept of themselves in relation to the practice (Holland et al., 1998; Nasir & Hand, 2008). Gresalfi and Cobb's framework highlights two key transitions that need to be more deeply understood: from resistance to compliance, and from compliance to identification. Layering this framework onto Herrenkohl and Mertl's process of knowing, doing, and becoming suggests important empirical questions about principals negotiating conflicting expectations for leadership practice: How do principals engage in new ways of knowing, doing, and being in order to make these transitions? How do knowing, doing, and being interact in this process? What particular ways of knowing, doing, and being need to be supported?

Wenger's (1998) concept of reconciliation adds a final layer to understanding how principals might engage in learning new forms of participation in the context of conflicting institutional expectations. Wenger argues that conflicts are actually an essential element of understanding learning, especially when considering the process of *becoming*. He describes how learners are often faced with conflicting expectations and definitions of competence. These expectations may include forms of practice that make competing demands, or forms of accountability that require very different responses to similar circumstances. In some cases, the repertoire of practice of one community may actually be considered inappropriate or even offensive in another community. According to Wenger, when faced with these conflicts, individuals will seek coherence: they "must find an identity that can reconcile the demands of these forms of accountability" (Wenger, 1998, 160). Crucially, reconciliation does not necessarily mean that conflicts are erased, just that individuals find a way for expectations to co-exist. Wenger argues that this process of reconciliation is intrinsic to learning. He also contends that the negotiation and reconciliation of points of tension serve as opportunities for further learning. Thus, this perspective suggests that as principals are faced with significant shifts in expectations, they will seek to reconcile them. This reconciliation over time has the potential to be a key process as principals negotiate new ways of knowing, doing, and being.

Thus, as shown in Figure 5, I propose a framework for conceptualizing principal learning of fundamentally new leadership practice as an intertwined process of knowing, doing, and becoming. This process occurs within the context of a significant institutional shift in expectations for competent practice. In addition, I argue that two other processes play important roles in how principals engage in learning new ways of leading: the shift from compliance to identification, and how principals reconcile conflicting expectations for their practice.

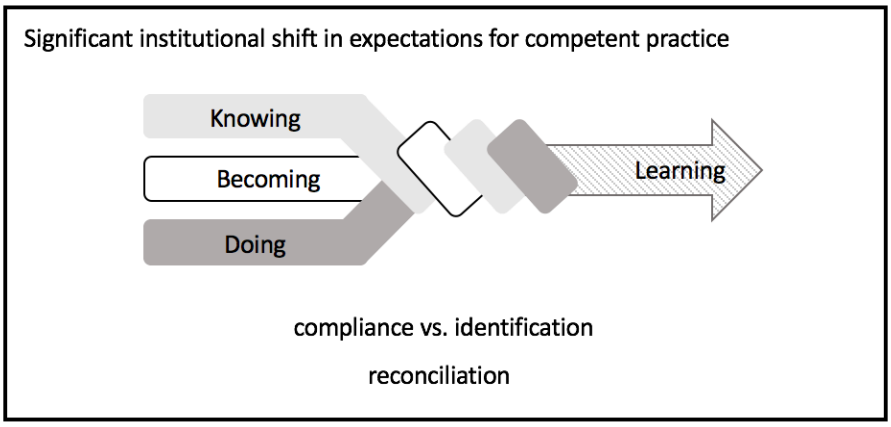

Figure 5. Proposed conceptualization of principal learning.

Data Sources and Analysis

This analysis examines data that provides insight into the process of principal learning over the course of the first year. In particular, I examined principals' individual reflections in interviews, their participation in learning events, and their enactment of leadership practice in school settings. These data sources provided insight into how principals were engaging with, negotiating, and identifying with (or not) new expectations related to lead learner practice. While all five principals were included in initial analysis, the data available for each principal varied. All principals participated in a two-hour, semi-structured interview at the end of the 2016-17 school year. In addition, the design team meetings include reflections about all five principals and their developing forms of participation and ways of thinking about their role. However, as shown in Table 5, the amount of observations conducted for each principal of both their participation in learning supports and leadership practice varied significantly. Raquel, for example,

decided early in the school year that she would be changing districts, and chose not to participate in learning supports after November. While her learning still presents an interesting case, and informed analysis, her case is excluded from the findings reported in this chapter. Her case is taken up in a subsequent analysis of what did or did not support principal learning (Chapter 4). The goal of this analysis was to understand what happened for the four principals that did engage in the designed learning supports for the full year. Given that I only conducted observations of practice in schools for Olivia and Angela, they served as focal participants. Larry and Irene's cases were used for triangulation. The differences across these four individuals and their contexts (as shown in Table 3) supported identification of both diverse variations and common patterns in principals' experiences (Patton, 2002). The second analysis of this dissertation (Chapter 4) examines the relationships between this contextual and individual variation and principal learning.

Julie's practice as a principal supervisor and her talk about her own and others' practice as principals served as a further data source. Julie had five years of experience as a principal in the same instructional improvement approach, and expectations for principal leadership were based off of her practice as a principal. As a result, her talk about, and engagement in, practice provided a comparative lens through which to understand the four principals' learning. Her forms of practice represented the learning goals for principals and helped illuminate how knowing, doing, and being might interact in more experienced principal participation.

Table 5. Data available for each principal and the principal supervisor, Julie.

	Observations of participation in principal-coach PD sessions	**Observations of participation in principal group meetings**	**Observations of principal supervisor support in schools**	**Observations of leadership practice in schools**
Olivia	4	4	3	4
Angela	4	4	3	8
Larry	4	4	2	1
Irene	4	1	1	0
Julie	4	4	11	

Finally, to gauge how others with whom the principal worked experienced principals' participation over the course of the year, I also examined principal supervisor, coach, and teacher perspectives. These perspectives were analyzed in design team meeting field notes, audio, and artifacts as well as interviews with the mathematics coach and teachers at each school. Design team meetings included conversations about both principal participation in learning supports and principal supervisor observations of principal developing forms of practice in their school contexts. Coach and teacher interviews provide insight into school context, principal relationships with staff, and principal developing forms of practice.

Analytic Approach

I analyzed the full data corpus in four phases that drew on my conceptual framework. The first phase examined the co-development of knowing, doing, and becoming evident in the four principals and Julie. The second phase examined how the principals and Julie reconciled the conflicting institutional expectations. The third phase involved analysis of relationships between knowing, doing, and being and approaches to reconciliation. Finally, a fourth phase involved a member check with Julie, all of the principals, and all of the mathematics coaches. Below, I describe the analytic approach in each phase.

Phase 1: Analysis of co-development of knowing, doing, and becoming., To analyze for co-development of knowing, doing, and becoming, I reviewed principals' interviews, observations of practice, and participation in learning events. I attended to their participation in practice (related to lead learner, manager, and evaluator). I also examined their talk and enactment of practice for implicit knowledge and assumptions. I first analyzed each principal and Julie individually. For each, I began with the final interview and then analyzed their participation in learning events and their leadership practice in schools in chronological order. I then triangulated across teacher and instructional coach interviews and design team member reflections. A theme that emerged in a first round of analysis indicated the importance of their knowledge and assumptions about supporting teacher learning. This initial theme aligned with broader research that shows that leaders' assumptions about what supports teacher learning impacts how they implement instructional reforms (Coburn & Stein, 2010; Cochran-Smith & Lytle, 1999;

Hubbard et al., 2006; Jackson et al., 2015; Spillane, 2000; Stein & Nelson, 2003). Drawing on Cochran-Smith and Lytle (1999) and Jackson and colleagues (2015), I developed the coding scheme shown in Table 6 to support analysis of developing implicit assumptions about teacher learning.

Table 6. Coding scheme for analysis of developing assumptions about teacher learning. Codes are shown in columns to show distinction between two broad approaches to thinking about teacher learning (delivery vs. ongoing experimentation).

	Delivery	**Ongoing experimentation**
Goal of teacher learning	• Rectifying deficits in knowledge or practice • Delivery of expert knowledge	• Progressive development of new vision of instruction • Collective inquiry into teaching and learning
Teacher learning supported by	• One-off, isolated experiences • One-on-one support from expert • Accountability for compliance	• Ongoing experiences • Collective experiences • Coordinated systems of support • Development of new norms and school structures • Accountability for engaging in learning

To analyze for *becoming*, I looked for evidence in principals' talk and practice that they identified with or valued particular forms of practice. First, I looked for evidence that principals were identifying with forms of practice by noting which forms of practice they seemed to be prioritizing and organizing their day-to-day leadership around. I was guided by Gresalfi and Cobb (2011) analytic questions to examine principal's response to the new expectations they were experiencing: (1) What is the individual's understanding of new obligations for practice? (2) What is her/his valuation of those new obligations? (3) What is the reason behind that valuation? According to Gresafli and Cobb, an individual's valuation of a form of practice provides insight into whether they are enacting those forms of practice out of compliance or identification. If individuals find forms of practice to be debilitating, unreasonable, or arbitrary they are likely either going to resist the new expectations or follow them out of compliance. If individuals find forms of practice to be enabling, reasonable, and valuable, then they are likely beginning to identify with those forms of practice. In other words, evidence that principals were coming to value forms of practice differently provided insight into how principals were engaging in *becoming*.

Phase 2: Analysis of reconciliation of conflicting expectations. Next, I examined how each principal and Julie appeared to *reconcile* the conflicting expectations associated with manager, evaluator, and lead learner practice over time. First, I referred back to my analysis of participants' identification with each set of expectations over time to see what their understanding and valuation of each set of expectations was. I then drew on Wenger (1998) to look for (1) acknowledgement of or grappling with tensions between the expectations, (2) efforts to seek coherence across different forms of accountability associated with different expectations. Based on this analysis, I developed a framework of three broad approaches to reconciliation evident in principals' practice and talk.

Phase 3: Relationships. After coding the data as described above and writing memos about each individual principal, I developed a time-order matrix (Miles & Huberman, 1994) aimed at illuminating any trends in principals' learning over time. Matrices were designed to support analysis of both individual learning as well as examination of patterns across all principals. These time order matrices supported analysis of relationships between how knowing, doing, and being co-developed in relation to reconciliation of definitions of, and expectations for, principal leadership practice.

Phase 4: Member Checks. Finally, initial findings based on the analysis described below were presented to the full group of school principals and mathematics coaches, and other design-team members as a member check (Lincoln & Guba, 1985). In this conversation, I presented initial findings and then led a discussion in which all roles were encouraged to offer reflections, voice points of agreement or disagreement, or ask questions.

Findings

For the four principals, the lead learner expectations were new and unfamiliar. Even thinking about teacher learning and developing a vision for what supports teacher learning was, in many ways, new. For example, Larry reflected that in 18 years of being a teacher and administrator, "there's never been, in my world, a high priority on teacher learning." This lack of focus on supporting teacher learning was evident across all four principals. In the first principal group session they attended in August,

principals were asked to share the motivation behind their work. All of the principals focused on outcomes they wanted for students. While there was general mention of "supporting teachers", principals did not convey an understanding of teachers as learners. The new expectation that they participate in teacher PD sessions and grade team meetings and work closely with the instructional coaches to design teacher learning experiences represented a fundamental change. All four principals talked about how this change involved being vulnerable in a way that felt really new to them. As Irene reflected, as a "principal, you come in and you think you need to know it all." In interviews, teachers also noted how significant the expected shift in principal leadership was. One teacher described how she had previously only interacted with her principal when there was an evaluation or student behavior issue, "so seeing [the principal] be part of our learning [during a Math Lab] and actually seeing her teaching [during the classroom visit] …I don't usually get to see that." Thus, the expectations for principal practice were new to everyone in the school community. Crucially, principals recognized that it wasn't that their previous roles as evaluators and managers went away. Rather, they needed to figure out how to be evaluators, managers, and lead learners. As one principal reflected during the member check conversation, "I have to manage all three which means…I have to figure out what is the lift in each situation and prioritize that." In other words, principals needed to develop ways of making sense of the competing expectations.

In what follows, I describe how principals engaged in this process of making sense of, and reconciling, these expectations. First, I describe three different approaches to reconciliation evident in principals' talk and practice over the course of the school year. I examine how each approach to reconciliation reflected principals' development of new ways of knowing, doing, and being. Second, I zoom into two particular areas of learning that serve to illustrate the interaction of knowing, doing, and becoming in principal learning: principal understanding of how to support teacher learning, and principal goals for leadership practice.

Different Approaches to Reconciliation

The first major theme that emerged from analysis of principal learning was that principals found coherence across the expectations of manager evaluator, and lead learner in different ways as the school

year progressed. As shown in Figure 6 these different forms of reconciliation appeared to occur along a continuum. Figure 6 shows three broad approaches to findings coherence, chosen to represent key points of contrast that appeared to be qualitatively different in how principals made sense of their conflicting expectations. It is important to note, that this identification of three approaches to reconciliation does not imply a clean, linear continuum of learning for principals. As the double-arrow indicates, principals moved back and forth between these approaches to reconciliation. These approaches provide a lens through which to understand principal learning and enactment of leadership practice in given moments in time. The first approach involved principals enacting lead learner forms of practice out of compliance, and with some resistance, but prioritizing the management and evaluation responsibilities that they were used to. Lead learner expectations were primarily seen as extra, or on top of their real work as principals. A second broad approach involved principals seeing value in the new expectation of lead learner forms of practice as well as previous manager and evaluator expectations. To find coherence, principals tried to keep conflicting expectations separate. In other words, principals saw their role as sometimes being a manager and evaluator and sometimes being a lead learner. A third approach to reconciliation involved principals finding coherence by reconceptualizing manager and evaluator expectations in relation to lead learner expectations.

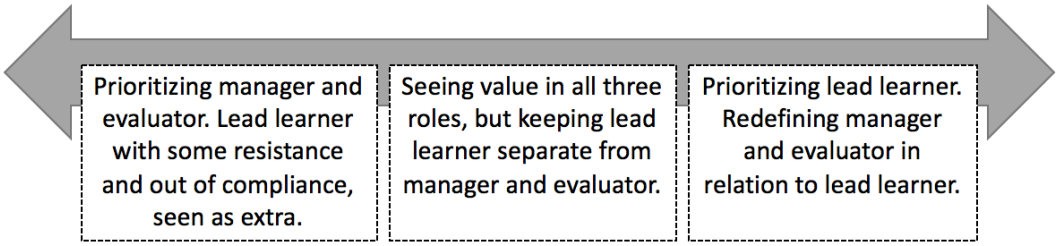

Figure 6. Three broad approaches to reconciliation of lead learner, manager, and evaluator expectations evident in principals' talk and practice over time.

All four of the principals demonstrated some form of the first approach to reconciliation at the beginning of the school year. Over the course of the year, they also began to demonstrate the second approach. The third approach was mostly evident in Julie's talk about her own practice as a principal, how

she mentored principals, and her expectations for principals. However, the principals began to demonstrate elements of this reconciliation by the end of the school year. The different approaches to reconciling conflicting expectations can be understood through the lens of principals developing new ways of *being* over time. Analysis considered developing ways of being through the lens of how principals appeared to value and identify with different expectations, and why. Movement along the continuum shown in Figure 6 was also evident in how principals shifted from enacting new expectations for lead learner forms of practice out of compliance, to beginning to enact them because they identified with, and saw value in, those forms of practice. At the same time, their enactment and valuation of previous forms of practice related to evaluation and management shifted.

Prioritizing manager and evaluator. Analysis revealed that at the beginning of the school year, principals enacted the lead learner expectations for practice out of compliance. For all of the principals, this represented a new way of enacting their role. The principals' talk about these new expectations indicated that while they were changing their practice, it was mostly out of compliance. For instance, they began attending Math Labs and grade team meetings, in accordance with the expectation. However, they also consistently asked questions to Julie using framing language such as "are we supposed to…" or "is it acceptable to?" In addition, two of the principals were observed participating differently (or not attending teacher learning events at all) if Julie was not also present. Principals appeared to view new lead learner expectations as extra, or on top of, their core work as principals which centered around management and evaluative responsibilities. For example, all four principals asked questions about how to fit in lead learner responsibilities *on top of* everything else. Amy expressed the challenge that she faced by spending one full day each week participating in teacher PD by participating in Math Labs: "Basically, we have a four-day work week now." Implicit in this statement was the idea that participating in teacher PD was not part of her work, and that doing so was constricting her time to do her work. This assumption about her role, and her priorities, was also evident in Amy's practice during the first half of the school year. For example, she was observed leaving teacher PD to have evaluation-related meetings with teachers or checking and responding to emails while sitting in on a grade-level team's meeting. In this way, she

conveyed that they were not yet prioritizing or seeing the value in the lead learner expectations for practice.

Seeing value in all three roles. As principals participated out of compliance, they began to see some value in lead learner forms of practice. Engaging in new ways of *doing* co-developed with new ways of *being* a principal in that principals began to identify with - or see value in - new forms of practice. One way in which this shift first manifested for principals was that they began to see the value of participating as a lead learner on their effectiveness at completing evaluation and management tasks. As principals engaged in their first evaluation cycle with teachers, they reflected on how it felt different from previous years. During the January principal and coach PD session, Olivia reflected that "it's the first time that I felt like the [evaluation] conversations were actually useful for [teacher] learning. Because I'm in [grade team meetings], classrooms, Math Labs." Similarly, Amy noticed that by participating in teacher learning spaces, she had developed new content knowledge in math, which supported her to "feel more confident about what I'm saying [during evaluations] because I understand. I feel like I can go a little bit deeper." In this way, principals began communicating new understanding of the value of participating in teacher learning spaces. However, it's important to note that this particular approach to understanding the value of new forms of practice was through the lens of past ways of *being* a principal. Being a lead learner was valuable because it supported them to more effectively enact other responsibilities related to evaluation.

Additional evidence of principals beginning to value and identify with lead learner forms of practice was a decrease in questions about what they were "supposed to do." These questions were replaced by interest in learning how to participate more effectively and conveyed desires for ways they hoped to participate in the future. For example, for most of the school year Amy frequently asked questions about whether she could attend teacher grade team meetings less frequently. Often these questions conveyed a sense of not understanding her role (e.g., "I don't feel I'm useful in [grade team meetings]"). After a full school year of participating in new ways, however, Amy began to convey desires for how she hoped to participate in the future. In her end-of-year interview she articulated wanting to "be

able to be in classrooms more, not necessarily for evaluation purposes, but just to be in there to see what's going on in between the labs and the [grade team meetings]. Because it has been hard for me to make the connections…so I want to be able to engage in the full process." These expressed desires for her *future* practice indicate a shift in her valuation of the lead learner forms of practice. Whereas her previous questions were often about how she could be in teacher learning spaces less frequently, at the end of the year she appeared to begin to value her role in those spaces in a new way.

Prioritizing lead learner. By the end of the school year, the principals conveyed that they were beginning to identify with new forms of practice. This was evident in their interviews and their participation in final PD sessions, where their reflections on their new forms of practice indicated a sense of connection with their new ways of participating. "We're never going back" Irene said in response to being asked about the new ways that she coordinated her role as a principal with her instructional coaches. Principals also frequently articulated a distinction between their "[improvement initiative]" practice and the practice of "regular principals." This distinction conveyed a sense of identification with a new definition of principal practice. There is also a developing identification *in opposition* to expectations for "regular" principals. Evident in this shift was a re-definition of evaluation and management roles. Olivia explained in an end-of-year principal meeting that she told her teachers:

> You know it looks on the [evaluation system] like I've only been in your classroom for X amount of minutes but we both know that's not true because I'm in your classroom multiple times a week sitting down with the kids. And although that's not in here as an evaluation. You and I know that I know what's going on in your room. And so that's what's important to me.

Other principals also conveyed similar ideas, reflecting a re-valuation of evaluative forms of practice. Evaluation was no longer the priority. To a certain extent, evaluation became a part of principals' practice that was enacted more out of compliance then out of valuing it for its impact on teacher practice.

Analysis of principal learning over the course of the school year revealed areas of learning that interacted with this shift from compliance to identification with lead learner forms of practice. Here, I describe two of them. First, principals engaged in significant shifts in their understanding of teacher

learning. And second, principals demonstrated important development in how they thought about the *goals* of their leadership practice. In what follows, I explore each of these in order to further unpack the observed shift from compliance to identification.

Developing New Ways of Supporting Teacher Learning

One specific area of learning that emerged as important in principals' shift from compliance to identification with new, lead learner forms of practice was their developing ideas about how to support teacher learning of fundamentally new ways of enacting instructional practice. In particular, two key shifts appeared to be crucial for principals to demonstrate movement along the continuum. First, principals demonstrated a shift from viewing teacher learning as occurring in one-off interactions to thinking about teacher learning as building over time, *across* different experiences. Second, principals demonstrated a shift in understanding about their own role in supporting teacher learning: from providing information to learning alongside. These shifts illustrate the co-development of ways of knowing, doing, and being a new kind of principal. Below, I explore these two key shifts in more detail.

Teacher learning in one-off interactions vs. across structures. One way in which principals shifted in their understanding of teacher learning was the development of a vision of supporting teacher learning *across* professional learning supports rather than in isolated structures. An important element of this shift was for principals to move beyond a previous understanding, grounded in evaluation, that teacher change in practice was supported through accountability in evaluative conversations. This proved to be a difficult idea to let go of for principals. For example, in April, Amy expressed finding it challenging to just be in classrooms with teachers and not give feedback: "It's ingrained in me. I have to give them feedback." In response, other principals chimed in, reflecting how in their past experience, when they went into classrooms it was for evaluation purposes because, as Olivia said, "That's what we were taught." In addition, principals often wanted to talk about teacher learning structures in isolation.

The shift that occurred for principals was beginning to think about teacher learning *across structures*. For example, Irene worked with her coaches to schedule follow-up classroom visits after every Math Lab where leaders would join classroom teachers for an additional opportunity to try out what was

learned during the Lab. They used grade team meetings strategically to planning of, and reflection on these shared opportunities for instruction. In addition, Irene started leveraging the bi-monthly whole staff meetings to provide opportunities for staff to share their learning from Math Labs and build community understanding of the changes they were engaged in. In her final interview, Irene conveyed how this new approach to thinking across structures had transformed the way she and her coaches planned for teacher learning: "It's never that…we're just talking about the [Math Lab] itself, we're talking about how the labs are linked to the cycles and how that's linked to our [grade team meetings], so we're always talking about the connection with the system versus just a piece of the puzzle because none of it would be successful without it." In this reflection and in examples from her practice, Irene conveyed a new conceptualization of her role in supporting teacher learning.

This shift towards thinking across structures impacted how they thought about their role. For example, for most of the year, Amy often asked questions about which individual structure (e.g., grade team meetings, Math Labs, or ILTs) she could cut out in order to be able to fully attend the others. Towards the end of the year, she shifted to asking about whether she could instead focus her attention one particular grade levels at a time so that she could be engaged throughout their learning experiences. "I'd rather be able to hold on to the thread for a short amount of time than not at all," she said. Thus, as principals developed new ways of thinking about teacher learning over time rather than through one-off interactions, they also started thinking differently about their ways of enacting leadership practice.

Delivering information vs. learning alongside. Another shift in principals' understanding of supporting teacher learning related to their understanding of what it means to teach or support learning. Principals' assumptions about learning influenced how they made sense of the expectation that they be the "teacher of teachers." At the beginning of the year, all four principals demonstrated an assumption that teaching others required knowing the content, so that one can deliver that content. This contrasted with Julie's assumption that supporting learning wasn't about delivering information, but about designing experiences for teachers and engaging in learning alongside them. For most of the principals, this assumption that they needed to learn before they could support teacher learning persisted throughout the

year. In an end of the year interview, Amy puzzled over her role in supporting learning: "I don't feel like I'm doing the teaching…I don't have the depth of knowing that [coaches] do." In this way, the principals initially conveyed the idea that supporting teacher learning involved already having, and then delivering, information. In contrast, Julie frequently articulated that her vision of leadership did not entail knowing things that teachers did not. For example, in a May session with coaches and principals, she emphasized that a "critical piece to name for [teachers]" was that "when I'm evaluating you, I'm humbled. Feedback is not because I could do better; it's because I think you could do better." This view contrasted with the principals' initial views of teacher learning.

As the year progressed, all four of the principals began to shift towards understanding that leaders can support teachers to develop new practices by engaging in learning alongside them. A recurring theme that emerged in principals' comments during the leader PD sessions was that they needed to think about teacher learning similarly to how they were learning to think about student learning in mathematics: as happening over time, through facilitated experiences rather than delivered information. This learning was truly an intertwined process of new ways of knowing, doing, and becoming for principals. As principals began to develop new forms of practice associated with lead learner expectations, they participated in different ways in practice and in doing so gained new understanding, skills for supporting teacher learning and school improvement. For example, principals talked about the impact that attending more closely to teacher practice had on them. Previously, they were not expected to be a part of teacher professional development and only visited classrooms for evaluations. Under new expectations, they were more aware of what teachers were learning, and were in classrooms more frequently. Because of this, they became more aware of teacher learning and practice. Larry explained that, "it quickly became, holy moly, we were really far away from the curriculum (meaning that classroom instruction did not reflect intended pacing or lessons)." Amy described this as the "biggest epiphany – we were paying attention in a different way to our teachers…. Because I'm in there more and hearing their conversations more. Whereas in the old system you kind of just let them go…so unless behaviors start happening you don't really start analyzing their instruction until further in." In this way, by being in teacher learning spaces and

classrooms more, they became aware of *how* teacher learning was (or was not) showing up as changes in instructional practice.

As a result, principals started to think about their role in supporting teacher learning differently. When asked to reflect on what they learned during the year, the four principals all mentioned something related to giving teachers time to learn new things, or the importance of supporting them in strategic ways over time. In her final interview, Irene said that she previously thought that if you required teachers to do something, they would do it; "if it's presented well, then people will do it." She said she now understood that teachers "can't go back and implement something that they don't have support to do." For her, a key element of the new way she engaged in her role was that the end of PD sessions wasn't "[teachers are] going to go do it." Instead, she had learned the value of asking "When are *we* going to do it," thus including herself in the framing of expectations for new instructional practice. Irene then described the importance of organizing key support structures, such as strategically visiting classrooms to support teacher implementation of new instructional approaches. In this way, principals shifted in their ways of knowing, doing, and being in relation to supporting teacher learning.

Developing Sophisticated and Differentiated Goals for Leadership Practice

Another layer of learning that emerged as an additional lens for understanding principals' reconciliation of evaluator, manager, and lead learner forms of practice was the development of more sophisticated, and differentiated goals for leadership practice. Principals' goals for particular forms of practice reflected their understanding of the function those practices might serve, and the impact they might have on others. Analysis of goals also served as a lens for examining the nuanced difference between a principal enacting a form of practice out of compliance or out of identification. To illustrate the learning evident in the evolution of principals' goals for their own leadership practice, I provide examples of two areas of practice: evaluation and engaging as a lead learner.

Goals for evaluation. Julie's practice provided an illustration of what goals for evaluative practice might need to entail for a reconciliation of expectations that valued and prioritized lead learner. For Julie, evaluation primarily served the goal of accountability. She did not think evaluation supported

teacher learning of new instructional practice, but rather, believed that evaluation could serve to hold teachers accountable if they were choosing not to engage in learning. During professional development sessions with principals, she described how she thought about achieving this goal in a differentiated way. She distinguished between teachers who were engaging in learning and at least approximating new practices, and teachers who were actively resisting new forms of instructional practice. How evaluation was used with these two kinds of teachers would be different, according to Julie. For a teacher who might be resisting the shift towards discourse intensive classroom instruction Julie argued that principals should take the time to be detailed and consistent with documenting feedback in the evaluation system. She explained that this was necessary to "give [the teacher] the signal. This [goal for improvement in your instructional practice] is the thing that we need to talk about. We don't agree that this is going well." In contrast, for teachers that were attempting to try out new forms of practice, Julie advised principals to complete evaluations only to meet the minimal requirements based on district expectations. Thus, Julie thought about her goals for evaluative forms of practice in a differentiated way based on a broader goal of changing teacher practice. She redefined evaluation as a tool you might use to signal the kind of practice that was expected and prioritized. In addition, Julie demonstrated a way of thinking about the quantitative evaluation expectations from the district (e.g., number of minutes observing in classrooms) in relation to the specific approach to teacher learning. For example, she supported principals to think about how they could use their observations of teacher planning, collaboration, and reflection on practice during professional development sessions or grade team meetings as evaluation evidence, and encouraged principals to count this time towards their overall minutes of observation. These efforts to redefine the purpose and use of evaluation supported her own reconciliation of evaluation and lead learner expectations.

For the principals, a differentiated view of goals for evaluation was not evident at the beginning of the year. While they vaguely described evaluation as a way to support teacher practice, they did not talk about their motivation for evaluation through this lens. Initially, all four principals conveyed goals for evaluation that were more oriented towards meeting district quantitative expectations about number of

observations and number of minutes in classrooms. For example, Amy talked about how she "should have logged more time. Most of [my teachers] have 60 minutes [of evaluation] …but not all of them." She went on to emphasize how important it was for her to make sure she met the district requirements for number of minutes of evaluation-related observations in classrooms, saying "[evaluation] is my job, this is what is going to get me fired." In this way, principals initially made sense of goals for evaluation through the forms of accountability on evaluation from the district. These goals aligned with an approach to reconciliation that continued to prioritize evaluation over lead learner forms of practice.

Goals for participating in teacher PD. A similar shift towards more sophisticated and differentiated goals for practice was evident in relation to the expected lead learner forms of practice. Again, Julie provided an illustration of what goals for leadership practice might look like after many years of learning and experience. When she described the role of a principal in a teacher professional development setting, for example, she described many different goals, including: her own learning, modeling learning, modeling vulnerability, holding teachers accountable, showing that the work was important, and gathering information to help her think about designing teacher learning supports going forward. In Julie's talk about her practice, there was evidence that she actually held all of these goals as potential goals for participation in teacher PD. It wasn't necessarily that she tried to achieve all of these goals simultaneously. Rather, she was aware of how at different times principals might be trying to achieve particular goals in response to specific teacher learning circumstances. In addition, her understanding of the impact of lead learner forms of practice supported her to prioritize her leadership decisions in any given moment. For instance, she described to principals:

> There were times where I just did sit in [grade team meetings] and think oh my god I have 9 hours of work to do tonight. And so someone has been asking to see me for the last four hours and I have a parent [who wants to speak with me]. This [time in the grade team meeting] is still the most important thing we can do…What [teachers] plan to do is so much more important than once you're watching them in the classroom [because then] it's done. You can't change what they were going to do--you just watched it happen.

In this example, Julie's deep understanding of the potential impact of her practice in different situations helped her make decisions about how to spend her time as a leader. For her, the potential impact of participating in teacher learning spaces on her ultimate goal of supporting student and teacher learning far outweighed the impact of any other responsibility she could fulfill. Thus, her goals for practice interacted with her reconciliation of competing expectations for her role.

As described above, when principals were first exposed to the new expectations for lead learner forms of practice, they enacted them primarily out of compliance. They didn't really articulate goals for their lead learner forms of practice other than compliance. As principals developed deeper knowledge of, and experience with, lead learner forms of practice, they tended to isolate particular goals for those forms of practice. Initially, all of the principals zoomed in on the goal of developing their own knowledge about mathematics instruction. For example, Irene talked about how she intentionally wanted to not know about the content of an upcoming Math Lab so that she could "authentically engage as a learner." Amy reflected that her role in teacher PD sometimes felt "selfish…like, 'oh, I'm just here for myself because I need to learn.'" In this way, principals at first appeared to zoom in on the goal of their own learning to make sense of their forms of practice in teacher PD.

However, as principals engaged in these new ways of *doing* and *being* in teacher PD spaces, they also began to develop more sophisticated goals, and started to articulate multiple goals they might be able to achieve simultaneously. For example, at the end of the school year, Olivia described a variety of purposes she tried to serve when participating in teacher professional development. In addition to trying out new forms of practice with teachers she described how she would make sure to "ask the questions that I thought, even if I knew the answer, I know [a teacher] doesn't necessarily have this foundation, so I'm going to ask this question to make sure we talk it." At the same time, Olivia described attending to the conversation in the group, "to make sure that there is a balance between voices at the table, and making sure that the coach is seen as important, but not the expert." Similarly, Larry said he needed to learn how to engage productively in challenging conversations with teachers during PD in which, for instance, deficit perspectives of students surfaced: "how to ask the [follow up] questions when [teachers say] 'yeah,

but those kids, they're not ready.'" These new goals that principals began to develop for their practice reflected new ways of finding coherence across being both a leader and a learner.

Illustrative Vignette

As the sections above illustrate, examination of principal learning through the lens of knowing, doing, and becoming alongside the concept of reconciliation of conflicting expectations provided important insights into principal learning of new leadership practice. In addition, analysis revealed that two additional, and related, lenses were useful for examining principal learning: principals' ideas about how to support teacher learning and their goals for particular forms of leadership practice. In fact, these lenses proved to be insightful for understanding principal learning in individual instances of practice. To illustrate this utility, I examine one particular episode that occurred during an observation of a school leadership team meeting at Amy's school in early September. During this meeting, Amy shared with Julie that an issue had surfaced that teachers were not planning lessons and were just opening the teachers' guide at the beginning of the math block. Amy described to Julie what her planned response was to the issue:

> I'm going to send emails to each team just in terms of time, I can't go to each [grade team meeting] to have the conversation…just talking about, you know, basically, evaluations are coming. It's not the most important part but it's the reality of what we have to do so I'm starting to think about [the planning indicators on the evaluation rubric].

In Amy's plan, she was proposing a response to an issue in teacher instructional practice through a management and evaluation lens. She suggested sending an email and reminding teachers to plan because it was on their evaluation. Implicit in this response is an assumption that teachers enact intended forms of practice when they are told to, and held accountable for doing so. She did not appear to see the issue as a teacher learning issue, but rather as a management issue. Amy's understanding of her role in this moment was, then, to tell teachers what to do. Importantly, her planned response was through an email, reflecting a view of teacher learning as supported through one-off interactions, rather than utilizing teacher learning spaces. Julie expressed concern about this response:

> Do you have a staff meeting on Wednesday? I wonder if it's better to [address] it in person…I just worry that right now, [teachers] are trying to lift a whole bunch of things. They are understandably stressed out. And it's the first week of school…politically, how safe is it to send out anything about evaluation when your mantra up until now has been take risks, be messy.

In Julie's response to Amy's plan, a different way of thinking about the role of principal is evident. Julie's perspective is grounded in thinking about how to best support teacher learning. She views the issue that Amy has surfaced as a teacher learning issue and suggests a plan that involves strategically thinking about how to support that learning. Notably, she is prioritizing supporting learning over evaluation. Thus, in these contrasting responses to the same situation, the learning required for principals to develop new forms of lead learner practice is evident. Amy and Julie were both trying to support teachers to change practice, but they were making sense of what it meant to do so through particular ways of knowing, doing, and being a principal.

Amy was open to Julie's idea, but expressed concern**.** "Our staff meeting is full with all the trainings," she said, referring to district-required trainings for things like using the new school laptops. Her hesitation here, reflected her prioritization of management expectations over supporting teacher learning related to instructional improvement. She went on to add: "I don't have to say the evaluation piece. I mean I do think it's a reality of those [evaluation] meetings are getting ready to start happening, but if you feel like that's too much then I can easily leave that piece out." This response conveyed that she considering Julie's suggestion mostly out of compliance to Julie (her supervisor) than out of really understanding the rationale behind the suggestion. At this point in Amy's learning, Julie's suggestion seemed rather arbitrary.

However, as the conversation between Amy, Julie, and the two instructional coaches progressed, Amy began to make sense of what her goals might be in engaging in a dialogue with teachers about their planning in a staff meeting. In particular, Amy started to see the situation through a teacher learning lens; that potentially teachers weren't planning because they were holding on to old routines that weren't necessarily the most effective use of their time in terms of impact on student learning. Julie explained to

Amy that maybe the purpose of the staff meeting conversation being to frame future dialogues that would occur in PLC meetings about time use. In response Amy agreed, reflecting that "teachers really stick tight to routines and what's concrete and comfortable…so, like you said, [it's important for me to] give them permission to let go a bit. And even then, it will take time, but at least I can get the initial piece out there." In this statement, there is evidence of Amy beginning to reframe the issue as a teacher learning issue, and one that will take time for teachers to grapple with. With Julie's support, Amy also started to think about teacher learning across structures. Rather than trying to "fix" an issue with one email, she was now thinking about how to use one staff meeting to set up learning in other spaces for teachers.

Thus, in one brief glimpse into an interaction between Julie and Amy, there is evidence of the potential for the proposed framework for understanding principal learning of fundamentally new forms of practice. Using the lens of reconciling conflicting expectations of manager, evaluator, and lead learner, provides insight into how Amy was approaching her role in a given leadership decision. At first, she framed the issue as one to be solved through management and evaluation, reflecting an assumption that teachers' problems of practice could be "fixed" in on-off responses. Through conversation with Julie and her instructional coaches, she began to reframe the problem of practice through the lens of teacher learning and to think about more long-term strategies for supporting teacher change in instructional practice. Thus, Amy's learning at any given moment was more than just what she knew or didn't know or what she was doing or not doing; her practice reflected her ongoing co-development of knowing, doing, and becoming in relation to how she was making sense of the different expectations for her role.

Discussion

In this analysis, I examined how principal learning unfolded in the context of a significant shift in district expectations for leadership practice in relation to an instructional improvement initiative. I argue that this shift in expectations was an essential layer of the context, and that principal learning must be understood in relation to how principals experienced and made sense of the new lead learner expectations in relation to previous manager and evaluator expectations. Analysis showed that principals reconciled the conflicts they perceived between these expectations in different ways as they learned. These different

approaches to reconciliation reflected principal learning of ways of knowing, doing, and being a principal, that were deeply intertwined. In particular, I highlighted two important shifts in knowing, doing, and being evident in how principals thought about and enacted (1) supports for teacher learning, and (2) their goals for leadership practice.

In proposing this framework for conceptualizing principal learning of fundamentally new leadership practice and illustrating its utility, this analysis makes a few theoretical contributions. First, studies of principal learning often do not attend to how principals negotiate conflicts they may perceive between past and new expectations for their leadership practice. My analysis of four principals indicates that how principals established coherence across conflicts in expectations was an important lens into their learning. While the specific expectations related to lead learner, manager, and evaluator that the principals in this case grappled with may be unique to the context, it provides an example of the shift from more traditional, management-focused principal leadership to instructional leadership that districts are expecting across the country. Analysis suggests that one way of thinking about principal learning goals is to identify the particular way in which they need to be supported to reconcile different expectations. In the case of this study, the reconciliation evident in Julie's more experienced vision of principal leadership involved a reconceptualization of past expectations of manager and evaluator that aligned with new expectations of lead learner. The goal then, is to support principals to reorganize their practice based on a new conceptualization of their role, priorities, and overall function. Often, expectations for instructional leadership can be viewed as additive, in that principals need to accomplish them *in addition* to all their past roles and responsibilities. This view has raised concerns that examples of instructional leadership present an "heroic" version of leadership that is not a reasonable expectation for principals (Hallinger, 2005). Responses to this heroic vision have included calls for viewing principal leadership as part of broader shared or distributed instructional leadership, that includes other roles, structures, and tools (e.g., Marks & Printy, 2003; Spillane et al., 2011). This analysis suggests that supporting principals to redefine, rather than simply add on to, past expectations may be key to principals *becoming* fundamentally new kinds of leaders in a way that is manageable.

Second, this analysis provides a conceptualization of principal learning that incorporates ways of knowing, doing, and becoming. As described previously, the existing literature on principal learning tends to limit understanding of how learning unfolds in that it focuses on knowledge, practice or identity in isolation without full consideration of the interaction. Analysis of the principal learning in this case indicated how intertwined the learning of certain knowledge, forms of practice, and understanding of the principal role was. In doing so, it pushes back some on the emphasis on content-knowledge development that tends to dominate studies of principal learning for instructional improvement (e.g., Steele et al., 2015). It is not that principals don't need to be supported to learn new knowledge related to content-specific instructional approaches and goals; rather, this analysis suggests that to support principals to *become* fundamentally new kinds of leaders, learning of new ways of knowing needs to be viewed as co-developing in interaction with new ways of principal doing and being. In addition, this study suggests that an important phase in this co-development of knowing, doing, and becoming is the phase of compliance. It was through compliance with new expectations that practice that principals began to value and identify with those expectations. Thus, principal enactment of practice out of compliance is not necessarily a negative phase in principal learning. The key is to understand how to organize and facilitate their engagement out of compliance in such a way that it moves them towards identification.

A third contribution emerges from the inclusion of Julie, as an experienced principal turned principal supervisor, as part of this analysis of principal learning. In Julie's practice and coaching of principals, it was evident that her practice reflected particular ways of knowing, doing, and being a principal. This example provided a comparison point that supported analysis of principal learning. For instance, the impact of principal's goals for their practice may not have showed up as one critical element of principal learning if their developing goals had not been analyzed in relation to Julie's. In this way, this study suggests the importance of making sense of learning processes and demands through comparative analysis of both more experienced practitioners and practitioners who are new to a set of expectations. This approach contrasts with most existing studies of principal practice and learning that tend to either look at experienced principals or principals as learners. Julie's practice also suggests the time-scale at

which to expect principal learning of fundamentally new approaches to practice to occur. Julie's practice at the time of the study reflected over five years of deep involvement in the approach to instructional improvement and leadership. The moves she made in, for instance, a Math Lab, were enacted based on her experience in many similar Math Labs. She had experienced many of the questions teachers would ask, the challenges that might arise, and how that one teacher learning experience fit into the broader work. Thus, it would be impossible for principals participating in that Math Lab for the first time to participate in the way that she did. However, her practice offered a lens through which principal learning towards Julie's more experienced practice could be seen. The inclusion of Julie in analysis emphasizes that district initiatives to support principal learning need to allow for the co-development of knowing, doing, and becoming over time.

These contributions should be further examined for their utility for both researchers and practitioners. First, future research should examine how this conceptualization of practitioner learning in the context of significant shifts in expectations supports understanding of the learning of principals, teachers, and other school leaders in different improvement contexts. Second, given that district approaches to principal learning often assume that new knowledge will lead to new practice, a next step is to examine how the conceptualization of learning as knowing, doing, and becoming might shift how district leaders think about supporting practitioner learning: How does the proposed way of conceptualizing principal learning support district leaders to attend to and support principal learning of fundamentally new forms of practice? What learning supports do district leaders need in order to reconceptualize the learning that school-based practitioners need to engage with in relation to instructional improvement initiatives? Finally, a next step is to begin to understand how to design supports that foster the learning illustrated in this analysis. How might supports be designed to foster the co-development of particular ways of knowing, doing, and becoming that lead to particular ways of reconciling expectations for practice? The next two analyses of this dissertation take up this question.

CHAPTER 4: DESIGNING SUPPORTS FOR PRINCIPAL LEARNING OF FUNDAMENTALLY NEW LEADERSHIP PRACTICE

The existing research on supporting principal learning suggests that in order to develop new leadership practice, principals will need more than traditional professional development experiences that center on delivery of information outside of school contexts. Instead, principal learning needs to include job-embedded, or field-based experiences (e.g., Augustine et al., 2009; Drago-Severson, 2012; Fink & Resnick, 2001; Honig, 2012). In addition, the literature suggests that principals will need to be supported to make sense of new knowledge about teaching, learning, and leadership in relation to expected forms of leadership practice (Boston et al., 2016; Nelson & Sassi, 2005; Steele et al., 2015). Examples of principal learning supports often feature the following limitations: (1) supports are designed around vague learning goals (e.g., Honig & Rainey, 2014; Hubbard et al., 2006), or (2) supports are designed to support development of particular forms of knowledge or isolated skills (e.g., Boston et al., 2016; Steele et al., 2015). In both cases, researchers find that while there might be changes in principal knowledge or talk about practice in the professional development setting, that learning does not often translate into a change in leadership practice in schools.

In this analysis, I argue that from a sociocultural perspective on learning, it is unsurprising that a focus on new types of knowledge and isolated skills does not seem to support fundamental changes in practice. From a sociocultural perspective, learning involves not only development of new knowledge and skills, but is also a process of *becoming* someone new (Herrenkohl & Mertl, 2010; Holland et al., 1998; Wenger, 1998). Learning of instructional leadership will involve not only *knowing* new knowledge and *doing* new forms of practice, but also *becoming* a new kind of principal. This process will be no small task for principals facing new expectations for their leadership practice that can be perceived as conflicting with past expectations. If districts fail to provide opportunities for principals to *become* new kinds of leaders, then principals are unlikely to participate in significantly new forms of leadership practice. However, there is limited understanding of how to design supports for leader learning that involves *becoming* a fundamentally new leader. This analysis responds to this gap in the literature and

examines what the characteristics of supports for developing fundamentally new leadership practice might be.

This analysis builds off of the first analysis of this dissertation (Chapter 3), which examined how principals engaged in becoming a new kind of principal in the context of a district improvement initiative. Findings indicated that four out of the five principals demonstrated development of new ways of knowing, doing, and being principals in their school contexts. In examining how this learning unfolded, I argued that new ways of knowing, doing, and being co-developed and were intertwined with principal approaches to reconciling what they perceived as conflicting expectations related to being managers, evaluators, and lead learners in their schools. Overall, there was evidence that principals developed new ways of knowing and doing in their school contexts, and *became* fundamentally different leaders. Thus, the case provides an opportunity to begin to understand what might support this kind of leader learning that results not just in take-up of isolated knowledge of skills, but in evidence of principals *becoming* different kinds of leaders.

Edelson (2002) argues that retrospective analyses of design-based approaches should aim to develop theories about what matters for the content, form and process of that particular class of designs. He suggests one outcome of analysis of design efforts is a design framework, or what van den Akker (1999) refers to as *design principles*. Design principles describe what was learned about the effective characteristics of the design of the intervention or innovation itself. While design principles cannot guarantee success in other contexts, the goal is to articulate design characteristics that may be applicable and useful to other designers of similar tasks, and to justify the potential of those characteristics both theoretically and empirically (van den Akker, 1999). Thus, the goal of this analysis was to draw on both sociocultural learning theory and empirical evidence from the case to identify a set of potential design principles for the design of principal learning towards becoming fundamentally different leaders. To this end, this analysis examines the following question: *What supports and features of those supports appeared to foster principal learning of fundamentally new forms of practice?*

Design of Supports for Principal Learning

In this section, I review the existing literature on supports for principal learning. While pre-service learning experiences shape principals' leadership understanding of their role, and resulting leadership practice (e.g., Browne-Ferrigno, 2003; Davis & Darling-Hammond, 2012; Rigby, 2016), I focus on the literature about supporting principals to learn and significantly change practice *while already a practicing principal.* This stage in a principal's career likely represents a unique challenge compared to pre-service learning as principals may already have an established practice as a school leader (Rigby, 2016). As districts expect changes in principal practice as part of school improvement initiatives, they need guidance as to how support the learning of principals who are already leading schools, and therefore need to *transform* their practice (Honig, 2012; Honig & Rainey, 2014; Hubbard et al., 2006).

The existing empirical literature on district supports for practicing principals is limited, however, it suggests that learning supports should:

1. connect to specific goals for students, teachers, and principals,
2. connect to school contexts,
3. involve collective experiences with other principals, and
4. involve a more experienced leader.

Below, I briefly review each of these themes and then highlight the conceptual limitations of the literature on principal learning supports.

Connect to Specific Goals for Students, Teachers, and Principals

First, the existing literature suggests the importance of the design of supports being directly connected to specific goals for students, teachers, and principals. Studies of principal learning in content-specific reforms highlight the importance of principals being supported to develop new knowledge of what high-quality instruction entails in relation to specific content (Boston et al., 2016; Nelson & Sassi, 2005; Steele et al., 2015). While there is debate about the amount of content-specific instructional knowledge that principals need to develop, there is recognition that in order to support instructional improvement, principals must understand the deeper goals of that improvement initiative. The

instructional leadership practices that principals are supported to develop also need to be directly tied to the specific goals for instruction (e.g., Hubbard et al., 2006; Nelson & Sassi, 2005; Spillane et al., 2011). Similarly, studies suggest that learning supports for principals need to involve specific goals for principal practice. Many studies simply state "instructional leadership" as the goal for principals (e.g., Barnes et al., 2010; Dana et al., 2009; Huff et al., 2013), which is problematic given the persistently underspecified understanding of what instructional leadership means *in practice* (Honig & Rainey, 2014). Underspecified goals lead to a lack of clarity about how exactly principal practice should change. For example, Hubbard, Mehan and Stein (2006) report on a principal professional development session focused on the goal of "leading with an edge" which supported principal take-up of new language about leadership, but principals left the session unsure how to enact new learning in practice.

Connect to School Contexts

The existing research also suggests the importance of principal learning supports involving direct connection to practice in school contexts. Across multiple types of supports, researchers find that it's important for learning supports to center on problems of practice that principals are experiencing in their daily work (e.g., Fink & Resnick, 2001; Honig, 2012). In addition, it appears important that principal learning supports involve clear opportunities to try out new practices in their contexts in an authentic way. For example, Boston and colleagues (2016) report on a program for principals aimed at developing their mathematical content knowledge so as to improve observations of classroom instruction. They found that principals demonstrated take up of new mathematical ideas and increased their ability to identify low- and high-cognitive demands instructional tasks during professional development sessions. However, a study of the same principals by Rigby et al. (2017) found that this new learning did not transfer to principals' feedback to teachers and that feedback tended to be content-free. Boston et al. (2016) hypothesize that this may have been due to lack of opportunity to practice using new knowledge in the school context. While the professional development design included tasks that principals completed in their school setting, these tasks were not aligned with the daily work of principals. Thus, it appears important that learning supports be designed to support application of new learning to the daily work of principals.

Opportunities that involve study of and reflection on principals' own leadership practice with clear action steps seem to have some potential (Dana et al., 2009). Similarly, receiving one-on-one coaching in their own school context can support principals to experiment with new learning in their daily practice (Honig, 2012; Huff et al., 2013).

Involve Collective Experiences

Research on principal learning supports also indicates the potential of collective learning experiences. Many of the principal learning support designs in the existing literature involve bringing principals together in some way (e.g., Boston et al., 2016; Dana et al., 2009; Honig & Rainey, 2014; Hubbard et al., 2006). Researchers find that collaboration with other principals shapes principals' sensemaking about their own learning and their leadership practice (e.g., Barnes et al., 2010; Dana et al., 2009). However, research indicates that *how* this collaborative work is designed matters. For example, Hubbard, Mehan, and Stein (2006) report that while interactions in a principal group appeared to be collaborative in that they were working together, the quality of the interactions and discussion often followed more didactic forms of instruction. Honig and Rainey (2014) also found that how collaborative time was facilitated impacted the kind of learning that principals engaged in.

Involve Support from a More Experienced Leader

Existing research also examines the role of someone with more accomplished forms of practice in supporting principal learning both in collective settings and in one-on-one formats. In collective settings, research indicates the importance of facilitators (often district leaders) having developed visions of specific goals for student, teacher, and principal learning. For example, Hubbard and colleagues (2006) found that when facilitators lacked this expertise, they often gave incomplete explanations of the material covered in principal learning sessions. It also appears important for facilitators to have knowledge of how to effectively facilitate collective learning of adults (e.g., Barnes et al., 2010; Honig & Rainey, 2014). Honig and Rainey (2014) found key differences in how principal learning played out in collective settings based on whether facilitators approached the work as a "teacher" of principals or not.

Studies of individualized support of principal learning through coaching of leadership practice provide some of the most specific descriptions of design of learning supports. For instance, Huff et al. (2013) identify key coaching practices including (1) asking targeted questions that support principal reflection and challenge principal perceptions, (2) engaging principals in role plays to practice responding to specific situations, (3) supporting principals to follow through on action plans by checking back and continuing discussions, (4) structuring meetings with principals so that both ongoing efforts and future challenges were discussed. In addition, Honig (2012) identifies key practices of principal supervisors supporting principal learning, including: (1) modeling thinking and action, including pre- and post-conversations about practice, and (2) use of metacognitive strategies so that principals understand underlying rationale for particular practice. Honig also emphasizes the importance of separating coaching of principals from the more traditional district leader role of supervising or evaluating principal leadership practice.

Limitations of Existing Research

While the themes in the existing literature described above provide some insight into how supports for principal learning might be effectively designed, many studies are limited by how they conceptualize learning. In a review of research on principal professional development, Smylie et al. (2005) found that most existing publications were conceptually ambiguous and primarily provided descriptions of programs without clear grounding in specific theories of learning (e.g., Peterson, 2002). In particular, studies often isolate learning as primarily related to development of either new ways of knowing or doing in school settings. For example, in the studies described above that aim to support principal learning of new content knowledge, the assumption is that new knowledge will transfer into new ways of enacting principal practice (e.g., Steele et al., 2015). Thus, while a separate body of literature argues that principal identity – or how principals envision their role – shapes how they enact their role, the literature on principal learning largely neglects to account for principal learning as an intertwined process of *knowing, doing, and becoming.* In one exception, Brown-Ferrigno and Muth (2004) found that practicing principals reported that alternating between experiences in their schools and activities with a

group of other principals supported them to change their perspective about their role as principal, which therefore impacted their practice. However, resulting forms of practice taken up by principals are vague (e.g., "involving many people in decision-making and school improvement"). Thus, there is a need to further specify and examine how particular designs of principal learning experiences might support learning that involves principals *becoming* fundamentally different school leaders.

A second conceptual limitation is that studies of principal learning are often not designed to account for the interaction between context and leader learning. Context is often viewed as a backdrop, rather than an essential component of leadership (Neumerski, 2013). Research indicates that contextual elements are essential in understanding what might support – or hinder - principal learning of new ways of leading. Factors such as (and not limited to) available resources, student body, district-level expectations, past principal leadership style, existing school norms and culture, or the stage of school transformation are all important for shaping how a principal enacts leadership practice (Timperley, 2005; Youngs & King, 2002). For example, studies suggest that conflicts between broader expectations at the district level and messages from professional development can interfere with principal take-up of new practices (Cobb & Jackson, 2015; Fink & Resnick, 2001; Hubbard et al., 2006; Rigby et al., 2017). In addition, studies of principal learning and practice tend to not account for how teacher relationships with principals, or perceptions of principal practice might shape how principals engage in their roles. One rare study by Blase and Blase (1999) looked at teachers' views of principals and found that moves such as the principal modeling instruction could have been interpreted as threatening or invasive by teachers but were not because "principals had cultivated respectful and trusting relationships with teachers" (p. 361). This example indicates that studies that only capture knowledge development, or whether a leadership practice is enacted by principal learners, do not account for the how context might interact with that leaders' learning.

This analysis aims to build off existing understanding of what might support principal learning by attending to these limitations explicitly in analysis. In particular, this analysis sought to understand what characteristics of learning supports and context might foster principal learning that goes beyond

development of isolated knowledge or practice and includes *becoming* a fundamentally new kind of school leader.

Conceptualizing Supports for Principal Learning

To conceptualize what might support principal learning that includes *becoming* a fundamentally new kind of school leader, it is important to conceptualize the following: (1) goals for learning, (2) what might interact with and support that learning.

Goals for Learning

To conceptualize goals for principal learning, I draw on the analysis of principal learning described in Chapter 3. In Chapter 3, I proposed a framework that conceptualizes principal learning as a process of negotiation of forms of participation in relation to social, institutional, and cultural expectations. In the case of contexts where principals are expected to take on instructional leadership, they face new expectations for participation that may conflict with past expectations. I examined how principals' negotiation of these conflicting expectations, and learning of new forms of leadership developed over the course of the first year of a district improvement initiative. I argued that their learning could be usefully understood through the lens of their approaches to reconciliation of expectations for management and evaluation with new expectations that they participate as a lead learner. In particular, I argued that findings indicated that to *become* a principal that engaged as a lead learner, the principals needed to redefine their understanding of their management and evaluation practices and come to identify with lead learner forms of practice. I described two key shifts that illustrated how knowing, doing, and becoming interacted in principal learning: (1) their understanding of what supported teacher learning, and (2) their goals for their leadership practice. Drawing on these findings, this analysis aims to understand what characteristics of the design of supports and the broader context supported this particular kind of learning. In other words, how might principal learning of the particular ways of knowing, doing, and being associated with the reconciliation of expectations towards lead learner be supported? To frame my analysis, I turned to sociocultural learning theories to identify what some of the characteristics of supports and context might be.

Supporting Learning that Includes Becoming

Drawing on a sociocultural perspective of learning points to particular aspects of the design of learning supports that might foster principal participation in, and identification with, new forms of leadership practice. Wenger (1998) argues that within the process of becoming someone new is a dual process of identification and negotiability. Individuals must both develop a sense of identification with a form of practice while also feeling that there is room for them to contribute to negotiating, or creating the meaning of that form of practice in a particular context. Through identification, individuals develop a sense of closeness, or connection with participation in certain forms of practice. The more connection an individual feels with a form of practice, the more likely he or she to engage in it (Nasir & Hand, 2008). Through negotiation, individuals have space to make new identities meaningful and applicable to their own circumstances. Nasir and Hand (2008) argue through negotiability, individuals have the opportunity to "make, adapt, and resist meanings in a community…to reposition oneself in it" (p.176). In other words, becoming involves coming to feel a sense of belonging in relation to a form of practice, which will involve both identifying with a practice, and feeling that there is space to negotiate that practice. Thus, for principals, learning fundamentally new forms of leadership practice associated with instructional leadership will require both a sense of identification with being a particular kind of instructional leader, as well as a sense that there is room to negotiate what that means for them in their own school context. Wenger argues that three modes of belonging are sources of both identification and negotiability: engagement, imagination, and alignment.

First, *engagement* in new forms of practice becomes a source of identification because in participating in practice, "we see first-hand the effects we have on the world and discover how the world treats us" (Wenger, 1998, p. 193). By engaging in practice, individuals gain access to that practice in that there is an opportunity to develop an understanding of the meaning of practice within a context, rather than just developing isolated knowledge or skills (Nasir & Hand, 2008). Through engagement, individuals have opportunities to make sense of how their actions impact others. This means that, in the case of principals, how teachers, parents, or other school leaders respond to principal practice will interact

with whether or not principals come to value and identify with new forms of practice (Gee, 2000; Wenger, 1998).

Second, through *imagination*, individuals start to picture new ways of engaging in practice in their communities (Wenger, 1998). Imagining new ways of participating might be supported by examples from more experienced others, clear descriptions of practice, or stories from peers. These examples provide illustrations of possible trajectories of participation, which open up images of new ways of *being* in particular contexts.

Finally, learners often seek *alignment* between their practice and what the institutions or communities they are a part of prioritize. Principals engage in practice within a historically and socially defined set of activities that define what it means to be a principal. To support principals to engage as lead learners, districts need to support a shift in what it means to be principal. This means in order to support formation of new forms of participation in leadership practice, "it may be necessary to offer learners alternative forms of participation that are as much a source of identity as they are finding elsewhere" (Wenger, 1998, 215). As such, it is important to attend to the messages that the social and institutional contexts send about the set of obligations that an individual in a certain context is expected to fulfill in order to be recognized as competent in a particular role (Cobb et al., 2009; Gee, 2000; Gresalfi & Cobb, 2011). Part of these messages is what practitioners are held accountable for, and how. For instance, Wenger (1998) writes that approaches to accountability can vary in the amount of negotiability they allow for, and thus either support or diminish the potential for individuals to make sense of and adapt practice to their own contexts.

Thus, Wenger (1998) suggests that supporting principals to learn in a way that leads to becoming a new kind of principal will involve supports and context that foster a dual process of identification and negotiability that includes opportunities for principals to (1) engage in new forms of practice, (2) imagine new ways of participating, and (3) seek alignment to particular identities of practice.

Data Sources and Analytic Approach

I examined the full data corpus (described in Chapter 2) to analyze characteristics of learning supports and the broader context that appear to have fostered principal learning over the course of the first year. The full data corpus was included as the combination of data sources provided insight into the design of supports, and the interaction between context, learning supports, and principal learning. Given the findings of the first analysis reported in the previous chapter, I asked: How did the design of supports and the context provide opportunities for: development of valuation for lead learner forms of practice, redefinition of management and evaluation practices, shifts in understanding of what supports teacher learning, and shifts in goals for leadership practice? In addition, informed by the conceptualization of supports for learning that involves *becoming*, I also asked: How did learning supports and context provide opportunities for: identification, negotiation, engagement, imagination, and alignment? Based on these analytic questions, I developed the initial coding scheme shown in Table 7 to identify aspects of supports that had the potential to provide *opportunities* for identification, negotiation, engagement, imagination, and alignment. Here, I drew on the construct *Opportunities to Learn* (Greeno & Gresalfi, 2008; Horn & Kane, 2015), which Greeno and Gresalfi (2008) describe as "affordances for changing participation and practice" (p. 172). Thus, codes were developed to identify aspects of the design of supports that appeared to provide opportunities that might support principal learning. The coding scheme was used in subsequent phases of analysis, during which sub-codes were developed inductively based on trends that emerged in the data. For example, themes emerged for aspects of context that appeared to matter, such as *teacher perception*, *past principals,* and *district messages.*

Table 7. Initial coding scheme based on conceptual framework

Code	Definition
Identification	opportunities for principals to identify with or value expected leadership practices.
Negotiation	opportunities for space for negotiation of expectations in relation to specific principal, context characteristics.
Engagement	opportunities for principals to engage with lead learner leadership practices, or experience or make sense of the impact of new the practices.
Imagination	opportunities for principals to imagine lead learner leadership practice (e.g., models of practice, descriptions of practice, shared stories of practice).
Alignment	opportunities that might foster principal interest in aligning with new expectations for lead learner leadership.

Using this coding scheme, the first goal of analysis was to develop detailed descriptions of the design of learning supports over the course of the year. Analysis involved examination of field notes and audio recordings of (1) design team meetings, (2) observations of principal learning events, and (3) observations of principal supervisor support in school contexts using the coding scheme described above. In particular, I attended to the goals and content of different supports, the activities and conversations involved in the supports, and the design team rationale behind the design of supports. Following this analysis, I developed a memo that summarized key design features of the supports. I also created a time-order matrix (Miles & Huberman, 1994) to analyze the development of supports over time.

The second goal of analysis was to understand how principal individual learning interacted with the design of the supports and elements of school and district context. To do so, I examined the individual principal learning analysis (detailed in Chapter 3) in relation to the new analysis of the design of supports. The coding scheme was used to identify where there were opportunities for identification, negotiation, engagement, alignment, and imagination in relation to how each principal's co-development of knowing, doing, and becoming in relation to lead learner expectations. This analysis also involved identification of key contextual elements from each principal's school to support analysis of how context might interact with principal learning. Finally, I looked across my analysis of all the data to identify broader trends in the design. Through an iterative process, I developed a proposed set of design principles. As a final step, these design principles were shared with other design team members, principals, and mathematics

instructional coaches as a member check to ensure that identified principles reflected the experiences of others who were part of the process.

Findings: Design Principles

In what follows, I describe five design principles that emerged from my analysis of the design of the coordinated system of principal learning supports. These design principles are not meant to be exhaustive, but rather capture five key characteristics that seemed to be particularly important for supporting principal learning of fundamentally different leadership practice in the context of specific student and teacher learning goals. To illustrate each, I provide examples from the Roosevelt School District context and make connections between the principal learning that occurred and the suggested design principle. Drawing on Wenger (1998), I make an argument for why each principle might support principals to engage in becoming fundamentally different school leaders.

1. Ground principal learning in a set of principles about student and teacher learning and principal leadership.

Analysis suggests that an important characteristic of the design of learning supports for principals was their organization around a defined set of broader principles about student and teacher learning and principal leadership. As described above, the reform involved a particular view on effective mathematics instruction and student learning, a specific perspective on what supports teachers to take up new forms of practice, and a defined vision of principal instructional leadership. Documents detailing each of these visions were provided to principals on an ongoing basis and these ideas were consistent themes in conversation. Analysis indicates that these clearly articulated principles supported coordination of learning supports and principal identification with, and negotiation of, new forms of practice.

First, the clearly articulated principles of student and teacher learning supported coordination of principal learning supports. These principles were shared with principals during every out-of-school session and conversations were consistently designed to be grounded in these principles. While past

efforts to support principal learning in similar mathematics reforms tended to focus on particular content-knowledge development (e.g., Boston et al., 2016; Steele et al., 2015), sessions in the Roosevelt context were designed to develop principal understanding of new instructional approaches through the lens of broader principles. For example, in multiple sessions principals engaged in watching video of mathematics instruction. While initial discussion of the videos focused on the specific lesson, the conversation was consistently broadened to support principals to make sense of the more general principles. Given that principals were expected to support teacher learning for mathematics instruction across grade K-5, there is evidence that focusing on principles rather than specific content supported principals to negotiate the meaning of new ideas about instruction in a deep way. Evidence from analysis of principal interviews and participation in learning events indicate that over the course of the year, principals significantly shifted what they thought supported teacher learning. As described in Chapter 3, Principals attributed this to a combination of both the out-of-school principal learning events as well as their participation alongside their teachers in professional development. Out-of-school learning events helped them to develop understanding of the broader principles of student and teacher learning, which then supported them to learn more specific ideas about content and instructional practice while participating alongside teachers in professional development. As a result, principals appear to have developed sophisticated and flexible ideas about mathematics instruction.

Second, learning supports were grounded in a particular conceptualization of principal leadership, which was consistently conveyed to principals as that of "lead learner" and "teacher of teachers." A portion of all the principal learning events was dedicated to supporting principals to make sense of this conceptualization of their role. Notably, rather than focusing entirely on specific forms of practice, the design of supports also aimed to foster a deeper understanding of the function of the role. A recurring theme across sessions was for principals to work on articulating their "why" behind the improvement initiative. Julie described the why as the foundation for all the decisions that principals would make about the "how" and the "what" of the improvement work. In her very first meeting with principals, Julie explained:

> So, if your why is a certain thing, there are probably certain hows that would never be consistent with that. There are things you could never justify if this is what you believe about the why of the work…. then when you make decisions, you have a clear way to think about it.

This quotation captures a recurring message that Julie sent to principals: that their decisions about what to do in any given moment needed to be grounded in a broader vision of their role as supporting teacher learning (vs. management of the building). In this way, the supports were designed to foster principal development of a personal and meaningful "why" for the work that was aligned with the specific vision of student and teacher learning described above.

I argue that in designing the supports around a clear vision of student and teacher learning and principal leadership, principals were supported to move towards reconciliation of lead learner, manager, and evaluator identities in a way that reflected new ways of knowing, doing, and being in relation to supporting teacher learning. Rather than focusing on isolated knowledge of skills, the designed supports aimed to develop a deeper vision of what it meant to learn, teach, and lead mathematics instruction. In this way, these visions served as an organizing framework for principals to make sense of their day-to-day practice.

2. Provide specific decompositions of practice while also supporting engagement in and negotiation of those forms of practice both in and out of school contexts.

A second design principle is that the supports included both specification of forms of practice and also opportunities for negotiation of those forms of practice. As described previously, a common challenge to supporting principals to engage in instructional leadership is lack of specificity to what day-to-day, context-specific forms of practice look like. Without specification of forms of practice, principals are unlikely to be able to imagine new forms of participation or begin to identify with those forms of leadership. In the design of learning supports for principals in Roosevelt School District, there was an intentional effort to specify, or decompose, the intended forms of practice. Extending previous research on decomposition of teaching practice (Grossman, Compton, et al., 2009; Janssen, Grossman, & Westbroek, 2015), the design team sought to specify principal practice in a such a way that the principal

learners could both see and learn to enact those forms of practice. This effort resulted in naming of varying levels of *function* that principals needed to try to support in different spaces. Naming these forms of practice at this actionable grain size appears to have supported principals to imagine new ways of participating as a principal. On multiple occasions, Julie described the framework as an effective tool in her conversations with principals because it gave them a common language for talking about the work of the principal in teacher professional development. While Chapter 5 reports on a subsequent analysis that zoomed in specifically on what about the decomposition of practice effectively supported principal learning, in this chapter I highlight key connections to providing opportunities for identification, negotiation, engagement, imagination, and alignment.

As Wenger (1998) warns, supporting individuals to imagine new forms of practice will not necessarily lead to individuals becoming new kinds of participants unless there is also space for negotiation of, opportunities to engage in, and desire to align with, those forms of practice. There is a risk that laying out specific forms of practice could result in individuals simply enacting them out of compliance. In the Roosevelt case, there appears to have been room for both identification and negotiation. While specific forms of practice were identified, negotiation of, and engagement and alignment with, those forms of practice were supported in four ways.

First, as more fully explored in Chapter 5, by framing the decomposed practice in relation to functions principals needed to serve, the naming of practice allowed for imagination, alignment, and negotiation. Principals demonstrated that the decompositions of practice helped them think about their own practice. For instance, Irene described the framework of principal functions in Math Labs as "an evaluative tool in my brain like what was I doing what wasn't I doing." In this way, she indicated that she both saw the framework as something to align to, and that it supported her to imagine how she should enact her role. At the same time, the functional focus left space for principals to negotiate different ways of achieving that function based on specific contextual elements, personality traits, on in-the-moment challenges. Second, when presented, the identified forms of practice were consistently messaged as a proposed, or initial set for the group of principals to work with and add to. For instance, when Julie

shared some examples of language she had used with teachers as a principal, she emphasized: "I shared mine. Not as a template. Just for you to be thinking about... My things won't be your things… yours will be different." In this way, forms of practice were specified in way that offered space for principals to negotiate them.

Third, sessions with both principals and coaches were used to engage school leaders in co-constructing further specification of their forms of practice. For example, in one session, principals and coaches worked together to think through the different phases of Math Lab and co-construct what the principal and coach roles were in each phase. The document they created specified that during one part of the Math Lab, in which teachers are debriefing a common experience in a classroom, principals might focus on participating in the following ways:

- *Paying close attention to status piece, thinking about how you celebrate/recognize what teachers are doing*
- *Focusing the conversation on student thinking/work vs. what teachers did or did not do.*

In this way, principals were engaged in co-constructing what their practice in Math Labs might look like at an actionable grainsize. Rather than only being told new ways of participating, activities were structured to engage principals in working together to define what their participation might look like. In this way, these activities provided opportunities for negotiation as well as collective imagination and identification with new forms of practice.

Fourth, while forms of practice were named in rather concrete ways during principal professional development sessions, Julie then supported principals to negotiate those forms of practice in school contexts. For example, principals were told in out-of-school learning events that one of their roles as principals was to productively narrate and frame challenges and successes to teachers in a way that promoted school and instructional improvement. Modeling and coaching in school settings then supported them to negotiate and make sense of this leadership practice in relation to their particular school contexts and teachers. For example, in school leadership team meetings, Julie was observed supporting principals to respond productively to challenging issues that arose. In one meeting at the beginning of the school

year, for instance, school leaders raised the challenge that teachers were focused on staying on-time with the instructional pacing calendar and therefore weren't making time for building classroom community. The principal's initial response was to "hold teachers accountable" for building community. Julie helped them think through how to narrate the specific challenge in a productive way. She asked, "Are [teachers] getting the message that they've launched [so many important pieces of this work]?" and pushed the principal to think about how to respond in a way that wasn't just telling teachers what they were not doing right. In doing so, she helped principals negotiate new forms of practice in response to specific contexts and teachers, and to imagine different ways to respond to a situation. In addition, as principals then engaged in trying out plans brainstormed during coaching sessions with Julie, they had the opportunity to see how teachers responded to them.

3. Involve and attend to the perspective and expectations of teachers and other instructional leaders in principal learning experiences.

Another design principle that emerged in analysis was the importance of the involvement of other roles (principal supervisor, coaches and teachers) in principal learning experiences. Analysis indicates that the design of the supports in the Roosevelt context provided opportunities for principals to develop new ways of knowing, doing, and being in their school contexts.

First, the design of supports in the Roosevelt context fostered the development of a new social definition of the role of the principal. A key design characteristic seems to be that principals rarely were learning with only other principals. The principal supervisor, mathematics coaches, and teachers were often present as principals engaged in the designed learning supports. Principals and coaches participated together in out-of-school sessions as well as in-school contexts such as Math Labs and PLCs. In doing so, principals and coaches engaged together discussing specified forms of practice and co-constructing what their roles in these spaces were. In addition, principals, coaches, and teachers experienced Julie's modeling of the principal role in teacher learning spaces together. Often Julie would describe to teachers what they might notice the principal and her doing as leaders (e.g., "I like to use classroom visits as an opportunity to verbally reinforce [student hand signals used in discussion]"). In other cases, she would

narrate the benefit of principal participation to teachers. For example, in one Math Lab, Julie told teachers that they would have "much richer" conversations with their principal because she was "learning alongside them." Data suggest that as a result, principals, coaches, and teachers developed a mutual understanding of the expected forms of principal participation in school contexts. Across interviews with all three role groups, there were similar themes in response to questions about what the role of the principal was in supporting teacher learning. For example, in one school the principal described the importance of his role in "modeling the learning…taking those risks with teachers." At the same school, all four teachers and the coach interviewed mentioned the same idea. Across all interviews, teachers conveyed that while the new forms of principal practice (such as participating in professional development and trying out new forms of instruction with teachers) were different than they'd experienced with previous principals, they now expected those forms of practice from their principals. Thus, there is evidence that the learning supports helped foster new community definitions of competent practice for principals, which likely fostered principal identification and alignment with lead learner practice.

Second, towards the end of the school year, the design team purposefully included teacher perceptions of new forms of principal leadership in the design of principal learning supports. On two occasions, the design team presented principals with quotations from teacher interviews about their experiences with principal leadership. First, principals engaged as a group with a selection of teacher quotations that highlighted trends that emerged in the interviews. For example, principals engaged in discussion about the PowerPoint slide shown in Figure 7 which summarized ideas teachers had about how they wanted principals to participate in Math Labs and PLCs. Second, in the final learning event in August 2017, the principals received and discussed individualized reports based on interviews with their teachers. These reports provided direct feedback to principals from their teachers and mathematics coaches about their practice. While the ideas that teachers conveyed in interviews about the role of the principal were similar to those shared by design team members during previous principal learning events, hearing the ideas from teachers' perspectives appeared to have a unique impact on principals. For

instance, throughout the school-year, one principal had shown some resistance to Julie's suggestion she not have her laptop open during [grade team meetings] so she could fully participate alongside teachers. After reading feedback from her teachers that they wished she would close her laptop and learn with them, she immediately began leaving her laptop in her office. In this way, conveying teacher perceptions and expectations of principal leadership appears to have supported principals to engage in new forms of participation.

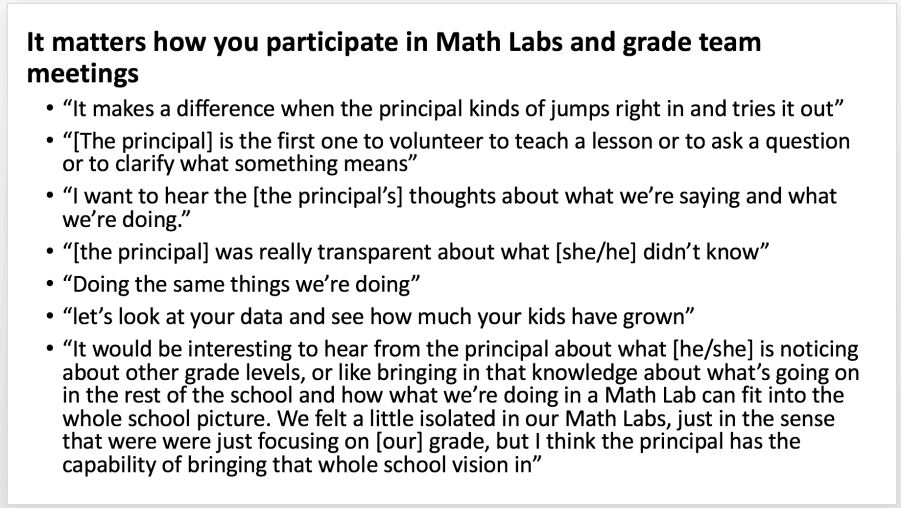

Figure 7. PowerPoint slide shared with principals with quotations from teacher interviews.

In addition, it appears important to attend to teacher perceptions of principal practice as a key contextual feature that may interact with principal learning. Comparative analysis across the five principals indicated that they were all very aware of teacher perceptions of them and their practice and that this interacted with their enactment of practice. For example, two of the principals (Amy and Larry) consistently received positive feedback from teachers about new forms of participation they were enacting. Both of them noted this feedback frequently and it appeared to encourage them to continue to participate in those ways. In contrast, evidence across teacher, coach, and principal interviews indicates that Raquel was not perceived as an effective instructional leader in her school. Raquel was the principal who briefly tried the new expectations for practice but decided early in the school year to no longer participate. In yet a different example, Olivia (principal at Hilltop elementary) faced an ongoing challenge of teachers who had deeply developed expectations about her participation as lead learner based

on their past experiences with Julie as principal. A constant theme in Olivia's participation in learning events was a feeling that she was not quite living up to expectations. This both frustrated her and seemed to serve as motivation for her learning. She was receiving messages from her teachers about particular forms of competence that aligned with lead learner expectations. In a final, example, Irene articulated in her final interview that she felt really comfortable with her role as lead learner with one of the grade teams that she had worked with most extensively, but still felt uncomfortable about it with other grade teams. In this way, analysis indicated that how teachers perceived and responded to principal practice interacted with how principals engaged in learning practice.

Thus, the design of the supports served to not only support principals in redefining their leadership role, but also involved the community around the principals (notably, teachers and coaches) in redefining the role of principal as well. From a sociocultural perspective, an individual's participation in practice has a reciprocal relationship with social definitions of competence (Wenger, 1998). It follows, then, that to foster principals' development of fundamentally new forms of practice, their broader community must also be engaged. The more that the intended forms of leadership are expected from the community, the more likely that principals are to want to align and participate in new forms of practice.

4. Attend to and adjust principals' broader context to support new forms of leadership.

A final characteristic of the design in the Roosevelt context was that the district leadership attended to aspects of the broader school and district contexts that might interfere with principals taking on new forms of practice. These contextual aspects included: instructional materials, metrics for gauging improvement, and expectations of other district leaders, including the superintendent. For the purpose of this chapter, I provide a few illustrative examples.

First, the new expectation that principals attend and participate in teacher learning structures required that principals not be pulled away to attend to managerial or discipline issues as much as they previously had. As a result, part of the initiative involved redefining the role of the assistant principal to have primary responsibility over all school discipline issues. Principals described this redefining of roles as crucial in supporting them to be present in teacher learning spaces. In schools where the assistant

principal did not fully take on their responsibilities, principals struggled to engage fully as lead learners. For instance, Amy reflected in her interview that as her assistant principal began to fall behind on responsibilities, she had to step in, which she said, "definitely impacted my ability to be in classrooms, and truthfully, to be able to engage in a deep way." Thus, attending to the roles and learning of other leaders in the building appeared to be an important contextual aspect to attend to if principal learning was to occur.

A second example related to teacher hiring. Based on previous experience at Hilltop Elementary, the district leaders realized the importance of principals being able to hire teachers that were ready to engage in school-wide learning of new instructional practices. As a result, the district agreed that the schools engaged in the improvement initiative would not receive any "forced placement" teachers, thus allowing principals to select teachers that were a good fit for the developing school communities. This control over hiring decreased the amount of time principals might have to spend managing teachers that weren't good fits for the improvement work, and in doing so opened up more space for principals to engage as instructional leaders.

These examples point to the importance of attending to the broader context in which principals are expected to develop new leadership practices. Learning occurs in relation to broader social contexts and the forms of practice that those contexts make space for and define as competent. If school districts are currently organized around principal leadership that centers on managerial and evaluative functions, then it is likely that key changes will need to be made to district systems, roles, and expectations in order for principals to *become* instructional leaders. Thus, the design of learning supports for principals should go beyond the direct supports they receive and also consider the ways in which the school and district context shape principal practice.

Conclusion and Implications

This analysis puts forth an initial set of design principles for the design of learning supports to foster principal learning of a fundamentally new way of being a leader in the context of specific student and teacher learning goals. These principles provide only a starting point, and should be further tested,

analyzed, and refined in other instructional improvement contexts. However, the principles do provide two important departures from existing research on supporting principal learning. First, in arguing that supports should be designed to foster principal *becoming* in relation to specific forms of practice, these principles are significantly different from past approaches that focus on principal development of knowledge, isolated skills, or vague forms of practice (e.g., Barnes et al., 2010; Honig & Rainey, 2014; Steele et al., 2015). While there are increasing arguments for attending to principal identity (e.g., Crow, Day, & Møller, 2017), there is scant attention to how principal identity formation might be supported, especially in relation to development of new ways of knowing and doing. Second, in contrast to most studies of instructional leadership, these principles situate principal practice and learning in direct relationship to specific student and teacher learning goals. Different approaches to student and teacher learning will surface unique challenges and require particular forms of instructional leadership to be successful. Thus, understanding how to design principal learning supports in relation to specific goals for students and teachers is essential.

It is important to note the crucial role that the principal supervisor, played in orchestrating a coordinated system of learning supports grounded in specific goals for student, teacher, and principal learning. Her consistent presence across all learning structures created an aligned experience for principals in which they received the same message about their intended forms of practice and goals for student and teacher learning across all of their learning supports. In addition, as she was the principal supervisor and evaluated the principals, her role provided accountability structures for principals to take on new forms of practice and align with expectations. Crucially, however, Julie's capacity to engage in the role was facilitated by (a) her past experience as a principal successfully supporting the specific student and teacher learning goals, and (b) the design of her role to support a small number of principals. Both of these factors make this context unique. Not all districts have principals with accomplished forms of practice in relation to specific instructional improvement goals that can take on supporting principal learning. In addition, most districts do not structure the principal supervisor role around a small set of principals; many supervisors support 15-20 principals, therefore significantly changing the amount of

time they can spend with each principal. Thus, a crucial area for future design work and research is how to support the learning of district leaders that is necessary for effective support of principal learning.

Thus, while the exact design of the learning supports in this context are not necessarily replicable, the characteristics identified as important in supporting principal learning of fundamentally new forms of practice in this context may be useful in informing design processes in other contexts. Future research is needed, however, to understand the utility of such design principles for supporting design in other contexts. For example, more research is needed to understand how to most effectively communicate design principles to others engaged in supporting principal learning so that they are useful. In addition, future research should examine how these principles can be adapted to other content areas or approaches to teacher learning: How do other design teams use existing design principles? How can design principles be taken up in different ways based on contextual variation? Comparative studies of efforts to support learning in different contexts based on similar principles might inform our understanding of both how design principles can be useful across contexts, and how contextual elements appear to interact with design.

CHAPTER 5: DECOMPOSING RELATIONAL PRACTICE: EXAMINING DESIGN TENSIONS AND PRINCIPLES

Decades of research on efforts to implement instructional reforms indicate that unless practitioners across a system are supported to learn fundamentally new forms of practice, reforms are unlikely to lead to significant change (e.g., Cohen, 2017; Hubbard et al., 2006; Spillane et al., 2002). However, districts often move forward with reforms without clarity about the specific forms of practice that teachers or school leaders need to learn. Grossman and colleagues (2009) argue that in order to support learning of new, complex forms of practice, there is a need to identify and name – or "decompose" – essential elements of that practice in a way that makes them *learnable.* In many cases, however, intended forms of practice at the center of reforms have not yet been decomposed. For example, reforms might involve broad expectations that teachers incorporate mathematical discussions into their instruction, or that principals participate in teachers' professional development, or that district leaders more actively support instructional coaches. What these new expectations require in moment-to-moment and day-to-day interactions is often left unspecified; what practitioners need to be supported to learn is unclear.

The challenge of decomposing the practice of educational practitioners is not simple. The work of educators on the ground in reforms – teachers, instructional coaches, principals, district leaders – is highly complex. These roles also involve highly *relational* forms of practice in that they occur in interaction and are only effective within particular relationships with others (Grossman, Compton, et al., 2009). Effective forms of practice are highly contextualized; decomposition of effective forms of practice in one school or district will not necessarily translate to other contexts. As a result, decomposition of practice is a potentially important design task for Research-Practice Partnerships (RPP) focused on instructional improvement. As such, this analysis seeks to contribute to understanding of how RPPs might effectively engage in the process of decomposing practice for local contexts and goals. It examines a case of one RPP that engaged in a Design-Based Implementation Research (DBIR; Penuel et al., 2011) approach to design supports for principal learning of new forms of instructional leadership practice. One design process the

partnership engaged in was the decomposition of effective forms of principal practice specific to participation in a mathematics teacher professional development structure, called Math Labs. Working together, a district leader, principals, instructional coaches, and university-based researchers engaged in an iterative process of decomposition, which was intertwined with the design of learning supports for principals. As previous analysis demonstrates (see Chapters 3 and 4), the principals in this particular case developed fundamentally new forms of practice in relation to their participation in Math Labs. In addition, analysis indicates that one important support for this learning was the decomposition of principal practice. Thus, the partnership's work provides a case of a productive effort to decompose relational practice for a particular context in order to make it learnable.

To learn from this case, this analysis seeks to identify the characteristics of the partnership's decomposition design process that might be usable for other partnerships in other contexts. Thus, rather than focus on *what* was specified about practice, this analysis examines what can be learned from *the process by which* the RPP engaged in decomposing practice. To do so, I draw on a *design tensions framework* (Tatar, 2007), which posits that design involves balancing competing goals. While not all teams engaged in a particular class of design task – in this case, decomposition of practice - will make the same final decisions, they will likely encounter similar design tensions. Analysis of these tensions can inform usable theory for others engaged in a process of decomposing context-specific forms of practice. In particular, this analysis examines the characteristics of the design process that appear to represent effective responses to the design tensions that emerged. These characteristics result in a set of proposed *design principles* (van den Akker, 1999) for partnerships engaged in decomposing relational forms of practice. The analysis is guided by the following questions:

1. *What, if any, tensions emerge in the design process of decomposition of relational practice in the context of an instructional improvement initiative?*
2. *Given these tensions, what design principles might guide researchers and practitioners to effectively decompose relational practice for practitioner learning?*

Through analysis of these questions, this manuscript aims to contribute theory that might inform other efforts to decompose complex forms of relational practice so as to support learning and improvement across school systems. In what follows, I first frame the analysis through review of existing literature on (a) decomposition of relational practice, and (2) analysis of design-based processes. I then provide an overview of the particular context and partnership and describe the research approach.

Framing Literature

This analysis is grounded in the sociocultural assumption that learning is not simply the accumulation of new knowledge or skills, but the development of new forms of participation in social practice (Rogoff, 1994; Wenger, 1998). Thus, educational practitioners engaged in instructional improvement efforts must be supported to learn fundamentally new ways of participating in school contexts. To inform supports for this learning, it is, then, necessary to be able to identify or name those intended forms of participation. Breaking apart practice in such a way has the potential to support learners to both see and learn to enact those forms of practice; to imagine trajectories of participation (Wenger, 1998). To further frame this analysis, I draw on two bodies of literature. First, I review the existing literature on decomposition of practice to establish both why it's an important process for RPPs to engage in, and what is currently known about what the process might entail. Then, I describe two frameworks for analyzing design processes and examine how they relate to the existing literature on decomposition.

Decomposition of Practice

The concept of decomposing practice is primarily used in the field of pre-service teacher education, with more recent research engaging in decomposition of the practice of facilitating teacher professional development (e.g., Gibbons et al., in preparation; van Es, Tunney, Goldsmith, & Seago, 2014). The goal of decomposing practice is to identify components of complex forms of practice, such as teaching, in a such a way that novices can both see and learn to enact those forms of practice (Grossman, Compton, et al., 2009). While prior teacher education approaches emphasized development of particular knowledge and beliefs, more recent scholarship aims to understand the components of teaching *practice*

that novice teachers need to be supported to develop (McDonald et al., 2013). These efforts to decompose practice rest on assumptions that teaching is both complex, contextual, and responsive while also involving some set of more stable, learnable components of practice (Lampert & Graziani, 2009).

The emphasis on decomposing practice in a way that is *learnable* is important. Efforts to decompose teaching practice respond to a divide in research on teaching; scholars argue that effective teaching practice and teacher learning – previously examined separately – need to be studied in conjunction (Forzani, 2014; McDonald et al., 2013). As Windschitl and colleagues (2012) write, identified practices need to be "conceptually accessible to learners" (p. 883). As the goal of decomposition is to make complex forms of practice *learnable*, decomposition involves engaging learners with the identified components. In other words, decomposition of practice is not just about identifying components of practice, but also about how those components are *communicated* to learners. Thus, in analyzing the RPP's decomposition of principal practice, I consider both how the partnership identified components of practice as well as how those components of practice were communicated to principals as learners.

This manuscript aims to contribute to the decomposition literature by examining the process by which a RPP might engage in decomposition of particular form of practice. The focus of the majority of studies is to report on identified components of practice, with the process of decomposition described in the methods section (e.g., Sleep, 2012; Windschitl et al., 2012). To decompose practice, researchers tend to rely on a range of combinations of drawing on existing discipline-specific literature or experts on teaching practice (e.g., Kloser, 2014) and analyzing examples of teaching practice to determine key components (e.g., Jacobs & Empson, 2016; Sleep, 2012; van Es, Tunney, Goldsmith, & Seago, 2014). Studies set within teacher education programs often include analysis of how learners interacted with the identified practices (e.g., Windschitl et al., 2012). Taken together, these studies suggest that the process of decomposition of practice might involve (a) drawing on research, (b) examining practice, and (c) analyzing learner engagement with identified components in order to refine them. However, *how* a partnership might effectively engage in these steps is largely unclear.

Analyzing Collaborative Design Processes

Edelson (2002) argues that studying design processes can lead to a type of theory about the process of design itself, that he terms a *design methodology*. A design methodology lays out the people and processes that were involved in the development of a particular design. According to Edelson, a design methodology describes: "(a) a process for achieving a class of designs, (b) the forms of expertise required, and (c) the roles to be played by individuals representing those forms of expertise" (p.115). This study adopts these three elements of a design methodology as an initial framework for analyzing the process by which the RPP worked to decompose practice. Edelson argues that retrospective analysis of design work can expose new theories about the design process that were not evident in the moment. In this way, while design methodologies can provide rich description of a design process, the intention is to also develop knowledge that might be usable by other designers. While the three elements of design methodology identified by Edelson (2002) appear throughout both methodological and empirical literature on design-based approaches, examples of retrospective analyses of the design methodology itself are rare. The majority of retrospective analyses of DBIR approaches focus on the results of the design itself and skim over the specifics of the design process (e.g., Boston et al., 2016; Donovan, Snow, & Daro, 2013). There are also a few examples of retrospective analyses of the design process itself (e.g., Johnson, Severance, Leary, & Miller, 2014; Penuel, Coburn, & Gallagher, 2013). These studies demonstrate the value of analyzing *how* researchers and practitioners engage in the challenging process of collaborative design itself. In addition, there is a need to more fully establish how to communicate findings from analyses of design processes in a way that is useful for partnerships in other contexts, with other goals. Two approaches appear in the existing literature: (1) the development of *design principles*, and (2) the use of a *design tensions framework*.

One suggested outcome of such analysis is the development of *design principles*, or statements about key characteristics of design that seem to support desired outcomes (van den Akker, 1999). Design principles are typically used to describe elements of the design itself (e.g., how a professional development experience should be designed to effectively support teacher learning). However, initial

studies indicate the usefulness of proposing principles that also build theory about the collaborative process of design itself. For example, based on analysis of one partnership, Donovan et al. (2013) propose design principles for both how to productively collaborate, such as: "district leaders have veto power over any proposal regarding the direction of the work" (p.410). In this way, their analysis makes visible their design process in a way that might be useful for other partnerships engaged in collaborative design.

A *design tensions framework* (Tatar, 2007) assumes that throughout a design process, designers must grapple with design tensions between competing goals. From this perspective, design is not about solving problems, but about balancing goals and developing approaches that provide compromise (Tatar, 2007). Other scholars of DBIR processes argue that adopting this framework supports analysis that surfaces elements of design work that are flexible and adaptable to other contexts, rather than focusing analysis on the outcomes of one design effort (e.g., Johnson, Severance, & Leary, 2016). For example, while the specific design decisions involved in decomposing a relational form of practice may vary from context to context, RPPs are likely to experience similar design tensions as they engage in the similar design tasks. Thus, examination of the design tensions may support other design teams to anticipate and respond to those tensions. In what follows, I examine what the existing literature on the specific design task at the center of this analysis, decomposition of relational practice, suggests about potential design tensions associated with the task.

Design Tensions of Decomposition

One important contribution of the decomposition literature is the suggestion of a two broad design tensions to decomposition that provide a starting point for analysis: (1) breaking practice into learnable pieces while maintaining integrity of the whole, and (2) breaking practice into learnable pieces while supporting adaptation and improvisation. In what follows, I explore each of these tensions.

Breaking practice into learnable pieces while maintaining integrity of the whole. First, there is a tension between the goal of decomposing practice into learnable components and the goal of supporting learners to understand complex practice as a whole (Ball & Forzani, 2009; Janssen et al., 2015). While learners need to develop individual aspects of practice, they must also be able to reconnect

them. For example, for teachers learning to lead a mathematics discussion, one component of practice is to elicit student ideas. While this is a challenging component to develop on its own, it is only one component of practice that teachers must develop in order to effectively facilitate students in a discussion. Teachers must also learn to elicit student thinking *in coordination with* other components of practice such as, orienting students to one another, representing student thinking, and guiding the conversation towards a mathematical goal. At the same time, the "whole" of practice can be interpreted at many different levels as practice is ongoing and situated. The enactment of one component of practice occurs within that particular interaction while also being situated within a series of other interactions, social contexts, and relationships (Dutro & Cartun, 2016; Lampert, 2010). Thus, a challenge to decomposition is how to both identify components that can be learnable while also capturing how those components fit into the "whole" of practice. In engaging in this challenge, decisions are inevitably made about which "wholes" and aspects of practice are most important for learners to engage with (Ball & Forzani, 2009; Dutro & Cartun, 2016). Grossman, Hammerness, and McDonald (2009) proposed a preliminary set of principles for identifying components of practice, shown here with revised language to reflect leaders rather than teachers:

1. Practices that occur with high frequency
2. Practices that novices can enact
3. Practices that novices can actually begin to master
4. Practices that allow novices to learn from their practice about instruction, teacher learning, and leadership
5. Practices that preserve the integrity and complexity of leadership
6. Practices that are research-based and have the potential to improve teacher practice and student achievement (p. 277).

These preliminary principles further surface the design tension of breaking apart practice while maintaining the integrity of the whole. While the first three emphasize identification of components of

practice, the final three highlight the need for those components to support learning of the complex practice as a whole.

Within this design tension is the challenge of identifying the effective grain size and structure for decomposition of practice. Existing research provides a range of approaches to grain size. Researchers tend to zoom in on a particular domain of practice to then identify components. The language used to name this decomposition varies with scholars using terms such as "practices", "moves", or "tasks" (e.g., Jacobs & Empson, 2016; van Es et al., 2014). For example, Borko and colleagues (2014) propose a framework of facilitation *practices* specific to the domain of planning and orchestrating discussions with teachers in video-based professional development. In effort to further specify practice to support pre-service teacher learning of the domain of "steering instruction toward a mathematical point", Sleep (2012) further decomposed each task (e.g., "making sure *students* are doing the mathematical work") into strategies for accomplishing that task (e.g., "asking questions that engage students in mathematical reasoning") and a set of problematic issues that can arise for teachers as the learn to enact the task. Responding to challenges they identify in supporting learners to *recompose* practice into a whole, Janssen and colleagues (2015) make a conceptual argument that practice should be decomposed by the function, or impact that they need to serve and be organized in a hierarchical system of different modules at varying levels of specificity. However, there are no examples yet of what this might entail. Thus, there is not clear agreement in the field about the most useful grain-size, structure, or naming of components in decomposition of practice.

Breaking practice into learnable pieces while supporting adaptation and improvisation. Second, there is a tension between the goal of decomposing practice into actionable components and the goal of supporting learners to develop the ability to be adaptive and improvisational in enacting complex, relational forms of practice (Janssen et al., 2015). As Grossman and colleagues (2009) write, complex, relational forms of practice involve conditions of uncertainty because they interact with human relationships that are "notoriously unpredictable" (p. 2059). Each situation a teacher or principal encounters requires improvisation and professional judgement in order to know which forms of practice

to use and *how* (Forzani, 2014). Thus, in decomposing practice, there is a danger of simplifying it in a way that reduces the complex and relational nature of the work (e.g., Zeichner, 2012). Scholars argue that to avoid this pitfall, decomposition must balance the goals of (a) specifying practice in a way that makes it learnable while (b) grounding the identified components of practice in a particular view of the practice as complex, situated, improvisational work (Forzani, 2014; McDonald et al., 2013). As McDonald and colleagues (2013) argue, the goal of decomposition "is not consensus on a final set of universal teaching practices, but instead a continual dialogue within the field and among scholars over how to conceptualize aspects of practice that support practitioner learning of high-quality instruction" (p. 381). In addition, scholars argue that this tension emphasizes the importance of accompanying identification of components of practice with the design of pedagogies for supporting learning of those components that highlights the flexible, improvisational nature of the work (McDonald et al., 2013).

Thus, the literature on decomposition of practice suggests design tensions that are likely present in the process of decomposing practice. While these tensions have been explored, there are two ways in which the case at the center of this analysis departs from existing research. First, the extant literature primarily seeks to understand decomposition in contexts of pre-service teachers who are new to the profession. The case at the center of this study involves decomposing intended forms of principal practice so that it is learnable for principals who have already engaged in the profession using other forms of practice. As part of a district instructional improvement initiative, the goal was for principals to fundamentally transform their leadership practice. Second, the existing literature on decomposition of practice reports on analytic processes that researchers engaged in independently, without practitioner involvement. In the case of this study, the decomposition process was conducted through a collaborative process between researchers and practitioners. This analysis seeks to understand how, if at all, the design tensions identified in existing literature on decomposition of practice emerge in this case. In addition, I examine whether additional design tensions also emerged. I then use these tensions as a lens for understanding what about this particular case of a design process might inform broader principles for how RPPs might effectively engage in decomposition.

Principal Participation in Teacher Learning: A Need for Decomposition

In the context of this study specifically, previous analyses of the role of the principal (Julie) at Hilltop revealed that her participation in Math Labs was important for supporting teacher learning. As principal, Julie participated in all of the Math Labs alongside teachers, and data collected during the time suggested that this participation served to model participation in collective learning spaces and foster teacher risk-taking and trust (for detailed description of her practice see Gibbons et al., 2017). However, as the design team engaged in supporting principals to engage effectively in Math Labs, a more specified understanding of the role of the principal was necessary.

The existing literature on principal instructional leadership provided minimal guidance as to what might be important about principal participation in Math Labs. Studies frequently mention a category of instructional leadership related to supporting, managing, or coordinating professional development for teachers (e.g., Hallinger, 2005; Leithwood et al., 2004). Some researchers find that one element of this is for principals to participate alongside teacher in professional development (Blase & Blase, 1999; Coburn, 2005; Fink & Resnick, 2001; Nelson & Sassi, 2005; Robinson et al., 2008). Research suggest potential benefits of principal participation in teacher learning, including: fostering collaboration, trust, and risk-taking by modeling ways of engaging with colleagues in learning (Blase & Blase, 1999; Bryk & Schneider, 2003; Little, 1982; Ponticell, 2003; Tschannen-Moran & Gareis, 2015), framing instructional improvement initiatives in a way that conveys the importance of the improvement work and supports teacher sensemaking of new ideas (Coburn, 2005; McLaughlin & Marsh, 1990), and supporting principal learning of new content and pedagogy which can improve perceived alignment between new learning and principal expectations (Bryk, Sebring, Allensworth, Luppesco, & Easton, 2010; Coburn, 2005; Nelson & Sassi, 2005). A few studies specify a little further what principal practice in teacher professional development might entail. For example, Nelson and Sassi (2005) and Coburn (2005) both describe principals who engaged in professional development as learners alongside their teachers by asking questions and publicly questioning their assumptions about instruction. Research suggests that principals might also participate in teacher professional development in order to frame messages about expectations

(Coburn, 2005, 2006), or promote reflection about teaching practice (Blase & Blase, 1999).

Thus, while research indicates the potential of principals participating in teacher professional development as a key part of their role in instructional improvement initiatives, the extant studies provided limited guidance for the design team about *how* principals should participate. As the idea of participating as a learner alongside teachers is significantly different than the traditional role of the principal, there was a need to decompose principal practice in professional development in order to make it *learnable* for principals. In addition, while a few existing studies (Coburn, 2005; Nelson & Sassi, 2005) specify the student and teacher learning goals at the center of the reform being studied, none of the existing literature on principal participation in professional development specified the approach to professional development. Given that different approaches to professional development engage teachers in very different kinds of learning experiences, it seemed important for the design team to decompose principal practice within the very particular context of Math Labs. Thus, the case at the center of this analysis provides an opportunity to understand how and RPP might effectively engage in decomposing a relational form of practice in the context of specific goals for students, teachers, and leaders.

Data Sources and Analytic Approach

For this analysis, I isolated data that supported understanding of the design process for decomposition of principal practice in relation to design tensions that emerged. Primarily, the analysis drew on data collected during design team meetings and principal learning events. Design team meetings and documents provided data on how the team engaged in decomposition of principal practice. Principal learning events provided insight into how the design team communicated the components of practice to principals as learners. In addition, in order to further understand the design tensions of decomposing principal practice, I analyzed interview transcripts from principals, coaches and teachers. Principal interviews provided evidence as to how principals perceived, made sense of, and engaged with the design team's communication of decomposed practice. Coach and teacher interviews also informed understanding of how principals' engagement in new forms of practice were perceived by their staff members. Across all of these data sources, analysis focused on the portions of data that involved (1) the

design team's process for decomposition of principal practice in Math Labs, (2) principals' engagement with the decomposed practice, and (3) interview responses that discussed principal practice in Math Labs.

Analytic Approach

The first goal of analysis was to develop a rich description of the design process specific to decomposition of principal practice in Math Labs. Analysis examined all data sources in chronological order and aimed to understand how the process unfolded. To do so, I drew on Edelson's (2002) framework to identify (a) key steps and activities in the design team process, (b) the expertise or sources of information that informed those steps, (c) the roles played by individuals on the design team. At the same time, I identified what was specified about principal practice in Math Labs during this process by identifying both the development and refinement of conjectures and how those conjectures were communicated to principals as learners. Following this analysis, time-order matrices (Miles & Huberman, 1994) were developed to track development of design activities and the decomposition of principal practice over time. Matrices were designed to draw out patterns and relationships over time between (a) developing conjectures about components of principal practice in Math Labs, (b) communication of those conjectures to principals, (c) particular design team activities and tasks, (d) the roles and expertise of individual design team members. Analysis of these matrices provided a rich description of how the design process unfolded.

The second goal of analysis was to identify and analyze the design tensions in the team's process of decomposing principal practice. I began with an analysis of the entire data corpus for evidence of design tensions, or points where conflicting goals surfaced related to the task of specifying principal practice in Math Labs. I looked for examples of both the design tensions suggested by the decomposition literature and additional design tensions that emerged. I also noted where, if at all, the suggested design tensions did not emerge. The identified design tensions then become the units of analysis for a subsequent phase of analysis in which I analyzed: (1) how the tensions emerged, (2) how understanding of the tensions evolved over time, (3) how tensions impacted the design process, and (4) how the design team responded to those tensions. Based on these analyses, I made connections back to the design process to

develop proposed design principles (van den Akker, 1999) that appeared to be effective in responding to the tensions and might be applicable to other design teams.

Findings

Retrospective analysis of the RPP's process revealed important insights into what a collaborative process of decomposition of relational forms of practice might entail. In this section, I examine these insights in three parts. First, I provide a brief overview of the process as a whole as this particular partnership engaged in it. Second, I identify the design tensions that emerged in analysis of the process that appeared to be potentially inherent to the design task of decomposing relational forms of practice. Finally, I examine key design principles that describe characteristics of the design process that appear to have supported productive responses to the identified design tensions.

Overview of Design Process

In this section, I provide a descriptive overview of the design team's process for decomposing principal practice for Math Labs. While the description of the specific process is unique to the particular design team and instructional improvement context, it provides a backdrop for understanding the design tensions, activities, and principles that emerge and may be applicable to other contexts. To overview the design process, I highlight three key developments in the RPP's understanding of what mattered about principal practice. These developments are represented by three different documents that captured different levels of understanding of principal practice. As shown in Table 8, the development of each document involved different roles, sources of information, and design activities. In addition, each effort to decompose principal practice was communicated to principal learners in a different way. In what follows, I provide a brief description of the documents, and the elements of the design process that they each represent.

Table 8. Overview of of main documents associated with design developments in the decomposition process.

Document	Roles Involved	Key Activities and Sources of Information	Communication to Principals
1. "Plates" document	Julie, university-based researchers	Developed by Julie following a design team meeting. Based on design team members' past experiences at Hilltop Elementary and other schools.	Provided as handout to principals throughout school year, and consistently referenced.
2. Principal role in Math Labs document	Julie, university-based researchers	Julie's reflection on her participation in, and observations of, Math Labs, debriefed through "brain dump" conversations with a researcher. Later revised to include teacher perspectives from interviews.	Served as tool for Julie to communicate with principals in school settings. Was not provided to principals in handout form until end of school year.
3. Principal role in *phases* of Math Lab document	Julie, university-based researchers, principals and school-based mathematics coaches.	Developed collaboratively in a leader professional development session. Based on principal and coach experiences in Math Labs.	Principals were involved in the collaborative development of document.

1. The "plates" document. The "plates" document emerged as the first effort by the design team to specify what mattered about the role of the principal in the particular instructional improvement initiative. During initial design team meetings, Julie shared from her experience as a principal leading the same instructional improvement work, and the researchers shared what they had learned from their research efforts at Hilltop Elementary as well as in other districts that were implementing similar approaches. Based on this conversation, the team developed what became known as the "plates" in that they detailed the key "plates" that principals needed to keep up in the air. These plates, shown in Figure 8, consisted of one central plate, which emphasized the principal role of supporting teachers to incorporate new learning into their instructional practice so as to transform student learning experiences. Surrounding that central plate were four additional plates that articulated other parts of the role that seemed important. This initial level of decomposition was not specific to Math Labs, but served as the initial articulation to principals of expectations for their practice. The document was shared with principals during the first principal professional development session and continued to be used throughout the school year.

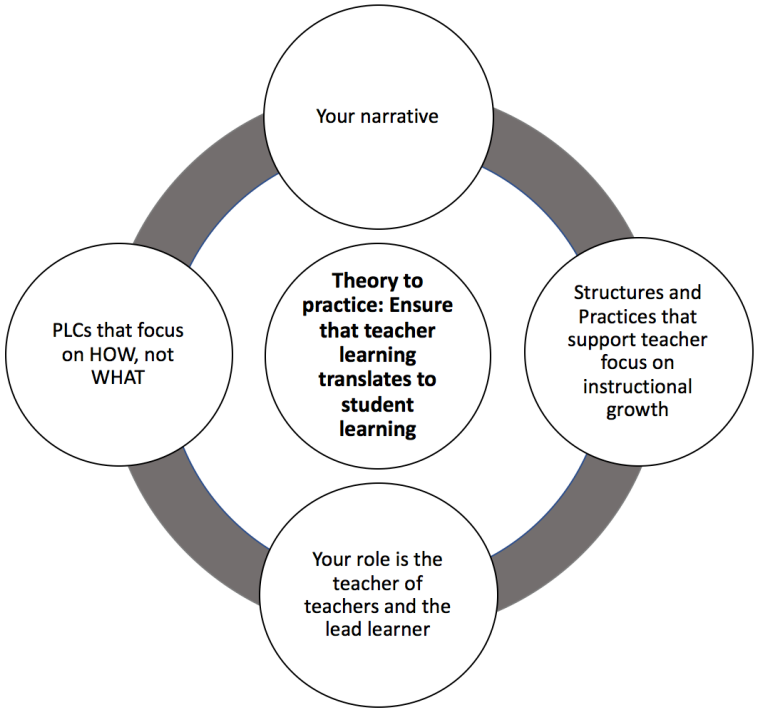

Figure 8. The image shared with principals of the "plates" they needed to keep up in the air.

2. **Principal role in Math Labs document.** The second document the design team produced provided a next step in specifying what mattered about principal practice, this time specifically in Math Labs. Once the school year started, Julie began attending Math Labs alongside principals to both model leadership practice and support principals to begin to take up new forms of practice. Very quickly, however, it became apparent that the level of articulation of principal practice as conveyed in the "plates" document was not enough. Julie found that principals were feeling frustrated and struggling to understand how they should participate in Math Labs. While Julie felt that she was modeling the forms of practice clearly, it was challenging for principals to understand what she was doing. When Julie surfaced this challenge during a mid-September design team meeting, the team decided to attend more closely to what the role of the principal needed to be in a Math Lab so that they could more effectively communicate that to principals. Given that Julie was in Math Labs already, the team decided to try a routine of having Julie reflect after each Math Lab about what she noticed about her own participation and the principals' participation by either (a) calling one of the researchers for a quick (20-30 minute), recorded

conversational “brain dump,” and/or (b) taking a photo of her notes taken over the course of the Math Lab and sending to the researchers.

After five of these “brain dumps”, the design team tried to process what they had learned so far and began to look for themes in what mattered about principal participation. In the conversation that followed, an initial framework was developed of five forms of participation that emerged across the “brain dump” conversations and Julie’s experience. Subsequent “brain dumps” and design team conversations supported revision of this framework, as well as insight gained from interviews with teachers at the end of the school year. By June 2017, the framework included ten identified components of principal practice. An excerpt is shown in Figure 9. The framework was not initially shared with principals in document form, but primarily became a tool for the design team to think through communicating this decomposition of practice to principals through Julie’s participation and coaching in Math Labs. The document was shown to principals at the end of the school year during a principal group meeting.

Function/Goal	*Working Definition/Explanation*
(1) Clarifying expectations	Principal role is setting expectations for how this will get implemented, framing new learning in larger "story" of the work. While coaches are introducing new practices, content, principal role is to situate that in larger work, state clear expectations for how new learning should show up in the classroom (e.g., is the expectation “go play with it” or is the expectation “this should be happening in this way”)
(2) Contextualizing the magnitude of change.	Principal supports teachers to see a seemingly big change in math instruction in relation to larger work. Lessening how new things feel to teachers. Example: Connecting new ideas in math instruction (e.g., summary phase of a lesson; conferring) to existing literacy practices.
(3) Monitoring quality of teacher participation	Monitoring for teacher participation and engagement and making moves to support teachers who are not fully present.
(4) “It’s okay to be messy.” (or “You can’t look good and get better at the same time.”)	Providing constant reassurance that you just expect approximation and experimentation at this point, being explicit about acknowledging how messy and challenging this work is -- and how that’s okay.
(5) Setting classroom expectations	Addressing students before enactment begins to frame experience (has impact both on teachers and students). Using enactments as a time to standardize smaller expectations about classroom instruction (e.g., quiet thumbs, agree signal, think time, turn and talk).

Figure 9. Excerpt of design team’s decomposition of principal practice in Math Labs.

3. Principal role in *phases* of Math Lab document. An additional layer of decomposition of principal practice was added during November professional development session with principals and coaches. During this session, the design team engaged principals in an activity in which they collaboratively filled out a document that aimed to break down (a) the purpose of each of the phases of a Math Lab, and (b) the coach and principal roles in each of these phases. During this activity, design team members contributed some of the ideas that were part of the drafted framework for principal participation, but they primarily opened up spaces for the coaches and principals to develop a collective understanding based on their experiences thus far. Figure 10 shows an excerpt from the created document in which coaches and principals detailed what they thought about the coach and principal roles in relation to the phase of a Math Lab in which teachers are supported to debrief their collaborative enactment of instruction in a classroom. It's important to note that principals were asked to think about their role in relation to the "plates" document described previously.

Phase	**What is the purpose of this phase? What are the goals of this phase?**	**What is the coach's role during this phase?**	**What is the principal's role during this phase <u>in relation to the plates?</u>**

Debriefs of enactments (classroom visit)	• Reflection of what worked/what didn't work, what felt challenging, what felt natural
	• Dig into students' thinking & what they did
	• Connecting to the "so what?"
	• A space to position teachers competently & work on status within teams
	  ○ Orient teachers to one another
		• Posing questions (planned in advance)
		  ○ What was challenging?
		  ○ What felt natural?
		  ○ What did it feel like to be in the classroom together?
		  ○ What would we want to try differently next time?
		  ○ What is the evidence that kids are taking up the thinking/talk moves?
		• Making space for people who taught to share first
		• Maintaining focus on student thinking
			• Paying close attention to status piece, thinking about how you celebrate/recognize what teachers are doing
			• Focusing the conversation on student thinking/work vs. what teachers did or did not do.
			• Setting, reinforcing expectations -- pulling threads back to what's important.

Figure 10. Excerpt from the document created by principals and coaches of decomposition of Math Lab practice.

Design Tensions

Across the design process briefly described above, there was evidence of design tensions that appeared to be intrinsic to the design task of decomposing relational forms of practice. Design tensions were evident where the design team needed to weigh competing goals as they made design decisions. In this section, I briefly explain each tension and how it surfaced for the design team. I start with the two design principles evident in the decomposition literature (breaking practice into pieces while maintaining the complexity of the whole, and breaking practice into pieces while supporting adaptation and

improvisation) emerged in this particular decomposition process. Then, I describe three other design tensions that were evident in this particular case of decomposition: (1) breaking practice into pieces while also attending to relational work, (2) balancing accountability and negotiability, and (3) weighing the urgency of reform with the time necessary for learning. While I will briefly examine each of these tensions individually, it is important to note that they do not occur in isolation and are deeply interconnected. Following this section, I more deeply explore what can be learned from how the design team responded to these tensions.

1. Breaking practice into pieces while maintaining complexity of the whole. The tension between needing to break practice into pieces while still maintaining the complexity of the larger "whole" of practice is articulated in the existing decomposition literature. While on one hand, a goal of decomposition is to name pieces of practice, in order to be effective this must be done so without losing sight of how the pieces fit together into effective practice. This tension was evident in the design team's progressive specificity of the grain-size of the decomposed practice. In addition, the design team grappled with how to support principals to understand not only specific forms of practice, but also how those forms of practice related to their larger role as instructional leaders.

2. Breaking practice into pieces while supporting adaptation and improvisation. This second design tension is also articulated in the existing decomposition literature. While decomposition aims to break practice into learnable, named pieces, the nature of relational forms of practice is that they are necessarily responsive to in-the-moment interactions. These competing goals were evident in a number of ways throughout the design team's process. First, in conversations with principals about their practice in Math Labs, principals often communicated one of the following sentiments: (1) but what am I *supposed* to do? or (2) "but what Julie did in her school won't work for my teachers or for my personality." In these comments, principals suggested tension between what the "right" way to participate was, and the need for them to engage in ways that were responsive to their unique contexts. Second, in design team conversations, team members weighed how to convey the expected forms of practice to principals in a way that also supported them to effectively make those forms of practice their own.

3. Breaking practice into pieces while also attending to broader relational work. The existing literature on decomposition is situated within relational forms of practice. Analysis of the design team's process indicates that there was a tension between naming forms of practice and attending to the necessary relational work that is important to explicitly name. While this tension is related to the previous tension about improvisation and adaptation, it also extends beyond that. Principal practice needed to not only respond to in-the-moment interactions, but also needed to be understood as situated within broader relationships between principals, teachers, and other roles. How principals enacted practice in the context of a Math Lab, and how teachers responded was directly related to the relationship they had established outside of Math Labs in countless other interactions. Recognition of the importance of these broader relational aspects of principal practice occurred throughout design team conversations. However, throughout the school year, it was not articulated to principals as a key aspect of their practice as instructional leaders in Math Labs. Additionally, the importance of the relational work for principals was never articulated by the design team in any of the produced documents. So, while this tension is evident throughout the process, the design team was not intentionally aware of it until towards the end of the school year. The tension surfaced explicitly in interviews with principals, coaches, and teachers and ended up being what Julie articulated as her major learning at the end of the year.

4. Balancing accountability and negotiability. An additional tension that emerged in analysis of the design process was the competing goals within the reform context of both holding principals accountable for new forms of practice while also allowing space for negotiation and adaptation. In order to support principals to fundamentally change their day-to-day practice, Julie needed to hold them accountable for developing new forms of practice. Simultaneously, the design team discussed that if the level of accountability was too strict, principals might resist because they might not feel like the forms of practice were valuable or impactful yet. Thus, this tension primarily surfaced in relation to how to effectively communicate the decomposed expectations for practice to principals in a way that held them accountable for trying new practice but also allowed space for them to negotiate expectations in relation to their own contexts.

5. Weighing the urgency of instructional improvement with the time necessary for learning.

A final tension evident in analysis of the design team's process was how to balance the urgency for highly developed instructional leadership to be enacted to support teacher and student learning with the time it was necessarily going to take for principals to learn those new forms of practice. This tension was evident in the design team's efforts to determine what the important, and learnable forms of practice were. While the team had the example of Julie's practice, her enactment of practice during Math Labs was the result of extensive experience and learning over five years. Her practice on its own could not represent what the principals who were new to Math Labs needed to learn right away. The tension was also evident in the design team's discussion about how to structure Julie's role for communication of intended forms of principal practice to principals. Julie found it challenging, in the moment, to decide when to model a form of practice, when to give space for principals to approximate the practice, and when to leave space for the principals, as learners to not be ready yet for a particular form of practice. Part of the tension in this case, was that Julie felt pressure to support teacher learning as much as possible in Math Labs, given the overall goals of the instructional improvement initiative and the urgency she felt to support change in classroom instruction. Thus, this tension was evident in the team's decisions about how to identify what was learnable for principals, and how to support that learning in the urgent context of instructional improvement.

Design Principles

The team engaged in design decisions and activities that appeared to support effective responses to the tensions outlined above. It's important to note that the tensions individually described above are deeply interconnected. For example, in order to attend to the complexity of practice as a whole or the time necessary for learning, it is necessary to also attend to the ways in which practice needs to adapt and be improvisational within particular, relational contexts. For this reason, it is not particularly useful to examine how the design team responded to and negotiated individual tensions. Instead, this section explores key aspects of how the team responded across these tensions. Following van den Akker (1999), I present these themes in the form of design principles. These design principles, shown in Table 9, describe

characteristics of the design process that emerged as supporting effective decomposition of principal practice. As described above, the process of decomposing practice emerged over time for the team; these design principles were not articulated by the team during the process, but emerged during retrospective analysis of the process. These design principles are not meant to be exhaustive, but rather the goal is to highlight four principles that appeared to most clearly respond to the design tensions described above. Following the definition of decomposition of practice, these design principles inform both how to go about effectively breaking apart practice into components and how to productively communicate them to learners in a learnable way. For each principle, I explore how the design team enacted it through key design activities and how the design principle responded to the design tensions named above.

Table 9. Design tensions and principles.

Design Tensions				
Breaking practice into pieces **vs.** maintaining complexity of the whole	Breaking practice into pieces **vs.** supporting adaptation and improvisation	Breaking practice into pieces **vs**. attending to broader relational work	Accountability **vs**. negotiability	Urgency of instructional reform **vs.** time necessary for learning
Design Principles				
Decompose by function and at different, nested levels of specification				
Decompose practice in relation to context				
Decompose practice in relation to other roles				
Involve a range of perspectives and roles in decomposition				

1. Decompose practice by function and at different, nested levels of specification. The first design principle evident in the team's decomposition process was that practice was decomposed in a way that captured the *function* of practice and that the decomposition involved a system of nested levels of specification. Rather than capturing what a principal needed to do or say, the design team ended up breaking apart practice into the different functions that a principal might need to serve in any given moment during a Math Lab. For example, as shown in Figure 10, the team articulated that principals needed to "celebrate/recognize what teachers are doing" and "set and maintain expectations." The team did not specify in writing exactly *how* a principal might achieve these functions, but rather sought to

articulate what the functions were. This use of function to decompose practice was evident across both how the decomposition was written down and how it was communicated to principals. This decomposition by function also occurred at different grain-sizes, which in retrospective analysis can be seen as a nested system of functions. At the most specific level, the team specified functions that principals might aim to serve through their practice in particular phases of a Math Lab. However, this decomposition was situated in relation to broader functions articulated by the design team's document articulating the role of the principal in Math Labs more generally, and through the plates document, which put forth functions of principal practice as a whole (e.g., ensure that teacher learning translates into student learning). Decomposition into this system of nested functions appears to have supported a productive response to a few design tensions.

First, decomposing practice by function supported the team to effectively respond to the design tensions related to breaking practice into pieces while also attending to the complexity of practice as a whole and the need for adaptation, improvisation, and relational work. For Julie, the decomposition process helped her think about the kinds of conversations she would have with principals, in relation to supporting them to understand their function. She expressed in a design team meeting that she needed to work with principals to co-construct "what should we be doing, what's the ultimate purpose of having the leader there in the learning…what's your job, your role, your contribution. I think that's really good to have a common purpose." The functional decomposition influenced how Julie communicated with principals about expected forms of practice. Her feedback to them tended to be structured in form of questions to principals, such as "How can you use the classroom visits to model/set expectations for how kids and teachers should interact?" In this way, Julie wasn't telling principals what do specifically, but was supporting them to understand the purpose their practice needed to serve and to develop their own approach for doing so. These functions were also communicated by highlighting teacher responses and perspectives. For example, the design team used teacher interview quotations to convey to principals how teachers were experiencing the function of new forms of practice. As explored more fully in a separate

analysis (see Chapter 3), evidence from end-of-year interviews and observations of principal practice suggested that principals began to internalize these functions of their role in Math Labs.

Decomposing practice by function also supported an effective response to the tension of balancing the urgency of instructional improvement with the time necessary for learning. The articulation of functions allowed for a range of different enactments of practice that might achieve that function, across different levels of principal experience and learning. Julie's enacted practice towards the function of pressing on teacher's visions of mathematics instruction looked different from how one of the principals she was supporting enacted that function. If the team had tried to articulate more specifically what Julie did, it likely would have been unattainable at first for the principals as learners. The functional focus allowed the design team to focus on the underlying purpose of what Julie did in practice, rather than the specific moves she made. Expressing these as functions allowed for space for principals to serve particular functions in ways that didn't require the level of experience or knowledge that Julie had accumulated over the years. In this way, the use of functional decomposition supported the design team to balance the goals of both supporting the urgency of instructional improvement with the time necessary for principals to learn new forms of practice.

2. Decompose practice in relation to specific contexts. Another important feature of this nested system of decomposed practice was that the team sought to specify practice in way that was contextualized within the Math Labs structure. In particular, retrospective analysis indicates that decomposing principal practice in relation to a specific structure (as shown in Figure 9 and Figure 10), but also reflected broader expectations for the principal role (the "plates" as shown in Figure 8) supported principal learning. This principle seems to have the potential to support a productive response to all five design tensions, for the purposes of this manuscript, I highlight connections to the tensions involving attending to the adaptive and improvisational nature of practice, and balancing the urgency of instructional reform with the time necessary for learning. I also discuss a challenge evident in relation to the tension of breaking practice into pieces while also attending to relational work.

One important element of the process was that the design team started with decomposition of what they later realized was the most straightforward and predictable of the structures principals were in as leaders (Math Labs). In the second half of the year, the design team began to think about expanding the decomposition of practice to other structures (such as teacher grade team meetings). As Julie started going to grade team meetings with this lens, she realized the different level of complexity within the structure. She explained to the rest of the team that in these meetings there was a lot more variability in what teachers and instructional leaders might be trying to work on: "In a lab, there's content, and everyone gets sucked in and process it kind of on an equal basis. But the teachers come into a [grade team meeting] with [lots of questions and concerns], and the coach has an agenda, and the principal might have a thing she's looking for, and they move a lot faster than labs." In this way, the team realized that the adaptive and improvisational work was much more challenging in other teacher learning spaces because the structure was not as predictable as in Math Labs. By zooming in on Math Labs specifically for the majority of the first year of the initiative, the design team appears to have supported the principals to develop an understanding of their role in one space (see Chapter 3). There is potential, then that principals might be able to learn to expand their understanding of that role to other, more complex spaces. In this way, the design team balanced the design tension of both supporting the urgency of instructional improvement while also leaving time for principals to learn. In addition, focusing first on the structure with least contextual variation, appears to have supported principals to take up some of the improvisational nature of practice in a more controlled setting which might then expand to other spaces. Rather than expecting development of fundamentally new forms of practice across all areas of principal practice at once, the team focused on decomposition of one space at a time.

Another apparent benefit of decomposing practice specific to the Math Lab structure was that the design team was able to support principals to make sense of their function in relation to the particular goals of that structure. A theme that emerged across the design team's learning supports for principals was a continued emphasis on building principal understanding of what Math Labs were, the teacher learning goals they aimed to support, and the key elements of the structure that fostered those goals. For

example, in the activity in which principals and coaches engaged in decomposing their roles in Math Labs (shown in Figure 10), they first thought through the goals of each phase of a Math Lab and then identified elements of their practice in relation to those goals. For instance, as shown in Figure 10, they specified that goals of the debrief phase included to "dig into student's thinking", "connect to the 'so what'", and "position teachers competently." These goals of the particular phase of a specific professional development structure connected to the functions that principals then identified for their own roles during that time, such as "focusing the conversation on student thinking/work vs. what teachers did or did not do." Other teacher professional development structures might have different goals; therefore, it was important to support principals to understand their practice in relation to the goals of the specific context.

It is important to note a challenge that emerges in the articulation of this design principle which suggests the value of decomposing practice in relation to very specific contexts. In zooming in on this space, the design team neglected to attend to some of the relational work that surrounded principal practice in Math Labs. During final interviews, it became apparent that the team had not supported principals to think about how their practice in Math Labs would be received in the context of broader relationships with their teachers established in every other interaction they had with them. Thus, there is a possible tension here between supporting learning of practice in particular settings and attending to the broader relational work.

3. Decompose practice in relation to other roles. This third design principle suggests the importance of decomposing the practice of one role in relation to other roles that may be present in particular contexts. Rather than just specify the functions that principals needed to serve in isolation, principal practice was decomposed in relation to other roles, such as the instructional coach. Decomposition sought to understand how these two leadership roles might work in coordination to achieve particular functions that supported teacher learning, and how they might differ from each other in the Math Lab context. This design principle supported responses to multiple design tensions. In particular, it supported the design team to balance breaking practice into pieces with also attending to the complexity of practice as a whole, and the need for adaptation, improvisation, and negotiation in particular contexts.

In this case of this particular design team, it appears important that principal practice was decomposed in relation to coach practice. In a Math Lab, the coach and principal both act as instructional leaders, but in different ways. Part of what the design team sought out to do was to specify the forms of practice that each role needed to enact in relation to the other role. For instance, Julie talked about the importance of supporting principals and coaches to understand: "what are our responsibilities, and where are we on the continuum of this is my responsibility and this is your responsibility?" The team discovered that it was important to understand principal practice in relation to coach practice in a Math Lab, because often principal moves were made in response to, or following up on, a coach move. For example, during one Math Lab, Julie articulated that she was realizing that the coach's role was "to say let's try this, let's lean into this, let's get messy, let me help you," and the principal's role needed to build off of that by "attending to ways the messages might be understood" and making clear statements about related expectations for classroom instruction. Due to this relationship, the design team purposefully set out to support principals to see their practice in Math Labs in relation to other leadership practice. In this way, the decomposition had the potential to support principals to see the pieces of their practice in relation to the complexity of context in which they were enacting practice, including how their practice might interact with the practice of other instructional leaders.

Two design activities supported the enactment of this principle: (1) the "brain dumps" with Julie following Math Labs, and (2) the design of coach and principal professional development sessions. First, the "brain dumps" by Julie following Math Labs supported the decomposition of principal practice in relation to coach practice. Because Julie was in the Math Lab setting, she could attend to how she was thinking about principal practice in the context of how coaches were facilitating the teacher learning experience. Notably, the relationship between coach and principal practice was most effectively surfaced during the brain dumps that involved a conversation with a researcher (rather than just Julie's notes). In conversing with a researcher, Julie needed to explain contextually what was happening around the forms of practice she was identifying as important. As the researcher was not present at the Math Lab, if anything wasn't clear she would ask follow-up questions of Julie to make sure that the context around the

principal practice was adequately captured. Second, professional development sessions were designed to support principals and coaches to collectively make sense of and decompose their practice in Math Labs. For instance, as described in the overview of the design process, a November session focused on an activity in which principals and coaches engaged in the following discussion: What is the principal's role? What is the coach's role? What's similar and different across the two roles? In this way, principals were not thinking through their practice in isolation, but constantly in the context of what might be happening around them in a Math Lab. Thus, the decomposition appeared to strike a balance between breaking practice into pieces and attending to the complex, adaptive, and relational nature of the work.

4. Involve a range of perspectives and roles in the decomposition process. A fourth design principle that emerges from analysis of the design process is the importance of involving a range of perspectives and roles in the process of decomposing practice. This design principle appears to have supported responses to all five design tensions. However, here I highlight connections to the tensions of balancing the urgency of instructional improvement with the necessity of supporting learning over time, balancing breaking practice into pieces while also supporting adaptation, and balancing accountability and negotiability. In this case, it was important that both researchers and practitioners were involved. It was also important that a range of practitioner roles were involved: a former principal with significant experience with Math Labs, principals who were new to Math Labs, coaches, and teachers. While the core design team consisted of the principal supervisor and three researchers, the other practitioner perspectives were involved in the process.

First, having both researchers and practitioners involved supported productive responses to the design tension of balancing urgency for instructional improvement with the time necessary for practitioner learning. In particular, the collaboration between the researchers and Julie appears to have been especially important for responding to this tension. Julie's role was the leader of the instructional improvement initiative and the supervisor of the principals. As such, she had a deep sense of urgency for the work to be effective. At the same time, she had deep experience with being a principal in Math Labs. The combination of these elements of her role meant that she felt urgency for principals to enact the forms

of practice that came somewhat naturally at this point in her career. In early conversations with the researchers, she expressed some frustration that principals weren't enacting what seemed so obvious to her, given her experience. For instance, she talked about principals not fully reviewing the agenda beforehand, or "not participating much," or not seizing opportunities she saw to provide framing. The role of the researchers in this case, was to help her see the learning demands entailed in what the team was beginning to specify about principal practice and to help her plan for responsive supports for principals. As a result, across initial design team meetings, including brain dump conversations, Julie developed a way of seeing principals within a continuum of principal practice. For instance, after one Math Lab, Julie reflected that an aspect of practice that she noticed a principal was not yet enacting, was maybe "further down the continuum. I need to reflect on that – did I do that in my first year?" In this way, different roles in the design team represented different sides of the tension. Julie represented the urgency for instructional improvement and the researchers advocated for the time necessary to learn. Their productive collaboration across these competing goals seems to have supported productive decomposition of practice.

Second, having a range of practitioner roles involved in different ways appears to have been important. This was true on multiple levels, and supported the design team to respond to the tensions of breaking practice into pieces while also attending to the complexity of practice as a whole and the need for adaptation, improvisation, and relational work. First, it was important that Julie, who had deep experience as a principal in Math Labs, was part of the decomposition process as well as principals who were just learning to participate. It was in the comparison of their practice and thinking about their role in labs that a more nuanced understanding of the role of the principal in Math Labs emerged. Julie's practice was based on far more experience with the goals, content, and structure of Math Labs. In addition, in her district leadership role, she attended the same Math Lab multiple times. These factors meant that her participation was at a level that could not have been expected by the principal learners. In addition, elements that the principals struggled with, or did not do, helped the design team identify what was important in principal practice.

Third, having principals and coaches from different schools supported an understanding of how principal practice needed to be adapted and improvised across school settings. One way in which the range of schools was important was that it allowed the design team points of comparison that supported them to notice differences in principal relationships with teachers, and resulting differences in practice. For instance, in one design team meeting, Julie reflected that there were subtle differences across the schools, with one principal having "the relationships, but needing more trust [from teachers]" and another principal having trusting relationships with teachers that were "really professional, but not playful." Julie noted how these differences in relationships impacted how principal practice was enacted (and received by teachers) in Math Labs. In this way, having a range of principals involved helped the design team attend to the improvisation, adaptation, negotiation, and relational work necessary for principals to be effective. In discussions of practice in Math Labs, principals and coaches shared various examples from across their schools of both success and challenges in supporting teacher learning. This provided the group as a whole with a wide variety of examples of how principals might engage in practice in response to particular contexts. For example, one principal reflected that there was power in "hearing each other and then thinking about how [examples of practice] fit with who I am." The same principal said that in hearing stories from other school leaders, she had realized that "You're going to have to be heavier on some things depending on what's going on and lighter on others depending on what's going on or what grade level it is." Finally, it appears important that the team included teacher perspectives as teachers surfaced a number of ways in which principal practice supported (or did not support) their learning in Math Labs that the design team had not previously identified. For example, a theme in teacher interviews was that it helped them to hear from their principal about how other teachers and grade teams across their school were engaged in similar learning and challenges. Notably, however, their perspective was not included until the end of the school year, when teachers had experienced multiple Math Labs and had time to develop and understanding of what supported them.

Discussion

Across educational reforms, there is often an embedded expectation that practitioners become fundamentally different people in their roles. Teachers, principals, and other school and district leaders are asked to engage in completely new ways in the context of relationships that are often already well-established, and structures (e.g., professional development, staff meetings, curriculum selection) that are, - on the surface - familiar. As a result, as RPPs engage in supporting reform initiatives, there is a need to understand *how* they might effectively support practitioner learning of fundamentally new roles. The analysis reported on above examines one potentially powerful design activity for RPPs: the decomposition of practice so that it is learnable. In this case, the decomposition process helped the design team to more effectively support principal learning of fundamentally new forms of practice, which was an essential piece of implementation of the instructional improvement initiative. The collaborative specification of practice supported all team members to engage in their particular roles with that lens on principal practice and fostered development of a common language about what mattered. In examining this case of a decomposition process, I aimed to understand what might be learned that could be useful for other RPPs in different contexts. As a result, I reported on five design tensions that surfaced, and four related design principles. Other's efforts to decompose practice will likely have different steps and outcomes based on specific contexts, goals for instructional improvement, visions of practitioner roles, and the experience and knowledge of partnership members. However, other partnerships may well experience similar design tensions, and therefore, the proposed design principals may support more effective decomposition of practice.

The design principles proposed above build off of existing ideas in the literature related to understanding school leadership, supporting learning of relational forms of practice, and effective design processes in partnerships. The first principle, *decompose in relation to other roles*, connects to arguments in the educational leadership literature for understanding leadership practice as distributed across roles; that an individual's leadership is only effective because it is situated in a broader context involving other roles and tools that interact with that leadership (e.g., Spillane et al., 2011). The second principle, *involve*

a range of perspectives and roles in decomposition, echoes findings from other analyses of practitioner-researcher collaborations in which scholars find that a range of perspectives can promote more effective design of education improvement initiatives (e.g., Penuel et al., 2013), and in particular, productive responses to design tensions (Johnson et al., 2016). The third principle, *decompose by function and at different, nested levels of specification*, reflects Janssen and colleagues' (2015) argument that a potentially effective way to support practitioners to *recompose* decompositions of practice into whole, improvisational forms of practice is to decompose into " functional hierarchical modular systems." They argue that organizing decompositions of practice by function and in different modules that relate to one another might support learners to change parts of their practice as they move towards changing their whole practice. Finally, the fourth principle, *decompose practice in relation to context*, connects to the designs of practice-based teacher learning approaches that seek to support teacher learning of identified components of practice. For instance, Lampert and colleagues (2010; 2009) describe the use of short instructional routines ("instructional activities") as containers in which teachers can learn in-the-moment, responsive instructional practice. Rather than tackle a whole class period or full school day, Lampert and colleagues argue that for teacher learning, there is utility in focusing on particular, routine structures to support teachers to learn relational forms of practice that they can extend to their broader work in the classroom. In the case of this study, the more predictable routine of Math Labs provided a container in which principals could learn instructional leadership. In addition, reflecting the decomposition literature, the design principles encapsulate process related to both the identification of components of practice and the effective communication of those components to learners (e.g., Windschitl et al., 2012).

Thus, the potential utility of the proposed design principles is supported by a wide body of existing literature. This analysis of one case of an RPP reveals key insights into both the process of decomposition specifically, and analysis of collaborative design processes more broadly.

Implications for Decomposition of Relational Forms of Practice

Previous analyses related to decomposition of practice have primarily reported on the outcomes of decomposition (e.g., Sleep, 2012; van Es et al., 2014), and have not examined the process itself. In

addition, other efforts at decomposition have been conducted by researchers on their own (e.g., Borko et al., 2014; Windschitl et al., 2012), or sought a range of perspectives of a range of experts, including practitioners through Delphi survey methods (e.g., Kloser, 2014). Decomposition has not previously been examined in the context of a collaborative RPP. However, this analysis of a case of an RPP's engagement in decomposition suggests that the process is potentially powerful for RPPs for a few key reasons. First, according to all design team members, the decomposition process supported them to more effectively support principal learning of fundamentally new forms of practice, which was an essential piece of implementation of the instructional improvement initiative. The collaborative specification of practice supported all team members to engage in their particular roles with that lens on principal practice and fostered development of a common language about what mattered. Second, the decomposition process appears to have supported Julie, as a new principal supervisor, to more effectively support principals on a day-to-day basis. Engaging in decomposition helped her realize the aspects of her own practice that had she had not been conscious of, or able to articulate, previously. Thus, this analysis contributes to the decomposition literature by suggesting the power of engaging in the decomposition process in a collaborative, RPP context. Future research should examine how, if at all, the process differs in other partnerships with different goals and contexts.

In addition, this analysis both confirms and extends existing understanding of the tensions involved in decomposition relational forms of practice. The analysis confirms the tensions related to breaking practice into pieces while also trying to attend to the "whole" of practice, including the need to improvise and adapt to in-the-moment interactions and contextual elements. Situated within an instructional improvement context surfaced three new tensions that are related to the already established tensions, but appear to be important to articulate explicitly. In particular, the case surfaced the need to balance (1) breaking practice into pieces while attending to the broader relational work, (2) accountability and negotiability, and (3) the urgency of instructional improvement with the necessary time to learn new forms of practice. These additional tensions surfaced primarily as the design team attempted to support principals in *learning* decomposed forms of practice within the particular context of a significant

improvement initiative. It is possible that these tensions also emerge in other decomposition contexts. For example, teacher educators likely also have to balance the urgency of improving pre-teacher practice in the short time-span of a teacher preparation course with the necessary time for teachers to develop complex forms of practice. However, these tensions have not previously been explicitly explored in relation to decomposition. Future research should examine how, if at all, the tensions described in this analysis show up in other contexts in similar or different ways.

A third contribution is the provision of an example of what decomposition into what Janssen and colleagues (2015) define as a *functional hierarchical modular system*. Janssen and colleagues make a theoretical argument that to effectively decompose practice in a way that will then support learners to *recompose* that practice, components of practice should articulate functions – or impacts that practice aims to create – and be organized in a system of hierarchical modules – or related decompositions at varying levels of specificity. This analysis provides an example of what that might look like. The decomposition at the level of the "plates" document provided a set of overarching functions of the principal role, the document created by the design team identified more specific, but related functions of the principal in Math Labs specifically, and the document created by the coaches and principals zoomed in further to describe functions at particular phases of a Math Lab. While by no means final or exhaustive, this system of decompositions of practice appears to have supported principals to develop a sense of their role in Math Labs and to demonstrate participation in new forms of practice (see Chapter 3). Thus, it appears that Janssen and colleagues' proposed approach for naming and structuring decompositions has potential. Future research should further examine how to effectively articulate functions to learners and how to support learners to see connections across different levels of specificity of practice.

Implications for Analysis of Collaborative Design Processes

Broadening out beyond the specific design task of decomposition of practice, this analysis also suggests broader implications for analysis of collaborative design processes and important next steps for research. The challenge facing researchers of RPP processes is how to effectively report on analyses of one partnership in a way that is useful to other partnerships. This analysis brings together two existing

ideas for how analyses might make useful contributions: (1) design tensions, and (2) design principles. First, design tensions have the potential to highlight for partnerships the competing goals they must work to balance as they engage in design. Second, design principles suggest key characteristics of design that might be important to effectively support desired outcomes. Emerging from my analysis is an argument that there is potential in examining, and reporting on, design tensions and principles in relation to one another. If, design tensions articulate the goals that teams must balance in design, then useful design principles should define characteristics of design that might support productive responses to those tensions. In the case of this analysis, a tension was balancing the goals of both holding principals accountable for new forms of practice while also allowing for space to negotiate those expectations. In order to effectively think about this balance of competing goals, the resulting design principles needed to be situated within this tension. Thus, this analysis suggests that a productive space for both examining and reporting on design processes lies in the interaction between design principles and tensions, as shown in Figure 11.

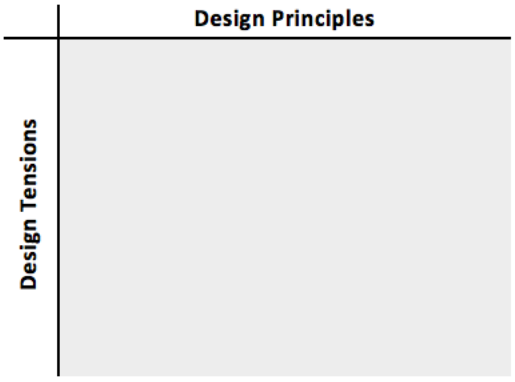

Figure 11. Proposed conceptualization of the interactive space between design principles and design tensions.

From this argument for examining relationships between design tensions and principles emerges new questions for the field. First, there are new questions related to grain-size and communication: What grain-size do design tensions and principles need to be articulated at in order for other RPPs to find them useful to their own design processes? How can design tensions and principles be effectively shared and communicated? How specific to particular design tasks to design tensions and principles need to be?

Second, there are questions about how design tensions and principles developed from one RPP's process might be used and revised by other RPPs: How, if at all, does access to design tensions and principles support RPP design process? How do RPP members use design tensions and principles? How do design tensions and principles need to adapt to different contexts? Given the increased interest in how RPPs can effectively support educational improvement, there is a need for research that more fully examines how RPPs can effectively develop knowledge and share information about how to engage in challenging, collaborative design work. In other words, how can we effectively break apart the design practice of RPPs so that it might be *learnable* for others engaged in similar design processes.

CHAPTER 6: CONCLUSION

This dissertation reported on three retrospective analyses of one case of a design-based approach to supporting principal learning of fundamentally new leadership practice. The three analyses were designed to examine the case from three different angles, with the goal of building theory from one case that might be useful to other contexts where leaders are expected to transform their practice. While I discussed implications of each individual study in previous chapters, this chapter looks across the analyses to consider the contribution they make as a body of work, and implications they suggest for future study. In particular, I will highlight contributions and implications related to the conceptualization of principal learning and building knowledge about design-based approaches.

Conceptualization of Principal Learning

As a body of work, these three analyses contribute to understanding and supporting principal learning of new leadership practice. The analyses depart from previous research on principal learning in conceptualizing learning as an intertwined process of knowing, doing, and becoming. Research recognizes that new knowledge, practice, and identity, or vision of one's role will all be important parts of principal learning of new approaches to leadership (e.g., Browne-Ferrigno, 2003; Steele et al., 2015). However, the majority of research isolates one or maybe two of these aspects of learning, and often fails to account for the interaction between the three, or how that interaction might unfold over time. In Chapter 3, I applied a lens of knowing, doing, and becoming to understand principal learning over time. This lens illuminated how intertwined new knowledge, new practice, and new understandings of the role of principal were as principals were supported to engage as fundamentally different leaders. I also emphasized the importance of situating principal learning within the context of changing institutional and community expectations of competence. Viewing principal learning in this way impacts how districts should then think about supporting principal learning. How do we support principals to *become* fundamentally different leaders? Chapter 4 took up this question and examined the design of learning supports in one case through a theoretical lens to propose characteristics that may have provided opportunities for principals to engage in knowing, doing, and becoming. Chapter 5 then zoomed in more

specifically to one process that the design-team engaged in to design learning supports to understand both the tensions and the effective characteristics of the process. Thus, across these analyses, I provide a conceptualization that provides insight into principal learning of fundamentally new ways of leading.

This framework for conceptualizing principal learning has implications for future research. First, the utility of the framework was only explored in the context of specific goals for principal learning – in this case, goals related to a particular vision of instructional leadership related to a collaborative, practice-based teacher learning approach to transforming mathematics instruction. Future research should explore how principal knowing, doing, and becoming unfolds in different contexts with different goals for students and teachers. For instance, within the overall shift towards principals taking more active roles in the experiences of students and teachers in schools, there is also an increasing call for principals to engage as social justice, equity-oriented, or culturally-responsive school leaders (e.g., Khalifa, Gooden, & Davis, 2016). This raises the question of how principal learning might unfold differently when concepts of race, equity, and justice in schools and broader society are more explicitly involved in new ways of knowing, doing, and becoming. While principals in the case of my study were pushed to think about their role as leaders differently, unpacking how their role interacted with broader structures of racism, classism, or sexism, for instance, was not an explicit part of their learning. The study suggests, however, that for principals to become fundamentally different leaders, supports need to be designed in a way that fosters particular knowing, doing, and becoming. Thus, future research should examine how principal learning unfolds and is supported in the context of different goals.

The utility of the framework should also be further examined more explicitly in the context of RPPs. In general, RPPs in education aim to transform some aspect of an educational system. Similar to all efforts to transform education, the work of RPPs will necessarily require learning on the part of practitioners; learning that involves *becoming* fundamentally different kinds of teachers, coaches, principals, or district leaders. An open question is how supporting those that lead learning in these contexts to develop an understanding of learning as knowing, doing, and becoming, might shape their own enactment of their roles. How, for instance, would principals and coaches make sense of and support

teacher and student learning differently if viewed through the lens of knowing, doing, and becoming? How might district leaders design district-level supports for teachers or school leaders given this lens on learning? How might this conceptualization of learning impact RPPs design-processes and outcomes?

Building Knowledge about Design-Based Approaches

As partnership and design-based approaches grow in education, there is a need to develop more robust, established, and useful ways of building knowledge that can move the work forward in different contexts. Too often, each partnership is inventing its own process and approach without guidance from others. Across the analyses in this dissertation, my aim was to present findings in a way that might be useful to others supporting principal learning in different reform contexts. To do so, I drew on Edelson's (2002) proposal of three different types of theory that retrospective analysis of design processes can help to build. As summarized in Table 10, Chapter 3 examined what could be learned about principal learning of fundamentally new practice; Chapter 4 analyzed what could be learned about the design of supports for such learning; and Chapter 5 sought to understand part of the design process itself. One contribution of the body of work, then, is that it provides an example of one case analyzed in three different ways with the goal of building three different types of theory. The studies complement each other and provide a rich image of the work that happened in one context that might not be achieved with a single analysis. In doing so, the study is part of an emerging body of literature that aims to establish a knowledge base about how analyses of design-based approaches can be conducted and reported on in ways that involve rigorous methods, evidentiary warrants for claims, and useful findings for others involved in design-based work (e.g., Dede, 2004; Russell et al., 2013; Sabelli & Dede, 2013).

Table 10. Summary of the contributions of the three analyses.

Analysis 1	Analysis 2	Analysis 3
Domain Theory	*Design Framework*	*Design Methodology*
Conceptualization and illustration of process of principal learning of fundamentally new practice	Theoretically and empirically grounded design principles for supporting principal learning of fundamentally new practice	Identification of design tensions and related design principles of decomposition process

An open question that emerges from the analyses in this study is how to most usefully communicate the findings of analyses of one design-based context. In the analyses shared, there are three examples of potential approaches. In Chapter 3, I presented a framework for conceptualizing learning that might support other RPPs to effectively design for learning in their own contexts. In Chapter 4, I proposed a set of design principles, grounded in sociocultural learning theory, for supporting learning of fundamentally new practice. In Chapter 5, I reported on both a set of design tensions central to a specific design task and a correlating set of design principles for effectively engaging in that task. These all represent attempts to use one specific case to glean potentially useful *theory* for other contexts. The open question for researchers and practitioners to engage with is how to effectively develop, articulate, and share such theory in a way that is *learnable* and useful for others. For example, how might another design team make sense of or use these different outcomes of my analyses? What grain size, format, and methods of communication are most useful? How do other RPPs effectively adapt or make sense of theory developed in other contexts for effectiveness in their own context?

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