A Decomposition of the Practices of High Quality Professional Development Facilitation for Teachers

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Abstract

While the literature in professional development (PD) for teachers makes clear that orchestrating teacher training requires a skilled facilitator, little is known about what constitutes skilled facilitation. In order to paint a portrait of high quality PD facilitation, I represented and decomposed the PD facilitation practices of an accomplished leader of mathematics teachers. To do so, I analyzed video data collected in a longitudinal study to investigate the nature of the high quality activities, participation structures, and talk moves of an accomplished facilitator. This qualitative analysis reveals that effective facilitation of PD for teachers entails the developing a community of learners, focusing teachers' attention on goals for student and teacher learning, grounding PD in complex instructional tasks, and pressing teachers to develop and articulate their pedagogical reasoning. Findings inform teacher professional development, teacher education, and educational leadership theory and practice.

Résumé

Alors que la littérature sur le développement professionnel (DP) des enseignants indique clairement que prendre en charge une formation pour les enseignants requiert un formateur qualifié, peu de recherches s'intéressent à ce qui constitue ces qualifications en soi. Afin de dresser un portrait de la formation de haute qualité en DP, j'ai représenté et décomposé les habitudes d'animation d'un formateur accompli auprès des enseignants de mathématiques. J'ai donc fait l'analyse de documents vidéo recueillis lors d'une étude longitudinale afin d'étudier ce qui détermine la haute qualité des activités, les structures participatives ainsi que les stratégies d'enseignement de ce formateur accompli. Cette étude qualitative montre que la formation efficace en DP pour les enseignants entraîne le développement d'une communauté d'apprentissage, permet de diriger l'attention des enseignants sur les cibles d'apprentissagedes élèves comme de l'enseignant, inscrit le DP au cœur des tâches éducatives complexes et encourage les enseignants à développer et à articuler leur raisonnement pédagogique. Les résultats de recherche touchent le développement professionnel des enseignants, l'éducation des enseignants ainsi que la théorie et la pratique du leadership éducationnel.

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CHAPTER I

INTRODUCTION

The Need for Ambitious Forms of Instruction

In order to meet the demands of the 21st century, teachers need to help students to acquire, understand, and use knowledge in order to solve complex, sophisticated, and authentic problems (Ball & Forzani, 2009; Franke, Kazemi, & Battey, 2007; Lampert, Beasley, Ghousseini, Kazemi, & Franke, 2010; Newmann & Associates, 1996). Scholars have described instruction that aims to support such learning goals as "ambitious instruction," "authentic pedagogy," or "teaching for understanding" (Lampert et al., 2013; Smith, Lee, & Newmann, 2001). When teaching is ambitious, students "develop in-depth knowledge of subject matter, gain higher-order thinking skills, construct new knowledge and understanding, and effectively apply knowledge to real-world situations" (Smylie & Wenzel, 2006, p. 7; as cited in Lampert et al., 2013, p. 226).

Such forms of instruction are labeled "ambitious" in part because there are so few models of it in schools, even in the classrooms of experienced teachers (Windschitl, Thompson, Braaten, & Stroupe, 2012, p. 881): most students spend the bulk of their time listening to lectures and focusing on replicating the forms of thinking the teacher has provided (Stigler & Hiebert, 1999). In math classes, for example, researchers have found that "students' work consists almost entirely of memorizing presented facts or applying formulas, algorithms, or procedures without attention to why or when it makes sense to do so" (Stein, Grover, & Henningsen, 1996, p. 456). In English Language Arts, "…despite an emerging consensus about the sociocultural foundations and character of literacy and classroom discourse, most schooling is organized… for the plodding transmission of information through recitation. Teachers talk and students listen. And the lower the track… the more likely this is to be true" (Nystrand, 1997, p. 3).

Need for Effective Professional Development for Teachers

Given the nature of most teachers' current practices, a great deal of teacher learning is required to produce the kind of student learning that those who advocate ambitious instruction envision—"for none of it is simple," as Ball and Cohen (1999) write (p. 4). Ambitious instruction involves the integration of understandings about content, children, and learning, along with technical skills and relational know-how (Chaiklin & Lave, 1996; Grossman, Compton, et al., 2009). It requires teachers to have opportunities to transform their deeply held practices, beliefs, knowledge and habits (Ball & Cohen, 1999; Borko, 2004; Coburn, 2003; Cohen & Ball, 1990). Thus, such sophisticated forms of instruction emerge neither spontaneously nor as a consequence of time spent on the job in teaching (Franke et al., 2007; Lampert et al., 2010; Newmann & Associates, 1996).

However, current professional development (PD) for teachers is generally intellectually superficial, non-cumulative, fragmented, disconnected from teachers' daily practice, and undifferentiated for varying teacher needs (Ball & Cohen, 1999; Jayaram, Moffit, & Scott, 2012). As such, most PD does not support the development of more ambitious forms of instruction. Indeed, researchers have characterized the inadequacy of support for teacher learning as an urgent and critical need for transforming our schools and society (Chung Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009, p. ii). Though transformation of instructional practices is incredibly difficult, it's worth it: research suggests that an effective teacher has a more significant effect on student outcomes than the student's language, minority or socioeconomic status, or class size (Darling-Hammond, 2000).

Evidence suggests that teachers who do receive ongoing support and structured learning opportunities can make significant gains in their teaching skills (Ingvarson, Meiers, & Beavis,

2005). Some of the contextual features of effective PD are known, such as the need to provide extended time for teacher learning in the context of collaborative teacher groups, to focus inquiry on student work, and to supplement formal PD with individual and small-group coaching (Chung Wei et al., 2009). Providing PD which features these characteristics of professional development is important: teachers need time to *focus,* and a support system of *friends* with whom to *"fiddle"* with new ideas (Frank, Zhao, Penuel, Ellefson, & Porter, 2011) in order to implement what they learn.

The Role of the Facilitator in PD for Teachers

However, even when PD meets all of the criteria established in the literature about what it takes to support teacher learning, if the PD is not orchestrated by a skilled facilitator, the PD will likely fall flat (Horn & Kane, 2015). Yet what it is that a PD leader should do to make the most of the affordances of well-organized PD is not well understood. While it is clear that facilitating PD requires significant expertise (Even, 2008; Even, Robinson, & Carmeli, 2003), the nature of that expertise has been poorly specified. Research suggests that in order to develop more effective professional practices, learners need access to *representations* of the targeted practice, and analyses, or *decompositions,* of those practices (Grossman, Hammerness, & McDonald, 2009). Just as novice chess players study the moves of grandmasters, learning the technical vocabulary for certain sequences and moves, learning PD leaders need access to vivid representations of effective practice, and access to professional language which describes effective patterns of support for learning teachers. To date, there is little research that provides these representations or decompositions of expertise in facilitating PD for teachers. Just as it is unlikely that a chess player would achieve grandmaster status without access to illustrations and

analyses of superior performance, it is unlikely that PD leaders will achieve excellence in the absence of representations or decompositions of practice.

Research in the field of PD has been critiqued on several grounds: it is not based on adequate models of learning and instruction (Ball & Cohen, 1999), fails to ground professional activities in robust theories of learning (Ball & Cohen, 1999; Borko, 2004), lacks clear instructional goals for PD leaders and teachers (Borko, 2004), lacks methodological rigor (Desimone, 2009), and fails to provide examples of expert PD leader behavior (Elliott et al., 2009; Even et al., 2003). As Desimone (2002) writes, "Given the size of investment in professional development and the dependence of education reform on providing effective professional development, the knowledge base on what works must be strengthened" (p. 82).

To recap: ambitious instruction depends upon effective teaching, and effective teaching is in part the result of effective teacher education and professional development. Effective PD for teachers is dependent not only upon effective structures and features of learning opportunities, but also upon effective PD facilitation. Thus, as a research community, in order to support more ambitious forms of instruction in our schools, we need to invest in better understanding effective PD facilitation. As Ball and Cohen (1999) argue:

> Ironically, while the role of the teacher educator is critical to any effort to change the landscape of professional development, it is a role for which few people have any preparation and in which there are few opportunities for continued learning: there is little professional development for professional developers. (p. 28)

In order to support the development of more effective PD facilitation practices, the research community must work to better understand the role of facilitation and the nature of expertise in facilitation.

Goals of this Dissertation

This dissertation paints a portrait of accomplished PD facilitation. The goal of this dissertation is to provide the field of PD and TE deeper insight into the practices of effective facilitation of learning opportunities for teachers. The research question that guides this study is: "What are the facilitation practices of an accomplished professional development leader?" In order to answer this question, I conducted a case study of one accomplished PD leader, Sabrina[1], who orchestrates learning opportunities for middle grades mathematics teachers. By analyzing her video recorded practice, I identify the activities, participation structures, and talk moves that she chooses to orchestrate in order to support teacher learning. I then describe and analyze four core practices she enacts which generate meaningful opportunities for teachers to learn.

Organization of the dissertation.

The dissertation is organized as follows. In Chapter 2, I review the literature basis for investigating, representing and decomposing expert facilitation. I also describe and justify the theoretical perspective that guided my analysis of expert facilitation of PD. In Chapter 3, I describe the data sources and methods of analysis I used in my analysis. In Chapter 4, I present the results of my analyses. I argue that accomplished PD leaders develop and maintain a community of learners, focus teachers' attention on the goals for student and teacher learning, ground PD in complex instructional tasks, and press teachers to develop and articulate their pedagogical reasoning. In Chapter 5, I discuss the central contributions of the study to the field

[1] Not her real name. The names of all participants, and the names of the people they mention in their quotations,

of research, I elaborate the need for future research, and I detail the implications of this study for practice.

CHAPTER II

RELATED LITERATURE AND CONCEPTUAL FRAMEWORK

To frame my investigation of expert facilitation, I draw on four bodies of scholarship: sociocultural and expertise theories, and research from PD and Teacher Education (TE). Sociocultural theories of learning and expertise theories help us understand the ways in which people learn to be experts, with sociocultural theorists focusing on the *learning* of complex practice in communities of practice, and expertise theorists focused on the *nature and development of superior performance.* I then looked to the field of PD and TE to highlight those principles of PD facilitation that are likely to support the teacher learning required for ambitious instruction.[2] As I will describe in what follows, the literature suggests PD leaders should help teachers develop a vision and professional language for the work of ambitious teaching; focus teacher learning on high leverage teaching practices; engage teachers in cycles of investigation and enactment, anchored in disciplinary instructional activities; and finally, provide teachers opportunities to co-participate with more expert others.

Sociocultural Theories of Learning

Professional education for teachers is generally founded on the transmission model, in which someone "knows something" and straightforwardly "teaches it" to someone else through direct instruction (Darling-Hammond, 2006). The transmission model suggests that knowledge, like pizza, can be delivered by one person and then consumed by another. The transmission approach to professional education is evident in typical PD offerings, which are generally designed as "one-off" workshops or conferences that aim to 'provide' teachers with 'tips and

[2] Although this dissertation focuses on PD for in-service teachers, because I think developmentally about teacher learning, and because teachers' formal PD begins in pre-service education, I have included research that draws from TE.

tricks of the trade' (cf. Ball & Cohen, 1999)—"101 Uses for Digital Cameras," for example, or "Move Over, Pokemon – Student Generated Trading Cards."[3] The underlying assumption of such workshops is that all teachers need to 'refresh' their practice is a few good ideas which can be given to them by their peers. Workshops are treated as discrete units, rarely followed with coaching focused on supporting the learning of such content afterwards (Gibbons, 2013a). In the typical approach to PD, participants are seen as "needing updating rather than opportunities for serious and sustained learning of curriculum, students, and teaching" (Ball & Cohen, 1999, p. 4).

The transmission approach is rooted in a tradition of cognitive psychology: historically, cognitive psychologists assumed that individuals could learn "content" in one context, and that this content, like a hammer, could be wielded in another situation. The assumption embedded within this model of knowledge is that there *is* stable content, which is complete and whole, and that this content can remain intact across various settings (Bransford & Schwartz, 1999). "…The functional theory of transfer… treats cognition as the literal, uniform transportation of tools for thinking from one situation to the next" (Lave, 1988, p. 37). From a cognitive perspective, arithmetic, for example, is learned in school and then "literally carried away from school to be applied at will in any situation that calls for calculation" (Lave, 1998, p. 5).

While the transmission approach to professional learning may be sufficient to elaborate or refine what teachers already do, there is little evidence to suggest that the transmission method is effective in supporting significant reorganization of practice, which ambitious teaching requires. For example, a PowerPoint presentation from a stranger may be all that is needed to teach a teacher how to use a new grading software programme, as teachers already grade and

[3] Both sessions were offered at the 2013 Conference for English Language Arts teachers in Quebec, "Springboards," the main formal learning opportunity for English teachers in Quebec.

record their grades, and so they are just learning to tweak what they already do. However, if you want to support teachers to learn how to use student thinking as a resource for learning, the transmission model is unlikely to be effective because such practice requires a radical transformation of existing knowledge structures, activity, tools, and identity. "Tweaking what we already do" will not support the kinds of changes that are necessary for instructional improvement. Thus, the theory upon which most PD for teachers is designed, the transmission model of learning, is an inadequate framework for supporting the development of expertise in complex professional practices.

"Situated" theories of learning, initially proposed by Lave and Wenger (1991) who built on the work of cognitive psychologists studying learning "in the wild," provide a more useful approach to learning complex practice than theories of transfer. From a sociocultural perspective, learning is not understood to be the acquisition of abstract knowledge structures, but moving from legitimate peripheral participation to increasingly central participation within a community of practice (Greeno, 2003; Lave & Wenger, 1991). Thus, teacher learning "is usefully understood as a process of increasing participation in the practice of teaching, and through this participation, a process of becoming knowledgeable in and about teaching" (Adler, 2000, p. 37).

The view that learning is a process of increasing participation in a community of practice is usefully illustrated in studies such as those conducted by Nunes, Carraher, and Schliemann (1993), Scribner and Fahrmeier (1982)**,** and Brenner (1985) revealed how intrinsically tied an individuals' learning is to the environment in which she or he learns it. Nunes, Carraher, and Schliemann's work (1993), for example, reveals how children were able to do the mathematical work of multiplying the price of coconuts in the everyday context of selling at the market with surprising fluency, flexibility, and accuracy. However, when those same multiplication tasks

were posed in a classroom setting, participants were significantly slower, less flexible, and dramatically less accurate. The street children who were able to perform complex mathematical calculations in the market were not able to do "simple" math in a laboratory setting. Similarly, Scribner and Fahrmeier (1982) and Brenner's (1985) anthropological work reveals how individuals were unable to transfer mathematics competencies from the "wild" domains of dairy loading and tailor shops to laboratory settings.

Lave (1985) theorizes that different settings generate a qualitatively different organization of cognition. Rather than being located in our brains, sociocultural theorists posit, cognition is stretched across mind, body, activity and setting (Lave, 1988). Participation in social situations means learning how to engage in cultural routines, which has implications for our cognition, social behavior, and activity (Lave, 1988, p. 14). In contrast to conventional views of learning as an individual psychological process, sociocultural theorists argue that learning occurs as individuals participate in social and cultural activities (Rogoff, 1990). To conclude, "the news …is how *little* transfer there is, rather than how much" (Lave, 1988, p. 34). Thus, traditional, "one-off" PD, which is structured around the transfer theory of learning, is unlikely to support teachers to improve their practices. To consider what approach to PD *might* work, we turn to PD practice-focused PD (Smith, 2001), which is grounded in socio-cultural approaches to the support of teacher learning.

A Practice-Focused Approach to Professional Development for Teachers

From a situated perspective, learning to teach means learning how to orchestrate the practices of accomplished teaching. But what is practice? Ball and Cohen (1999) argue that practice is situated knowledge in action. Nunes, Carraher, and Schliemann (1993) examined the

practices of selling coconuts on the street, while Brenner (1985) examined the practices of calculating how boxes of dairy products are loaded onto trucks. Thus, practices are socially situated knowledge which require the "orchestration of skill, relationship, and identity to accomplish particular activities with others in specific environments" (Grossman, Compton, et al., 2009, p. 2059). Thus, while the transmission theory of learning may be sufficient for learning a new procedure, we cannot "transfer" complex practices, such as ambitious instructional practices, to teachers. If the goal for PD is improved instruction, teachers will need opportunities to learn that are grounded in an understanding of how people learn complex practice.

Professional Vision and Shared Language

One key aspect of learning complex professional practice is learning the language for phenomena that may be invisible to outsiders. Learning to "see" with a professional lens is a process Goodwin (1994) calls the development of "professional vision," which he defines as "socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" (p. 606). Goodwin shows how professionals develop their vision by learning how to *see* like a professional in their field. As an example, he analyzes how a young archaeologist learned the work of identifying finds under the earth by learning to notice the difference in shades of dirt using a standardized colour guide while working with a more expert archeologist. At first the novice archeologist did not notice the difference in shades, nor had she names for the different colours. However, with support from the mentor and the tools of the trade, the novice learned to see like a professional. This process is a helpful representation of how individuals learn to become professionals: Learning to see and learning the language for what she was seeing was a mutually reinforcing, synchronous process

for the novice.

Further, when professional language is relatively standardized across the field, the potential for learning in the context of community increases. Without a shared professional language, it is difficult to speak with the depth, precision, or nuance that is necessary for meaningful learning. Archeologists code dirt by colour schemes and clinical psychologists code relationships by patterns of attachment: the categories used to describe elements of a profession become the framing criteria for understanding and relating to phenomena. This shared professional language functions as a coding scheme that orders the professional world into categories and events that become professionally significant (Goodwin, 1994). The result of this kind of work is a "disciplined perception" of practice (Stevens & Hall, 1998), or a "set of coordinated practices through which people perceive and interpret the world in discipline-specific ways" (Stevens & Hall, 1998, p. 111 in Grossman, 2011). Thus, what is learnable on the job is shaped by our access to professional language.

However, the field of education lacks a developed professional language for the work of teaching. Many have written about how private the field of teaching is (cf. Little, 2002, 2003; Lortie, 1975), and how often conversations amongst teachers fall back on "personal opinion and preference, without recourse to evidence and relevant analysis" (Ball & Cohen, 1999, p. 18).

> Lacking… a common analytic vocabulary… professional conversation tends to become an exchange of buzzwords and slogans more than specific descriptions and analyses with concrete referents. Imagine physicians discussing the treatment of tetanus by discussing only how patients described their illness, how the physicians felt about that disorder, what patients said, how often they saw cases of tetanus, what patients looked like, and the like. Few patients would get well, and many would die, because physicians' discourse did not deal with any of the medically relevant issues (Ball & Cohen, 1999, p. 17).

Developing a shared taxonomy for the work of teaching would move teaching towards other professions, such as clinical psychology, in which the "common factors" across disciplinary approaches to therapy have been articulated and analyzed (Grossman, Compton, et al., 2009). For example, all psychologists know what others mean when they speak of "therapeutic alliance"–though they may differ on the best way to achieve it (Grossman & Shahan, 2005). If we want teachers to improve upon their current practices, professional educators must first "make an effort to identify the underlying grammar of practice" (Fullan, 2007, p. 35). Part of the necessary work of professional educators ought to be developing shared vocabularies that could develop practice beyond the currently private enterprise that it often is (Ball & Cohen, 1999, p. 18; Little, 1990). Otherwise, "without a common language and set of identified pedagogies, teacher educators are left on their own to figure out how to prepare teachers to teach the core practices, and more importantly the field misses an important opportunity to generate knowledge on the range of ways in which we can support teachers' learning" (McDonald, Kazemi, & Kavanagh, 2013, p. 4)

Pedagogies of Investigation and Enactment

In order to learn from professions with a robust professional language that support the development of expertise, Grossman and colleagues (2009) looked to other "caring professions" with effective training programmes, such as clinical psychology, and noticed a consistent model of clinical training. All three training programmes engaged in what Grossman and colleagues called "pedagogies of investigation and enactment." I will briefly outline the approach, and then expand upon each element in the subsequent pages. First, learners need opportunities to investigate **representations** of superior performance. Second, learners need **decompositions** of

expert practice: they need to learn the labels for discrete elements of practice, and they need to understand how the disparate elements relate to one another. Finally, learners need **approximations** of practice: they need to try out enacting a feature of the professional practice while receiving valuable feedback from mentors, who work with participants to refine and improve their understanding and technique (Grossman, Compton, et al., 2009; Grossman, Hammerness, & McDonald, 2009; Grossman, Schoenfeld, & Lee, 2005). Pedagogies of investigation and enactment emphasize the "practicable" strategies of developing professional competence. The logic of the model builds on sociocultural theory; learning comes from doing. Simply reading about and analyzing the moves that skillful practitioners engage is not enough; individuals need to examine, analyze and rehearse complex tasks with more expert others in order to reliably demonstrate competency.

Cycles of investigation and enactment ought to be grounded in clear examples of accomplished practices. Representations become the basis for the decompositions, and they orient the enactments. According to sociocultural theorists, the initial stages of becoming an expert are often mimetic – though newcomers may not understand the full function of a particular form of practice, they begin to learn why things work the way they do by observing a more expert other at work (Sherin & Han, 2004). As an example of representations of practice, consider Hatch and Grossman's (2009) "Learning from the practice of teaching" Digital Exhibition. Designed to support the development of novice teachers' capacity to orchestrate whole-class discussions in English Language Arts, Hatch and Grossman provide pre-service teachers videos, reflections, and artifacts of practice related to orchestrating a whole class discussion from an expert teacher, Yvonne Hutchison. Through hours of videotaped classes, interviews with the teacher and student, and samples of student work, this exhibition aims to

provide novices "a vision of the possible" (Vygotsky, 1998).[4] Examination of those representations, the decompositions of practice, provide a shared taxonomy that allows professional educators to develop and share a technical language for the practice, a vital aspect of supporting the development of professional vision. Further, the practice of decomposition allows professional educators to consider the constituent elements of practice that will need to be taught.

When participants have limited access to representations and decompositions of practice, they are unlikely to develop expertise. Marshall's examination of the apprentice butchers (as cited in Lave & Wenger, 1991) is an example of the consequences of learning environments that fail to provide representations of expert practice. In Marshall's research, apprentice butchers were physically separated from master butchers: the old-timers worked in the back room while the apprentices worked in the front, wrapping the pre-cut pieces of meat in plastic. The apprentices could not observe the work of their more expert colleagues. After years of practice, "apprentices" were no further along in their understanding of butchery, because they had limited opportunities to observe and practice the more advanced work of master butchers. "Apprentices gain a great deal by observing and being observed" (Marshall, as cited in Lave & Wenger, 1991, p. 79). By limiting access to more expert others, apprenticeship is unlikely to be successful.

One reason to provide learning teachers with representations of complex practice is to launch simulations of that practice. Opportunities to rehearse and develop discrete components of complex practice in situations of reduced complexity represent what Grossman and colleagues (2009) call "approximations of practice." Approximations of practice allow learners to become

[4] Hatch and Grossman (2009) take this Digital Collection one step further by providing supporting materials for Teacher Educators who may wonder how to use this archive with novice teachers to maximum effect. The authors also provide representations of practice of Teacher Educators discussing Hutchison's practice with pre-service teachers, and include interviews, reflections, and data on how pre-service teachers made sense of their work with the representations of teaching practice. Making this link from representations of teaching practice to representations of teacher education practice is a valuable and important contribution to the field of professional education, which, as stated, has a thin literature base.

enact skills through "deliberate practice" (Ericsson, 2002) of specific components of professional activity. In his studies on expertise, Ericsson (2002) demonstrates that what differentiates amateurs from professionals is not necessarily the amount of time spent practicing, but the nature of their practice. Specifically, experts spent a significant amount of their time practicing and rehearsing the most challenging aspects of upcoming performance (Grossman, 2011, p. 2840). Further, as Lampert et al. (2013) write, "deliberate practice is not just repeated doing but cycles of repetition with feedback, where the feedback can bring conceptual elements to bear on particular problems" (p. 228).

Pedagogies of investigation and enactment provide a social setting for motivating teachers to teach differently than the ways in which they themselves learned, an orientation necessary for ambitious instruction building the commitment necessary to teach ambitiously. "The motivation to do things differently is as important as knowledge and skill to creating consistently ambitious practice, and that motivation depends on the social circumstances in which one learns and develops an identity as a particular kind of practitioner (Cole, 1995; Rogoff, Baker-Sennet, Lacasa, & Goldsmith, 1995)" (Lampert et al., 2013, p. 227). The work of engaging pedagogies of investigation and enactment is the work of engaging the practices of the profession publicly, while being both pressed upon and supported to develop one's motivations, understandings, and knowledge in the company of peers and more expert others.

What should we investigate and enact?

I have already established that *practice* ought to be the focus of professional education: not simply 'theory' or 'tips and tricks of the trade.' I have also argued that teachers need to investigate and enact the desired professional practices. The question then arises, *which*

professional practices should be investigated and enacted? Researchers have shown that when teachers have opportunities to focus their attention on a small set of masterable practices, their work improves (Ball, Sleep, Boerst, & Bass, 2009). However, it is clear that not all practices are worth investigating and enacting. Further, it is likely that certain practices will not develop except through formal training, while it is possible that others skills could be learned through experience (Shaughnessy & Forzani, 2012). For example, while colleagues often give each other tips about classroom management, learning how to design a lesson plan that is likely to structure and scaffold student learning is likely too complex for a teacher to learn over lunch with colleagues. Thus, as a professional community it is worth determining what teaching practices should be attended to in PD settings, and at which stages of teacher development.

Scholars posit that TE and PD ought to focus teachers' attention on what are called core practices, or High Leverage teaching Practices (HLPs) (Ball & Forzani, 2009; Grossman, Hammerness, et al., 2009; McDonald et al., 2013). Ball et al (2009) provided a succinct definition of HLPs:

> [High leverage] practices are most likely to equip beginners with capabilities for the fundamental elements of professional work and that are unlikely to be learned on one's own through experience … We want to focus on teaching practices in which the proficient enactment by a teacher is likely to lead to comparatively large advances in student learning (p. 460).

Working on a small number of core instructional practices is a form of scaffolding for teachers because it allows them to focus on specific aspects of teaching without the distractions of competing agendas. Grossman, Hammerness, et al. (2009) characterized the criteria for choosing which practices ought to be considered high leverage as follows:

- Practices that occur with high frequency in teaching;
- Practices that novices can enact in classrooms across different curricula or instructional approaches;
- Practices that novices can actually begin to master;

> • Practices that allow novices to learn more about students and about teaching;
> • Practices that preserve the integrity and complexity of teaching; and
> • Practices that are research-based and have the potential to improve student achievement. (p. 277)

Focusing PD on the HLPs of the disciplines is an important criterion for the support of instructional improvement (Ball et al., 2009; Grossman, Hammerness, et al., 2009). An example of an HLP is leading a whole-class discussion. In a whole-class discussion, according to TeachingWorks (n.d.),

> the teacher and all of the students work on specific content together, using one another's ideas as resources. The purposes of a discussion are to build collective knowledge and capability in relation to specific instructional goals and to allow students to practice listening, speaking, and interpreting. In instructionally productive discussions, the teacher and a wide range of students contribute orally, listen actively, and respond to and learn from others' contributions (High Leverage Practice section).

In effective whole-class discussions, the teacher must elicit and respond to student thinking, while integrating content knowledge, pedagogy, and the particular learning needs of the students in the class in order to support student learning. Across disciplines, enacting the HLP of orchestrating a whole class discussion requires enacting a variety of learnable skills (Stein, Engle, Smith & Hughes, 2008): communicating expectations for students' participation (Wood, 1999), using probing questions, asking students to repeat the ideas stated by their peers to check for understanding, all the while steering the conversation towards the instructional point (Sleep, 2012).

To further parse practices so they can be taught to teachers, professional educators could look across HLPs to examine the routines that can be enacted across contexts, including what Chapin, O'Connor, and Anderson (2009) call "talk moves." Talk moves are purposeful actions that are guided by goals for participant learning. As moves cut across practices, a series of moves may be engaged in order to achieve a particular pedagogical goal within the context of an

activity or an HLP. An example of a talk move Chapin, O'Connor and Anderson provide is "revoicing," in which a facilitator repeats what a participant just said in different words in order to clarify or reinforce a key idea (p. 14). Other examples of teacher moves are leaving wait time after asking a question, or pressing students to explain their ideas in greater detail. For example, in a Writer's Conference, the teacher would likely revoice ("So you're saying…."), leave wait time after asking a provocative question, or ask the student to elaborate on their answer.

HLPs and moves embody the views and values of a community, and as such, are powerful content for professional learning. For example, whole group discussions are powerful because teachers have the potential to model productive and relationally-oriented views of student learning. By practicing orchestrating a whole group discussion, teachers can enact a belief that students are sensemakers, that there are many ways to make an argument, and that an important part of learning is listening to others. In other words, orchestrating whole group discussions is not just a technical skill, but a platform for engaging potentially new values, ways of framing problems and solutions, and epistemic stances. In this way, HLPs, routines, and moves, though only "slices" of the job of teachers, embody philosophical and epistemological commitments, and thus can reflect the "whole" of ambitious teaching practices.

Maintain a Wide Horizon of Observation

While it is vital to decompose complex work into its constituent elements for the purposes of learning, sociocultural scholars warn about the dangers of too much parsing. When people learn to participate in complex practice, they need help to continually situate new elements of practice in broader context of professional goals. Hutchins (1989) introduces the term "horizon of observation" (p. 52) to describe the elements of a work environment that are

available to novice marine navigators as they learn; the broader one's horizon of observation, the more access to the entire enterprise one has, and the greater the opportunity to learn. In another example, Lave and Wenger (1991) describe the apprenticeship of tailors in Liberia. Novice tailors begin their apprenticeship by sewing buttons on jackets; however, because they work in the same shop alongside more expert tailors, they continually have access to seeing how the entire garment is constructed, granting them access to participation in the community of practice from the outset. Similarly, Lave and Wenger's (1996) study of apprentice Yucatec midwives demonstrated that novices had responsibility for completing important tasks such as running messages to giving pre-natal massages and accompanying master midwives to births from the very beginning of their entry into the profession. While they obviously could not perform all the same tasks of the masters at the beginning, their involvement in every aspect of pre-natal support, delivery, and post-natal care provided access to understanding how the discrete components of practice fit within a broader framework of professional competence. A broad horizon of observation allows individuals to witness how someone who participates centrally in the community of practice spends time, manages competing goals and projects, allocates resources, uses tools, and cooperates with others.

Research shows that managing the relationship between the specific teaching practice and the complex whole is very challenging work (Jackson & Shahan, 2013). If practices are not clearly situated within the larger goals for teacher learning within the context of instruction, such practices can easily become an independent—and therefore nonsensical—enterprise. For example, teachers who focus narrowly on the core practice of eliciting student thinking might begin to elicit all forms of thinking all the time, absent consideration of larger pedagogical goals. Maintaining a wide horizon of observation in the case of teaching means constantly providing

teachers opportunities to situate the specific HLP against the context of the broader instructional aims.

Teachers rarely have access to a wide horizon of observation because they are often separated physically and psychically from their peers and more expert others (Little, 1990; Lortie, 1975). Like the butchers, teachers seldom have opportunities to watch each other professionals at work (Ball & Cohen, 1999). Further, there are few opportunities to watch or co-participate with more expert teachers on outside-of-the-classroom activities of practice, such as planning instruction, assessing students, or working with parents. Learning from the midwives, in order to develop expertise, teachers must have access a more expert teacher's thought processes, materials and routines.

Part of maintaining a wide horizon of observation for teachers is providing learning opportunities that are developmentally appropriate, while still providing access to representations of practice that are likely not achievable at this stage in their career. Livingston and Borko (Ghousseini, Beasley, & Lampert, 2012, p. 1) have shown that what is interesting and useful to experts may have no meaning for novice teachers, and vice versa. In order to support meaningful growth, all teachers need to have a sense of knowing the next step in their development, and how that step is contextualized in a broader vision of ambitious instruction. When the trajectory of learning is made visible to learners, the transition from student to expert professional can be accelerated (Lajoie, 2003, p. 24).

Facilitation of Cycles of Investigation and Enactment

In order to develop more ambitious forms of instruction in our schools, teachers need opportunities to investigate and enact high leverage teaching practices. While scholars continue

to devote considerable attention to models of pedagogies of investigation and enactment as a framework for TE and PD, less attention has been given to the person or people who orchestrate this work. Theoretically, orchestrating this work requires considerable expertise. Next, I build on my argument about how to best support teacher learning by showing how researchers conceptualize the role of expertise in supporting the development of professional practice.

Researchers across cognitive and situated theories of learning agree that learning is both "enculturation into established practices," and "cognitive self-organization" (Cobb, 1994, p. 13). Further, researchers from both fields concur about *with whom* people ought to learn to engage in complex practice: experts. Research from the field of sociocultural theory, such as that of Lave and Wenger (1991) and research from the field of expertise studies, such as that Chi, Glaser and Farr (1988) and Ericsson (1996; 2002; 2006), suggest that a key principle of supporting the development of complex practice in teaching is providing learners with access to co-participation with a more expert other who can welcome the newcomer into more complex forms of participation in the professional community (Lave & Wenger, 1991; Rogoff, 1990; Borko, 2004; Elliott et al., 2009; Franke & Kazemi, 2001; Kazemi & Franke, 2004; Wilson & Berne, 1999). Similarly, from the field of cognitive psychology, researchers argue that the emergence of professional competence depends in part on the individuals' access to learning from and with a more expert other (Lajoie, 2003). Thus, when it comes to the role of the expert in supporting the learning of novices, perspectives from sociocultural theory and cognitive psychology are complementary. The more central one's role in a community of practice, the more likely one is to be considered an expert. In general, central participants in a community of practice, or experts, are identified as those people who structure their performance better, represent problems with greater depth, recognize meaningful patterns, adapt with flexibility, plan opportunistically, make

meaning in ambiguous situations, solve problems faster, self-regulate better, and develop automaticity in their responses compared with novices (Berliner, 2001, p. 464). Understanding the role of central participants, or experts, is critical in understanding how people develop complex practice. In the field of teaching, for example, as Gibbons (2013) notes, associations between teachers' access to expertise and instructional improvement are clear, as demonstrated in literature from the field of social network analysis (Frank, Zhao, & Borman, 2004; Penuel, Riel, Krause, & Frank, 2009).

Co-Participation with a More Expert Other

It is vital that learners co-participate with more expert others in the process of learning complex practice (Gibbons, 2013a; E. Kazemi & Franke, 2004). Sherin and colleagues (2001; 2008; 2009) and van Es and Sherin (2008) build on Goodwin's concept of professional vision and apply his work to the field of teaching, describing *professional vision for reform teaching* (Sherin, 2001; Sherin & Han, 2004; Sherin, Russ, Sherin, & Colestock, 2008; van Es & Sherin, 2008). Their research provides a salient example of how, with the support of an expert who guided a video club in which teachers watched instruction, teachers learned to "focus on different aspects of classroom interactions and developed new approaches to analyzing both pedagogy and student conceptions" (Sherin & Han, 2004, p. 179; van Es & Sherin, 2008). Van Es and Sherin (2002; 2008) conducted empirical analyses to examine how teachers learned to notice, and found that teachers' expertise developed particularly in the ways in which they interpreted classroom events when they collaborated with a more-expert other.

One of the key roles of the expert in supporting the learning of others is providing dynamic assessment, or "moment-by moment assessment of learners during problem solving so

that feedback can be provided in the context of the activity" (Lajoie & Lesgold, 1992 in Lajoie, 2003, p. 22). Being prompted to notice particular features of the problem, receiving feedback or advice, and hearing suggestions from a more expert on the spot, are vital forms of support for learners. Part of why this is so important is because it allows the feedback to be tailored to the learner, so the expert is able to keep the novice in the zone of proximal development. Studies of midwives and tailors who received constant feedback throughout the learning process reveal how they became experts over relatively brief periods of time compared with those in other fields (Hatch & Grossman, 2009, p. 70).

In addition to providing representations of ambitious practice and providing learners with meaningful feedback through dynamic assessment, co-participation with experts can help teachers develop their capacity to respond flexibly to trouble as is arises. While teachers need to learn routines and moves that will allow them to structure interactions with students and focus attention on learning goals, expert practice is characterized as being *adaptive.* Berliner (2001) argues that because "experts are more flexible, are more opportunistic planners, can change representations faster when it is appropriate to do so," (p. 464), and they can model this behavior and explain those choices when working with novices who are "more rigid in their conceptions" (p. 464). When orchestrating a whole-group discussion in mathematics, for example, students are likely to surprise the novice teacher: perhaps a student will provide an accurate response, but for the wrong reason; or perhaps a student will provide the wrong answer, but have generated it through employing a creative strategy. What is the teacher to do? When should she press, on what, and when should she change direction? How can she use student misapprehensions to take the class in a productive direction without losing sight of the instructional goals?

> Teachers' work… is demanding and complex because it operates in the midst of instructional interactions that involve more than one student, adding multiple,

> competing, and often ambiguous demands. The problems of practice that arise from this complexity require teachers to improvise, conjecture, experiment, and assess. They must be able to deliberate and adapt (Ghousseini et al., 2012, p. 1).

Teachers need to learn how to navigate when the course changes mid-stream, and working closely with a more expert other can help teachers develop adaptive expertise.

Research shows that when teachers do not have access to a more expert other when exposed to new representations they may adopt new practices, but in ways that do not necessarily support gains in student learning. Cohen's (1990) seminal case study of elementary math teacher Mrs. Oublier exemplifies the case of teachers who implement ostensibly high leverage practices at the form level, for example, by using manipulatives, absent a deeper understanding of the function of such practices. After her initial support, mostly through the form of reading books about reform-oriented mathematics, Mrs. Oublier received no ongoing support from a more-expert other. She had no one to press her to develop an understanding of the *meaning* or *potential* of the new practices. Although Mrs. Oublier believed she had implemented the new, reformed curriculum "to the tee," and believed her practice provided a model of "teaching for understanding," outside observers witnessed students engaging in the new forms of instruction, but within the frame of very traditional mathematics. Thus, while the children were happily engaged in class, they were not learning more or better than they were before she adopted the new practices; they were still engaging in proceduralized instruction and failing to develop conceptual understanding of key mathematical ideas. The story of Mrs. Oublier is one of a teacher trying to develop expertise in the absence of a more expert other. All Mrs. Oublier had access to was *form,* she had no access to understanding of the *functions* of her new practices. While mimesis can be useful, it will only support meaningful teacher learning when those moves are observed and supported by a more expert other, otherwise, new forms are likely to collapse

onto the old functions, and though instruction might appear to have changed, students are unlikely to be better supported. The case of Mrs. Oublier suggests that representations of expert practice are not enough; teachers actually need to have *conversations* with experts in which teachers are pressed for more conceptual understanding of particular practices. Therefore, Mrs. Oublier suggests learners need help to make sense of the form and function of representations of new practice.

A Focus on Facilitation

Drawing from sociocultural and expertise theory, I have suggested that if teachers are to improve their practices, they need opportunities to engage in cycles of investigation and enactment focused on the HLPs of ambitious instruction. Expert facilitation is required to orchestrate this work and support teachers to decompose practices into learnable chunks while still maintaining a wide horizon of observation. At the same time, there is very little empirical research that details the practices of effective PD facilitation (Even, 2008; Even, Robinson, & Carmeli, 2003).

That said, several recent empirical studies have made important contributions for teacher educators and PD leaders who want to better understand how to orchestrate these features of effective professional learning environments into coherent programmes of learning for teachers. First, it is important that PD leaders be relatively accomplished teachers in the domain in which they are leading (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Elliott et al., 2009; Wilson, 2015). Second, PD facilitators need to establish clear goals for teachers' learning (Elliott et al., 2009; Grossman, Hammerness, et al., 2009; Jackson et al., 2015; Wilson, 2015). Of course, they need to choose the right activities in which teachers can meet these learning goals (Borko, Koellner, &

Jacobs, 2014; Jackson et al., 2015; E. Kazemi et al., 2011; Koellner, Jacobs, & Borko, 2011; Wilson, 2015), privileging activities that approximate ambitious teaching practice.

Facilitators also need to orchestrate productive discussions focused on helping teachers learn to notice key features of core practices of ambitious instruction (Borko et al., 2014; Borko, Koellner, Jacobs, & Seago, 2011; Elliott et al., 2009; Lampert et al., 2013; van Es, Tunney, Goldsmith, & Seago, 2014). Specifically, facilitators need to create and sustain a culture of learning guided by clear norms (Elliott et al., 2009). As an example, recent research by Lampert et al (2013) attends to how effectively facilitated discussions about rehearsals of upcoming instruction can support teacher candidates to elicit and respond to student thinking, a central practice of ambitious teaching. Van Es et al (2014) define high-quality PD conversations as those in which "the group engaged in sustained discussions of the details of students' mathematical thinking, they sought to make sense of the details of their thinking, and they engaged in joint sense-making of student ideas (see Sherin, Linsenmeier, & van Es, 2009)." This research reflects a growing interest in the role of the facilitator in orchestrating conversations that generate meaningful opportunities for teachers to learn.

Recent work has focused on how to facilitate high quality PD organized around analyzing videos of practice (Borko, Jacobs, Koellner, & Swackhamer, 2015; Borko et al., 2011; E. Kazemi et al., 2011; van Es et al., 2014). As a tool for focusing teachers' noticing on the complexity of classroom practice, video has rich potential to support teacher learning. However, as scholars acknowledge, "simply viewing video does not ensure teacher learning. An important question concerns how to facilitate substantive analysis of teaching practice with video so that it becomes…productive" (van Es et al., 2014, p. 340). Borko et al (2011; 2015) found that in order to support teacher learning, PD facilitators must choose the right video clips, pose substantive

questions, and facilitate productive conversations in order to generate meaningful teacher opportunity to learn. My dissertation builds on this current interest in how to conceptualize expertise in leading PD for teachers, and considers what expertise in facilitation might look like across multiple activity structures.

Much remains unknown about what expertise in leading PD entails. It is clear, for example, that teachers are unlikely to learn in the absence of a trusting community of colleagues (Bryk, 2009; Bryk & Schneider, 2003; Grossman, Wineburg, & Woolworth, 2001). However, what the facilitator should do to establish and maintain those kinds of communities has been poorly specified. While we know that cycles of investigation and enactment are more likely to generate opportunities for teachers to learn than transmission approaches to teacher support (Grossman et al., 2007; E. Kazemi, Lampert, & Franke, 2009), there has been very little work which decomposes the work of the teacher educator or PD leader in facilitating those cycles. It seems clear that using video in PD settings can be a rich context for productive conversations about teaching and learning (Borko et al., 2015; Borko et al., 2011; E. Kazemi et al., 2011; van Es et al., 2014), but it is less clear if there are generalizable principles of high quality PD facilitation which cut across activity structures. If so, what are the functions or principles that underlie cross-cutting talk moves? In short, there has not yet been a holistic portrait painted of expertise in leading PD for teachers.

In the following chapters, I zoom in on how an accomplished facilitator orchestrates pedagogies of investigation and enactment in order to develop teachers' ambitious teaching practices. This empirical analysis aims to build the empirical research base about the nature of expertise in facilitating learning opportunities for teachers by painting a holistic portrait of generating opportunities to learn.

CHAPTER III
METHODS

The research question that guides this study is: "What are the facilitation practices of an accomplished PD leader?" In order to engage in an investigation and a decomposition of the practices of an effective PD leader, I analyzed data from PD sessions led by an accomplished teacher trainer, Sabrina. In this chapter, I describe the motivation for the study, the methodological tradition in which the study is situated, the case selection process, the context in which the research was collected, the data and collection procedures, and the analysis procedures. I conclude the chapter with a discussion of the measures I implemented to ensure my study was trustworthy, and I discuss the limitations of the study's design.

Motivation for Study

My goals for this doctoral study emerge from questions that arose in my nine years as a high school English Language Arts teacher. During those years, I frequently attended PD, as I was hungry to improve my teaching. While I liked learning about new ideas and approaches, I never found the workshops I attended helped me figure out the problems I actually had in my classroom–I never attended a workshop that helped me help students learn how to analyze the implicit messages of texts, for example. Nevertheless, within several years, I began leading sessions myself. I led the way I had been taught: I prepared beautiful PowerPoints chock full of information and ideas I thought teachers might like to know. At the same time, I knew the workshops I led likely had little impact on what other teachers were doing on a daily basis in their classrooms.

At the same time, my mentor Nathalie was helping me figure out how I could help my students better articulate thesis statements. Once, she came to my classroom and watched me teach the introductory lesson to thesis statements. We met afterwards and she discussed what she noticed: she asked rich questions that challenged me to think about what students were struggling with, and why it was so hard for them. After I grappled with those questions, she gave me several suggestions for how I might re-teach the lesson. Over the next few months, her questions and suggestions buzzing in my mind, I found my instructional approach radically evolved, not only with respect to thesis statements. I tried to ask students to figure things out before I told them; I paused more often to let them talk with each other or write things down; I integrated group work much more often. These few visits from Nathalie supported my teaching in ways in which the days and weeks of PD I had attended never did.

What was it about Nathalie's visit that had such an impact on my practice? Why didn't all the PD workshops I had attended have even a fraction of the impact? How could I learn to mentor other teachers the way Nathalie had helped me? How might I lead workshops, the "bread and butter" of most PD opportunities for teachers, the way she led a classroom observation? I began investigating and realized that the answers to many of these questions were as yet unanswered in the research literature. I decided to dedicate myself full time to these questions as a PhD student. My goals for this study, then, are ultimately tied to my practice: I want to improve my own facilitation of PD, and I want to help others do so as well. In order to do that, we all need clearer representations and analyses of expertise.

A Case of High Quality PD Facilitation

I engaged in a qualitative case study of the PD facilitation practices of an accomplished professional development facilitator in order to generate an empirically grounded theory of skillful PD facilitation that other researchers can take up in their studies. Because I wanted to develop "dense conceptual analyses of empirical problems," (Charmaz, 1996 p. 28), I looked to the methodologies of grounded theory, which entails analyzing individual cases in order to develop "progressively more abstract conceptual categories to synthesize, to explain and to understand... data and to identify patterned relationships within it (Charmaz, 1996, p. 28). This study reflects the core principles of the grounded theory method: I began with a research question and then collected and reviewed qualitative data in an attempt to respond to the question. As repeated ideas or themes emerged, I labeled the ideas with *codes* that were extracted from the data. As I analyzed more data, I reviewed, revised, and grouped the codes. Finally, these codes were organized into large categories that then became the basis for my theory development. I outline these steps more specifically in the chapter that follows.

I chose to undertake a case study, because case studies are particularly important in situations where nuance and wholeness is important (Stake, 1995, p. xii). Case studies are important when researchers attempt to characterize the *particularities* that define and give meaning to a situation. As Noor (2008) writes, "case studies become particularly useful where one needs to understand some particular problem or situation in great-depth, and where one can identify cases rich in information" (p. 1603). When generalities or aggregation can obscure the defining features of complex situations, case studies can highlight nuances and manifold relationships between people or phenomena. In order to generate theory about the nature of expertise in teaching, case studies have been widely used to better understand the complexities of

the work (see, amongst others, Lampert, 2001; Ball, Lewis & Thames, 2008; Shoenfeld, 2010). For example, as researchers concur that while skillful teaching is organized around principled routines, expert teaching is defined by how such teachers handle the spontaneous, non-routine, in-the-moment problems that characterize the dynamic setting of teaching. I posit that leading PD for teachers is at least as complex as leading instruction for children. Thus, I conjecture that understanding expert PD facilitation entails understanding how skilled leaders handle in-the-moment decision-making and problem-solving. Thus, I chose a case study in order to illustrate how an expert facilitator manages the in-the-moment complexities of leading PD for teachers (c.f., Shoenfeld 2008; 2010).

Case studies are also particularly well-suited to research of contexts for which little is known. In this case, little is known about the practices of expert PD facilitators. Moreover, in the literature, there few representations of what high-quality PD facilitation might entail, which is often the situation when researchers investigate cases of expertise. In fact, as I will elaborate below, Sabrina's practice was the only case of accomplished PD facilitation available for inquiry in a study of four major urban school districts' reform in middle-grades mathematics.

My choice of a case study follows the methodological tradition of many researchers who are concerned with the lack of representations of accomplished practice. One such example is the work of Shoenfeld (2010), who was concerned with the lack of representations and decompositions of effective classroom instruction, and spent many years studying the teaching practice of accomplished educators, including mathematics educator Deborah Ball. Shoenfeld's (2010) case studies of accomplished teachers aimed to generate theory about the nature of how teachers make in-the-moment decisions. Similar to Shoenfeld (2010), I conducted an *instrumental case study:* choosing to study Sabrina is less about wanting to understand her

particular life, choices, worldview, and tastes, as an object of inquiry in and of herself but rather about using her case as a way of generating theory about the nature of high quality PD facilitation.

Finally, I chose to conduct a case study of an *expert* PD leader. While Shulman (1987) argues that the "bumps and bruises" typical of less expert teaching makes visible aspects of practice that might go unnoticed in the 'smoother' performance of more skilled practitioners (Sleep, 2012, p. 939), I build on the work of scholars (e.g., Lampert, 2001, Chazan and Ball, 1999; Forman, Larreamendy-Joerns, Stein, & Brown, 1998; Hufferd-Ackles, Fuson, & Sherin, 2004; Kazemi & Stipek, 2001; Wood, 1999) who argue that if the goal of professional training is the development of expertise, it is important that we have a clear idea of what being an expert entails. Such representations are important for the design of curriculum for that supports the development of expertise. In other words, researchers in education need to analyze representations of skillful practice in order to support the development of such practices amongst practitioners.

Research Context

The data from this study was gathered as a part of the Middle School Mathematics and the Institutional Setting of Teaching (MIST) project, a National Science Foundation-funded research project that aimed to understand what it takes to support instructional improvement of middle-grades mathematics teaching on a large scale. In Phase 1 (2007-2011), researchers collaborated with four large, urban districts serving 360,000 students in three different states in the United States that were all pursuing ambitious middle-grades math reform. Researchers continued to partner with two of the four districts in Phase II (2011-2016). Every year,

researchers documented the district's improvement strategies, collected and analyzed data to assess how these strategies were being implemented, and reported the findings to the district, making recommendations about how the strategies might be revised (Cobb, Jackson, Smith, Sorum, & Henrick, 2013, p. 326). As a part of the MIST project, data was collected regarding various forms of support for instructional improvement in the district, including pull-out PD for teachers.

Case Selection

To identify an expert PD leader from within the MIST data set, I looked at video-recordings of PD in two districts, District A and District B, which shared three key characteristics. Both districts:

1) Identified middle-school mathematics as a priority area, and invested significant resources into PD for middle grades mathematics teachers;

2) Adopted a rigorous, conceptually-oriented middle-school mathematics curriculum, *Connected Mathematics Project II* (Lappan, Fey, Fitzgerald, Friel, & Phillips, 2009), funded by the National Science Foundation, which became a central tool to anchor PD for teachers;

3) Engaged in a long-term relationship with the Institute for Learning (IFL), an outreach of the University of Pittsburgh's Learning Research and Development Center. The IFL partnered scholars, mostly from the University of Pittsburgh, with district leaders to provide, amongst other forms of support, training for the PD leaders.

I first watched approximately 45 hours of PD that was video recorded from District B, led by five different PD leaders, between years 2008 - 2013. Across all sessions, it was difficult to discern a specific set of learning goals targeted by the activities; the sessions tended to be a sequence of disconnected activities that did not seem directed by instructional goals. (For example, significant time was spent in one session showing teachers different ways of celebrating student success with fun gestures, like "sparklehands"). Furthermore, when

colleagues and I analyzed the PD offered by these PD leaders, we noted that, "although the PD leaders elicited teachers' ideas in both sessions, they did not press or build on teacher contributions in meaningful ways. For example, they asked teachers to share ideas, but did not press on teachers to elaborate what they said, check to see if other teachers understood what was shared, or make connections between the teachers' contributions" (Jackson et al., 2015, p. 96). Thus, I decided that the practices of the PD leaders in District B were not accomplished enough to analyze as cases of expertise.

I then looked to the practices of the two PD leaders in District A for potential analysis. The middle-grades mathematics district leader led PD in District A. In 2007, the leader, Lucy, employed a transmission-oriented style: her central mode was the lecture, which she did for upwards of three hours at a time. She rarely stopped for questions, and if she did, her questions were often rhetorical. In 2009, Sabrina was promoted to Lucy's position after having taught mathematics for 17 years, 13 in high school, and four in middle school. Sabrina's practices were remarkably different. I noticed that Sabrina organized and facilitated PD that met many of the criteria established in the literature as indicative of high-quality PD.

My initial examination of the video of Sabrina's practice leading PD signaled to me that she was an extraordinary skilled facilitator. In order to determine if Sabrina's facilitation practices met the criteria of high quality PD for teachers, I evaluated her sessions against what is known about high quality PD, including effective facilitation: she consistently focused on subject matter content connected to instructional practices while providing opportunities for teachers to participate actively and collaboratively in a professional community (Borko et al., 2015; Desimone, 2009; Loucks-Horsely, Stiles, Mundry, Love, & Hewson, 2009). There was a strong sense of community in Sabrina's sessions: she seemed to maintain a positive, engaging and

collegial energy in all of her sessions. Teachers seemed to be learning with Sabrina, and they seemed to get to know one another in her workshops. As I will illustrate in Chapter 4, Sabrina continually supported teachers to investigate and enact high quality teaching practices, often providing them with opportunities to rehearse the strategies they investigated. She provided teachers with representations of practice while continually situating those practices in a broader picture of ambitious mathematics teaching. In all sessions, she maintained a strong focus on equity, frequently justifying her suggested practices by explaining to teachers how those practices would support all students to engage in significant mathematics. Thus, my initial examination of the data from District A revealed that Sabrina's facilitation practices were worthy of extended analysis.

District context.

Sabrina worked in District A, a large, Midwestern, urban school district. At the time of data collection, District A was coping with a range of challenges typical of urban districts, including limited financial resources, a high proportion of students from poor communities, high teacher turnover, a high proportion of novice teachers, and highly public Federal and State accountability systems (Cobb et al., 2013). District A had 35,000 students enrolled in about 100 schools, two thirds of whom were students of colour, and one third of whom were identified as English Language Learners. A significant population of Somali and Hmong refugees were enrolled in the school district. Like most large urban school districts, District A was challenged to meet the needs of a wide variety of student needs with few resources. At the same time, District A provided important supports for teachers and students. They adopted a rigorous and high quality mathematics text to anchor student learning and teacher work, *Connected*

Mathematics Project (CMP). The district was also committed to providing PD for teachers and school leaders, as you will see.

Sabrina's expertise.

As I mentioned, Sabrina had taught for 17 years when she transitioned to her role as a district math leader in 2009. Having identified Sabrina as my case for extended analysis, I looked to other data sources from the years 2007-2009, the years for which we have data on her teaching, to flesh out my understanding of her background knowledge. Several measures of expertise adopted or developed by the MIST project reveal that Sabrina was a highly accomplished mathematics teacher prior to transitioning to her new job. Based on MIST's measures of expertise, Sabrina's scores indicated that she was highly accomplished in terms of the quality of her instruction, her mathematical knowledge for teaching (Hill, Schilling, & Ball, 2004), and her vision of high quality math instruction (Munter, 2014).

First, measures of Sabrina's classroom practices as a teacher (from 2008, before she was a PD leader) using the Instructional Quality Assessment (IQA) (Boston, 2012; Boston & Wolf, 2006) indicate that she had sophisticated and effective teaching practices when working with middle school children. The IQA evaluates key features of ambitious instruction; specifically, "the level of instructional tasks and task implementation, opportunities for mathematical discourse, and teachers' expectations" (Boston, 2012, p. 76). Further, IQA scores are based on samples of student work and videos of teachers' practice: these artifacts provide comprehensive data on instructional practices and "can be considered the gold standard for assessing classroom instruction" (Borko, Stecher, Alonzo, Moncure, & McClam, 2005 in Boston, 2012, p. 78). The IQA has been used in numerous longitudinal research-practice partnerships, including MIST.

The IQA is an important measure to consider because it indicates Sabrina is able to do what she asks teachers to do and because it increases her credibility with teachers. Her scores on the IQA reflect a teaching practice which emphasizes practices maintaining the demand of rigorous tasks, even through implementation, making connections between mathematical concepts and procedures, and enacting discursive routines that privilege sense making and collective problem-solving (Boston & Smith, 2009). In addition, Sabrina was also a very experienced teacher: she brought 17 years of work in the classroom to the workshops. While research (Borko et al, 2015) suggests that years of experience and skill as a facilitator correlate less strongly than the quality of PD a leader receives to become a facilitator, the years Sabrina brought to the workshop surely earned her "street credentials" with the teachers in the room.

Secondly, Sabrina's scores on the Math Knowledge for Teaching (MKT) assessment (Hill & Ball, 2004) in 2008 is a strong indicator that she has a sophisticated grasp of mathematics and how students learn mathematical concepts. The MKT pen-and-paper assessment not only assesses mathematical subject knowledge, but also "why and how specific mathematical procedures work, how best to define a mathematical term for a particular grade level, and the types of errors students are likely to make with particular content" (Hill et al., 2008, p. 431). Sabrina's score indicates that she performed better than 83% of math teachers in a nationally representative sample. This means that she is likely to be adept at assessing student work, representing numbers and operations, and explaining common mathematical rules or procedures. Research has shown that because teachers with a higher MKT score have better structured and connected knowledge, they provide better explanations, give students better examples, and better support students' use of representations (Sleep, 2009, p. 4). Research also demonstrates that higher scores on the MKT are correlated with more ambitious forms of instruction (Hill, Rowan,

& Ball, 2005; Hill et al., 2008).

Finally, Sabrina had very high scores on her vision of high quality math instruction (VHQMI) according to interview-based questions scored on the VHQMI rubrics (Munter, 2014). The VHQMI rubrics were created for the purposes of characterizing how teachers, principals, mathematics coaches, and district leaders characterize "high quality math instruction." The instrument then allows researchers to assess the degree to which the participants' vision of high quality instruction aligns what has been identified in the literature as critical dimensions of mathematics classroom practice (Munter, 2015). Specifically, the VHQMI interview presses participants to explicate their perception of the role of the teacher, the role of the students, the role of classroom discourse, and their vision of high quality math tasks. Sabrina's vision, or her "set of images of ideal classroom practice for which teachers strive" (Hammerness, 2001, p. 143), is important because it likely influenced her capacity to formulate goals for teachers' learning. Sabrina's scores on the interview-based assessment of her vision of high quality math instruction reveal she had a sophisticated, reform-oriented vision of high quality mathematics teaching. Specifically, she viewed the role of the teacher as being one of proactive support for student learning through co-participation. Sabrina stressed the importance of designing learning environments that supported problematizing mathematical ideas, giving students mathematical authority, holding students accountable to others and to shared disciplinary norms, and providing students with relevant resources (Munter, 2014). When considering the nature of talk in the classroom, Sabrina promoted whole-class conversations about important mathematical ideas, not just whole-class lecture, though her description placed the teacher at the center of talk. In her interview, Sabrina maintained that her vision of effective math teaching would involve teachers asking conceptually-oriented questions which required students to explain their problem-solving

strategies in order to help the teacher understand the students' thinking.

Data Collection Procedures

At the beginning of the school year, district leaders shared the dates and times of upcoming PD with the MIST team. Whenever PD was led, a MIST research assistant or professional videographer attended in order to videotape the day. Sabrina wore a lapel microphone, and there were often several microphones on tables in order to capture the discussion happening at different table groups. Sabrina was recorded for the entire duration of the PD session, usually around 5 hours a session, and records of practice, such as handouts and PowerPoints used in the session, were collected.

Data

The data used in this case study includes three interviews of Sabrina led by researchers in the MIST team, tests and measures of Sabrina's expertise (as mentioned above), PD video recordings, and extensive analytical notes. This study draws most extensively on the video data, as it captures a "degree of specificity and depth unlikely to be captured in observation protocols or field note summaries alone and even more unlikely to be represented well in post hoc interview accounts" (Little, 2012, p. 158). Sabrina led six PD sessions for teachers that were video recorded between 2009-2011, and I analyzed all of the sessions. I viewed all the video featuring her PD facilitation from when she took the job as district math leader in 2009 till the MIST project ended in District A in 2011.

The chart below provides a brief outline of all of the video recorded data I used to study Sabrina's practices.

Table 1

Data Overview

#	Date	Participants	Focus	Duration	Central Activities
1	February 10, 2009	Approx. 20 Middle School (MS) math teachers	Inquiry Model of Instruction: Identifying the Big Idea and the Residue	5 hours	Teachers began the day with a science experiment to ground the focus for the rest of the day, which was the inquiry model of problem-solving. Teachers analyzed the year-long plans of an expert teacher who orchestrated the inquiry model. Teachers did a guided reading of a research article focused on the inquiry model and did the complex math task discussed in the article. Teachers then discussed how they would support students to engage with the big ideas in the problem, and they co-planned an inquiry-based lesson using the task just completed. Teachers examined and discussed the "Talk Through the Lesson Plan" model of co-planning instruction.
2	March 6, 2009	Approx. 20 MS math teachers	5 Practices of orchestrating a whole class discussion	5 hours	Teachers learned about the five practices of effective whole class discussion (anticipating, monitoring, selecting, sequencing, connecting) by doing a challenging math task in small groups, planning how they would support students to be successful on the task, and then planning a whole group discussion based on the task. Teachers made posters that summarized their work, and then did a gallery walk to look at other people's ideas about solution paths, order, and questions.
3	December 10, 2009	Approx. 20 MS math teachers	Accountable Talk and the Whole Group Discussion	5 hours	Teachers worked on learning about rigorous tasks and Accountable Talk (AT) by doing math, examining a vignette of accomplished practice, and rehearsing a small group discussion.
4	March 11, 2010	Approx. 15 MS teachers – all disciplines	Courageous Conversations	Evening (2 hours)	Sabrina opened the session by sharing state data that showed that students of color in District B significantly underperformed relative to their white peers. Teachers discuss why this might be the case, they read a short article focused on race in schools, they discussed the reading as a group.
5	December 28, 2010	Approx. 20 Grade 8 math teachers	Differentiation of Instruction	5 hours	Sabrina reviewed upcoming state tests with teachers and examined the new pacing guides. Teachers did a math

Table 1 continued

#	Date	Participants	Focus	Duration	Central Activities
					task together that was focused on the Pythagorean Theorem, and they discussed how they would structure the learning of this unit in light of the new pacing guides. Sabrina then focused on how teachers might "study their students" based on formative assessment in order to differentiate instruction appropriately.
6	February 3, 2011	Approx. 16 6th grade teachers	The Launch Phase of Instruction	5 hours	Sabrina focused on the launch phase of instruction by activating teachers' prior knowledge with a Freyer model, asking teachers to articulate the criteria of a high quality launch, examining a video of an effective launch, analyzing the representation, planning a launch for an upcoming math lesson, and then rehearsing it in small groups. At the end of the day, Sabrina modeled a launch for the group for an upcoming lesson and the group analyzed the representation.

Data analysis.

This section details how I analyzed the data to investigate my research question. Again, my research question is: "What are the practices of an accomplished PD leader who generates opportunities for teachers to learn?" In order to answer my question, I engaged in an iterative cycle of decomposition and analysis, which I describe in detail, below. In order to conduct my analysis, I used the constant comparison method. This involved looking for data that were both a challenge to, and were consistent with, my definitions, then grouping definitions, and looking for patterns and accounting for inconsistencies (Corbin & Strauss, 1990). Glaser and Strauss (as cited in Lincoln & Guba, 1985) described the constant comparison method as following four distinct stages: a) comparing incidents applicable to each category, b) integrating categories and their properties, c) delimiting the theory, and d) writing the theory (p. 339).

First Phase: View video, transcribe all sessions, and develop analytic memos.

My first stage of data analysis was to watch and transcribe all of the PD sessions Sabrina led. This was a descriptive, non-evaluative phase of analysis. As I watched video the first time, I developed a model for my analytic memos by dividing the transcript into what some researchers call ‘‘idea units,’’ (Jacobs & Morita, 2002), or, more simply, what Grant and Kline (2004) refer to as ‘‘meaningful chunks’’ (van Es & Sherin, 2008, p. 250). I took notes in three columns (See Table 2): I labeled the activity on the left column, I transcribed the conversations in the center column, and I took analytic notes about what I noticed in the right column.

Table 2

Example of Transcription and Analytic Notes From my First Phase of Data Analysis

Guiding Discussion on anticipating student misconceptions	1:02:31 So I want to bring it back to the interim assessments. We're not necessarily gonna be talking about the [redacted]CAs in depth any more today. But it you have questions you can bring 'em up and I'll reserve some time. I wanna talk for about 10 more minutes about the interim assessments. Then we'll get up and stretch and kinda go in a different direction. So, on the interim assessment I asked you to look at: Which answers do you think were the most frequently chosen wrong answers? What questions do you think students got right and which ones do you think they got wrong? Let me start here. I'm gonna start at the end. Anyone have an opinion on a question they think students probably got wrong? Just one of 'em. T: [Inaudible.] S: Give me a number.	Explains agenda for day. Makes space for teachers who have more questions/ideas Asks teachers to activate their prior knowledge of areas in which students struggle; asks Ts to put themselves in the students' shoes -- Also, activating mathematical knowledge for teaching = Orients teachers to students' mathematical thinking

This first round of analysis helped me understand the general structure of Sabrina's PD sessions. I begin to notice what Coburn and Russell (2008) might call the "routines of interaction" that characterized sessions. I began to build a picture of the patterns in how Sabrina set up the goals for the session, orchestrated teachers' activities, and questioned teachers throughout. Across all sessions, I looked for examples of episodes in which teachers had particularly vivid opportunities to learn. My initial impression about what counted as an opportunity to learn was that the teachers were deeply engaged in the material being taught, they

were asking meaningful and rich questions, they were grappling with how to apply their learning, and they seemed to be enjoying themselves. Later, I refined my understanding and established a more formal definition of opportunities to learn. As I engaged in the first round of analysis, I also looked for non-examples of opportunities to learn, such as when the session seemed boring, unfocused, or unproductive.

Second phase: Design a preliminary coding scheme.

I used my analytic memos to develop my preliminary coding scheme. Some of my initial codes were based in literature (e.g., "Collaborative analysis of student work," (cf. Dufour, Eakor, & Dufour, 2005). However, because so little has been written about PD facilitation practices, I had to generate most of the codes myself. Based on my notes, I looked to the left column of my analytic memos for the labels that described what was happening in the PD session, and how teachers were interacting with the content.

In this second phase of analysis, I decided that the three major categories of codes were activities, participation structures, and talk moves. I defined activity as *what* teachers did together (e.g., completing a math task, planning instruction), and I defined participation as *how* the teachers engaged with the activity (e.g., think-pair-share, silent reading). I then added talk moves, which is *how the facilitator orchestrated the work* (e.g., making light, affirming teachers). These three broad categories aligned with my conceptual framework in that they broadly describe the three aspects of consideration in the research with respect to engaging in cycles of investigation and enactment. The activities entailed in cycles of investigation and enactment are, broadly examining representations of high quality practice and then rehearsing those practices in situations of reduced complexity. *How* the teachers ought to do that (by

working in small groups or alone, for example) is not explicitly established in the literature – I tried to capture that information in my analysis. Finally, we know from the literature in PD that how the facilitator orchestrates that work is important, though we know little about what high quality facilitation looks like. For that reason, I coded Sabrina's talk moves. In short, by coding activities, participation structures, and talk moves, I was able to flesh out the features of enacting cycles of investigation and enactment in order to represent one case of high quality PD facilitation.

After parsing my codes into three major categories, I grouped like activities, though if I was unsure I kept the labels separate. I looked to the column on the right, and noticed that those analytic notes tended to focus on what Sabrina said that opened up or shut down conversation. I wrote those down as my tentative codes that described what I later called facilitation moves, which I define as the talk moves a leader makes to orchestrate PD. I then wrote a definition and found representative examples of each code from the dataset. The entire codebook can be found in the appendices, beginning on page 141.

Table 3

Example of a Definition of a Facilitation Move and Sample Application of Codes

Positioning teachers as expert *Facilitator frames a particular group of teachers, or teachers in general, as having important and specialized knowledge or skills.*	101028: 00:01:00-00:02:00 S: I want you to know that I am considering you all my experts, and I'm going to ask you some things that are going to become policy in the district.	091210 47:06 S: "Thank you for struggling with this a bit. Lars and I really believe that you have some natural gifts that you bring to this and you have some smarts that you can share with us. And we wanted you to work on it rather just read it."

I then created the codes I would use to code my video data for the second time.

Tool for analysis: StudioCode.

I will pause here to describe the tool I used to code the video data, StudioCode, as it was an important feature of my analytic process. Studiocode is a software package that allows users to code directly "on" video using a set of user-created codes, descriptors and notes. When using StudioCode, the user sees the video in the upper left-hand corner, the codes and labels being used in the upper left-hand corner, and a "timeline," running along the bottom of the screen, which provides a "chronologically organized multilayered graphical representation of all codes, descriptors, and narrative comments attached to a particular video" (Lampert et al., 2013, p. 230) (See Figure 1). Coding the video directly allowed me to label not only what was happening, but also to see how the features of what I was coding were related to each other simultaneously and sequentially.

The StudioCode software facilitated the constant comparison method because it allowed me to easily see all recorded instances of a single code with a simple click. For example, if I were to click on the box on the timeline that reads, "Represent Teachers' Thinking," it would instantly stitch every recorded instance of representing teachers' thinking into a new short film. This allowed me to compare multiple instances of a single code with ease.

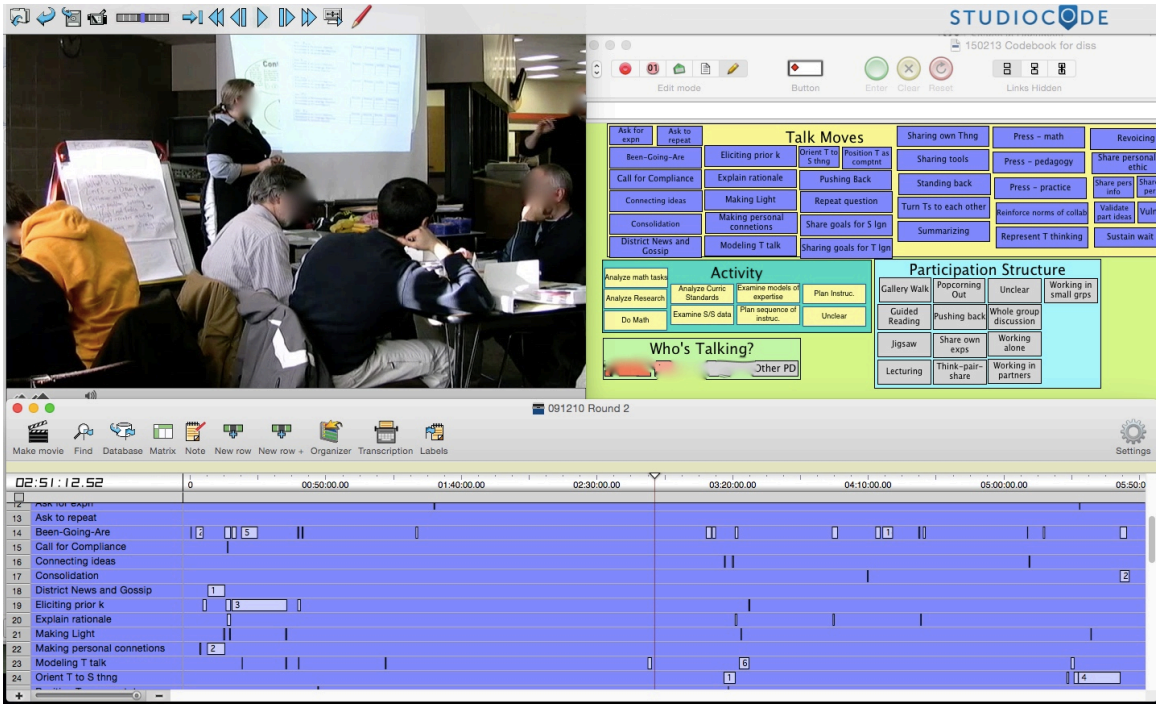

Figure 1. Example of a StudioCode Screen. The video being coded is in the top left corner, the codebook is in the top right corner, and the time line is in the bottom frame.

Once I had developed my preliminary codebook using the analytic memos, I watched all of the video again and coded it using StudioCode. This round of data analysis allowed me to refine my preliminary coding scheme using the constant comparison method, lending considerable heft to the analytical framework. In my case, as I viewed video, I compared codes, definitions and examples to the new videos viewed in order to revise and expand my codebook in three ways. First, I broke single codes into finer-grained codes. For example, the talk move "press for expansion," was divided into three codes: "ask for expansion" (in which the facilitator asks a teacher to elaborate upon their response or provide examples), "ask to repeat" (in which a facilitator asks a teacher to repeat what s/he said), and "ask someone else to repeat another teacher's idea" (in which a facilitator asks a teacher to repeat what another participant has said).

Second, I revised by codebook by adding new codes. For example, I did not notice in my first viewing of the video that Sabrina either summarized (restating what happened in her own words) or consolidated (summarizing in a way which highlights the goal of the activity or the central point of the conversation) after each activity. Third, I renamed codes as the phenomenon under observation became more clear to me. For example, I changed the code "I know you," which labeled moves in which Sabrina would say something that indicated that she knew the participant, to "making personal connections," as I began to see that her gestures were more purposeful and consistent, and not just ad hoc sharing, as I initially believed. I also renamed talk moves when I came across research that described similar phenomena in order to be consistent with the literature. For example, I changed the code "letting it go" to "standing back," which is the term vanEs et al (2014) use to describe the move of letting teachers talk with one another on topic in whole group setting without interruption or comment from the facilitator.

By the end of this phase, my coding scheme was quite different from the preliminary codebook I had developed. I now had a detailed list of all of the activities, participation structures, and talk moves Sabrina employed in her work with teachers. I had a definition for each code and at least two examples of content that helped describe the code. The definitions for each code are found in the Appendices, beginning on page 141.

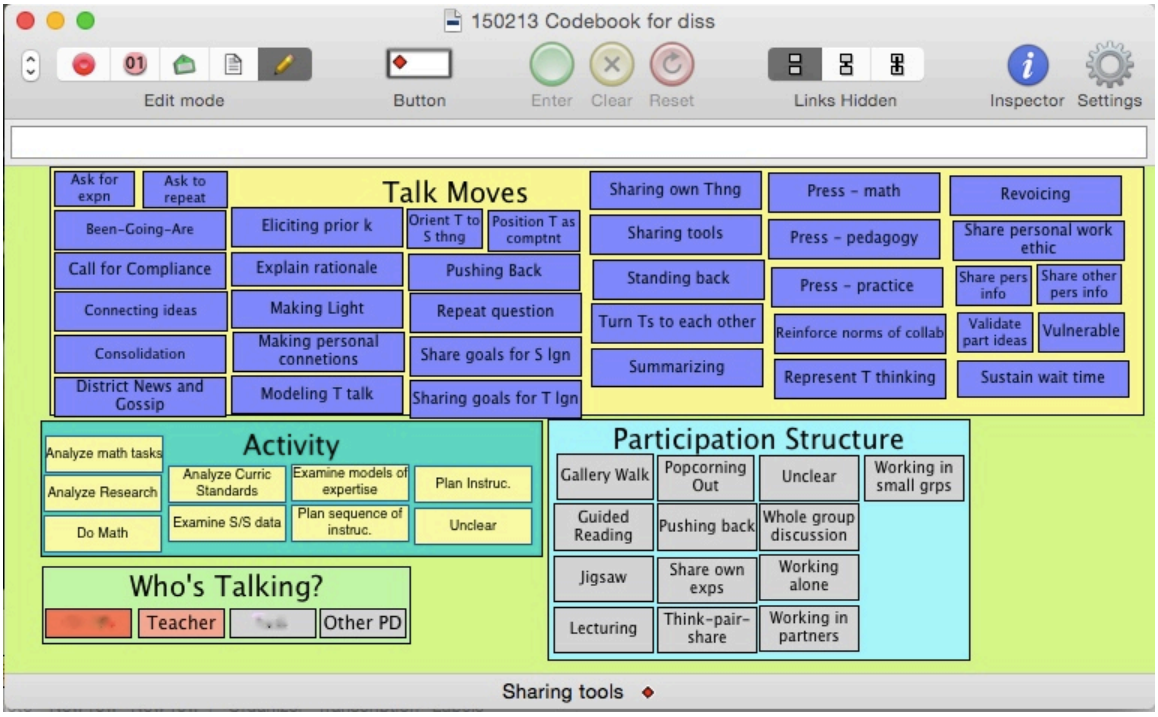

Figure 2. The final codebook I used to code my video data.

Third phase: Focused coding.

The third round of coding entailed "focus coding" the data (Charmaz, 2006, p. 58). At this stage, my goal for analysis had two goals: (1) to ensure my final coding scheme was stable, and (2) to see how the various codes "hung together." Because I had done so much analytical work in the last phase, I found that the codes I had developed to this point were stable. At this stage, I was most interested in examining the *patterns* of interactions – were there consistent patterns of activities, participation structures, and talk moves which seemed to hang together? The patterns that emerged are the focus on Chapter 4, as I describe the practices of a PD leader who generates opportunities for teachers to learn.

Fourth phase: Identify the functions of the practices.

In the final phase of my analysis, I identified the sets of activities, participation structures, and talk moves that worked together to generate opportunities for teachers to learn. I then grouped the practices in several categories defined by their function, or what the facilitation practices achieve. A discussion of these findings follows in Chapter 4.

Trustworthiness

I engaged a number of techniques in order to ensure that my findings were trustworthy and credible. First, I included extensive details about my *methods of interpretation* so others could conduct similar studies in the future and replicate the study. Secondly, I included *thick descriptive data,* so others can examine the data and evaluate for themselves the soundness of my judgments, and consider whether the findings might transfer to other settings or people (Lincoln & Guba, 1986). Third, I engaged in *negative case analysis:* I actively searched for findings that disconfirmed my definitions and examples (Lincoln & Guba, 1986).

In order to ensure my findings were trustworthy, I shared my preliminary findings with colleagues in the fourth phase of analysis. First, I shared my initial codes and examples from the transcript for each code with the PD leaders with whom I work at the Ministry of Education. I also shared my codes, examples, and findings with my academic community. In addition to reviewing my data and analyses with my co-supervisors, I also presented preliminary findings at the American Educational Research Association and the National Council of Teachers of Mathematics in April 2014. I also presented my analyses at several MIST meetings. At each session, I received valuable feedback that informed and refined my analyses.

Limitations of the Design of the Study

As a reminder, I did not aim to label to generalizable elements of expertise in leading PD for teachers. Rather, this dissertation aims to develop theory that can be used as lens for future studies and can aid practitioners with tools and lenses on their practice. That said, there are several limitations to the design of the study as a case study. First, and most significantly, I do not have access to data about what and how teachers learned, how their classroom practices changed, if at all, or what their lived experiences were of the PD offered by Sabrina. Thus, I cannot engage in the kind of analysis that would allow me to argue that certain facilitation practices led to improvements in classroom practices. Thus, I do not make claims about what or if the teachers learned, only that they had *opportunities* to learn.

Secondly, it is difficult to discern what the *tone* and *climate* was like in the room when Sabrina was leading the PD, information that is critical when I consider her relational practices. While the video of PD for teachers captures the back of the heads of the teachers, and shows us the Sabrina's face, I wonder, "are the teachers nodding and smiling when Sabrina talks, or are they snoozing?" While I can make significant inferences based on the nature of teachers' questions, and Sabrina's comments (e.g., "You guys seem ready to move on,") ultimately, this study would have been more robust if I had been able to take on-site field notes rather than relying strictly on video recorded data.

Third, as mentioned earlier, Sabrina received support from the IFL in terms of the development of her PD materials and agendas for PD days. Thus, it is hard for me to know the extent to which this is also a study of the efficacy of the IFL training module. What were Sabrina's practices like prior to her engagement with the IFL? What did she adopt from the IFL and what did she create herself? The IFL's influence on Sabrina's practice is evident, though it is

hard to know the degree to which she was influenced by the training she received. For example, Sabrina asks teachers to complete several mathematics tasks (e.g.. “Cal’s Dinner Card,” discussed in Chapter 4) which are used in IFL training sessions. Thus, this paper does not have sufficient data to be able to analyze which ideas for PD emerged from IFL and which emerged from Sabrina’s personal reflection.

CHAPTER IV

FINDINGS: THE FACILITATION PRACTICES OF ORCHESTRATING HIGH QUALITY PROFESSIONAL DEVELOPMENT FOR TEACHERS

In Chapter 2, I made a literature-based argument that if teachers are to improve their practices, they need opportunities to engage in cycles of investigation and enactment focused on the core practices of ambitious instruction. Teachers need to examine representations of high quality practice, and then have opportunities to try out new practices out in situations of reduced complexity with high degrees of support if they are to enact more ambitious forms of instruction in the classroom (Grossman et al., 2009, p. 456; McDonald, Kazemi, & Kavanagh, 2013). At the same time, simply engaging in cycles of investigation and enactment is likely not enough: teachers also need the support of a skilled facilitator who supports teachers to understand the function of the various practices in light of goals for student learning. However, we lack representations of what skillful facilitation of cycles of investigation and enactment might entail. In this chapter, I identify the facilitation practices and the functions of the facilitation practices of a PD leader who generates opportunities for teachers to learn through cycles of investigation and enactment. In this chapter, I examine the following interdependent practices of an accomplished PD leader: Sabrina developed and maintained a community of learners, she focused teachers' attention on goals for student and teacher learning, she grounded PD in complex instructional tasks, and she pressed teachers to develop and articulate their pedagogical reasoning.

Activities, Participation Structures, and Talk Moves

Before I begin my analysis of Sabrina's facilitation practices, I will share what I found when I coded the six PD sessions Sabrina led. I invite the readers to examine the appendices beginning on page 141 for a full definition of all the terms, and for examples of the codes. Following this brief summary of findings, I will dig into one representative PD session Sabrina led, the Accountable Talk session, and then examine the one session that was an outlier, the Courageous Conversations session.

Table 4

Activities in each session

#	Date	Participants	Focus	Duration	Central Activities, number of times each activity was engaged
1	February 10, 2009	Approx. 20 Middle School (MS) math teachers	Inquiry Model of Instruction: Identifying the Big Idea and the Residue	5 hours	Consider student misapprehensions (2) Do math (2) Do student work (not math) (1) Examine models of expertise (2) Examine standards (8) Guided reading (4) Plan instruction (10) Reflect on current practice (2) Whole group discussion (2)
2	March 6, 2009	Approx. 20 MS math teachers	5 Practices of orchestrating a whole class discussion	5 hours	Do math (2) Examine models of expertise (1) Guided reading (2) Plan instruction (3) Whole group discussion (5)
3	December 10, 2009	Approx. 20 MS math teachers	Accountable Talk and the Whole Group Discussion	5 hours	Analyze math tasks (2) Analyze research (2) Do math (1) Examine models of expertise (5) Plan instruction (2)
4	March 11, 2010	Approx. 15 MS teachers – all disciplines	Courageous Conversations	Evening (2 hours)	Analyze research (3) Examine models of expertise (1) Examine student/state data (1)
5	December 28, 2010	Approx. 20 Grade 8 math teachers	Differentiation of Instruction	5 hours	Analyze research (2) Do math (2) Examine criteria (2) Plan instruction (1) Reflect on current practices (2) Whole group discussion (4)
6	February 3, 2011	Approx. 16 6th grade teachers	The Launch Phase of Instruction	5 hours	Examine criteria (2) Examine models of expertise (3) Examine student/state data (1) Examine video (1) Guided reading (2)

					Plan instruction (3) Whole group discussion (2)

Note that, with the exception of the Courageous Conversation Session, the most common activities across all sessions were planning instruction (18), whole group discussion (13) and examine models of expertise (11). The choice of these activities, as I will discuss later, shows a commitment to bringing one of the core practices of teaching – planning instruction – into the center of the PD workshops. Further, it suggests a commitment to cycles of investigation (examining models of expertise) and enactment (planning instruction).

Table 5

Participation structures in each session

#	Date	Participants	Focus	Duration	Participation Structures, number of times each activity was engaged
1	February 10, 2009	Approx. 20 Middle School (MS) math teachers	Inquiry Model of Instruction: Identifying the Big Idea and the Residue	5 hours	Lecturing (15) Popcorning out (3) Pushing back (3) Question and answer (7) Sharing own practice (5) Silently reading (6) Think-pair-share (25)
2	March 6, 2009	Approx. 20 MS math teachers	5 Practices of orchestrating a whole class discussion	5 hours	Gallery walk (1) Question and answer (4) Rehearsing (2) Think-pair-share (7) Whole group discussion (4) Work alone (2) Work in pairs (1)
3	December 10, 2009	Approx. 20 MS math teachers	Accountable Talk and the Whole Group Discussion	5 hours	Lecturing (1) Popcorning Out (3) Pushing back (1) Question and answer (2) Rehearsing (3) Silently reading (5) Teachers sharing their own practice (1) Think-Pair-Share (12)
4	March 11, 2010	Approx. 15 MS teachers – all disciplines	Courageous Conversations	Evening (2 hours)	Lecturing (5) Popcorning Out (2) Pushing back (1) Think-pair-share (3) Whole group discussion (3)
5	December 28, 2010	Approx. 20 Grade 8 math teachers	Differentiation of Instruction	5 hours	Lecturing (5) Popcorning out (5) Pushing back (3)

#	Date	Participants	Focus	Duration	Participation Structures, number of times each activity was engaged
					Question and answer (5) Think-pair-share (8)
6	February 3, 2011	Approx. 16 6th grade teachers	The Launch Phase of Instruction	5 hours	Jigsaw (1) Lecturing (2) Question and answer (4) Share own practice (1) Silently reading (1) Think-pair-share (4) Work in pairs (2)

The most common participation structure across all sessions was the think-pair-share (59), which I will discuss later in this chapter.

Table 6

Talk moves in each session

#	Date	Participants	Focus	Duration	Talk Moves, number of times each move was used
1	February 10, 2009	Approx. 20 Middle School (MS) math teachers	Inquiry Model of Instruction: Identifying the Big Idea and the Residue	5 hours	Activating prior knowledge (6) Affirmation – naked (2) Asking for expansion (4) Been-are-going (13) Calling for compliance (3) Making light (16) Making personal connections (7) Opening the group to the group (13) Sharing district news and gossip (5) Sharing own teaching (12) Sharing personal information (6) Sharing tools (14) Sharing goals for teacher learning (5) Sharing vulnerability (12) Standing back (1) Positioning teachers as competent (5) Press – math (11) Press – pedagogy (11) Explaining rationale (2) Revoicing (3) Repeating the question (6) Representing teachers' thinking (1) Wait time (7)
2	March 6, 2009	Approx. 20 MS math teachers	5 Practices of Orchestrating a Whole Class Discussion	5 hours	Activating prior knowledge (1) Affirmation – naked (1) Affirmation – why (2) Asking for expansion (3) Been-are-going (11)

Table 6 continued

#	Date	Participants	Focus	Duration	Talk Moves, number of times each move was used
					Calling for compliance (1) Explaining rationale (2) Making light (3) Making personal connections (1) Modeling teacher talk (1) Positioning teachers as competent (5) Press – pedagogy (5) Press – math (1) Standing back (2) Sharing district news and gossip (1) Sharing own teaching (5) Sharing goals for student learning (1) Sharing goals for teacher learning (5) Sharing tools (4) Sharing personal information (5) Sharing vulnerability (7)
3	December 10, 2009	Approx. 20 MS math teachers	Accountable Talk and the Whole Group Discussion	5 hours	Activating prior knowledge (7) Affirmation – naked (4) Affirmation – why (4) Asking for expansion (5) Been-are-going (7) Explaining rationale (1) Making light (4) Making personal connections (4) Modeling teacher talk (7) Opening the group to the group (2) Positioning teachers as competent (5) Press – math (3) Press – pedagogy (2) Representing teachers' thinking (3) Revoicing (2) Repeating the question (11) Sharing goals for teacher learning (5) Sharing own teaching (4) Sharing tools (7) Sharing vulnerability (4) Standing back (1)
4	March 11, 2010	Approx. 15 MS teachers – all disciplines	Courageous Conversations	Evening (2 hours)	Been-are-going (3) Explaining rationale (1) Making personal connections (3) Positioning teachers as competent (1) Sharing district news and gossip (2) Sharing goals for teacher learning (1) Sharing personal info (3) Sharing tools (3) Sharing vulnerability (5)
5	December 28, 2010	Approx. 20 Grade 8 math teachers	Differentiation of Instruction	5 hours	Asking for expansion (1) Been-are-going (2) Calling for compliance (1) Eliciting prior knowledge (2) Making personal connections (2)

Table 6 continued

#	Date	Participants	Focus	Duration	Talk Moves, number of times each move was used
					Modeling teacher talk (1) Opening the group to the group (3) Positioning teachers as competent (1) Reinforcing norms of collaboration (1) Repeating the question (2) Sharing district news and gossip (7) Sharing own teaching (1) Sharing personal information (3) Sharing tools (3) Sharing vulnerability (1) Sharing vulnerability (4) Validating participant ideas (1)
6	February 3, 2011	Approx. 16 6th grade teachers	The Launch Phase of Instruction	5 hours	Affirmation – why (1) Asking for expansion (3) Been-are-going (9) Explaining rationale (4) Making personal connections (3) Modeling teacher talk (5) Opening the group to the group (2) Positioning teachers as competent (7) Press – math (3) Press – pedagogy (3) Sharing district news and gossip (1) Sharing goals for teacher learning (2) Sharing own teaching (2) Sharing personal information (1) Sharing tools (10) Sharing vulnerability (1)

The most common talk move across all sessions, not including the Courageous Conversation session, was "been-are-going" (42), which reveals that a key feature of high quality PD facilitation entails managing activities and transitions by helping teachers see the clear trajectory from where they were, where they are, and where they are going. Secondly, Sabrina privileges sharing tools (39) and sharing vulnerability (29). I will discuss these features of her facilitation later in this chapter.

Context for Analysis

In order to make sense of this data, I choose one representative session, the Accountable

Talk session. The Accountable Talk session, like the other four sessions (not including the Courageous Conversations session) focused on providing teachers with opportunities to investigate and rehearse high quality instruction. Through an analysis of this workshop, I will illustrate how Sabrina orchestrated the activities, participation structures and talk moves into practices that generate teacher learning.

First, I will provide some context about the workshops Sabrina facilitated, all of which, with the exception of the "Courageous Conversations" workshop that I analyze at the end of this chapter, had similar contextual features. Sabrina always worked with groups of between 25-32 middle grades math teachers, and the days usually ran from about 8:30am – 3:30pm. Often the groups were composed of teachers of the same grade. The rooms were arranged the same way: four teachers sat together at small table pods, with members of the small group facing each other. A screen at the front of the room showed the PowerPoint presentation, and a chart paper easel at the front of the room allowed individuals to record group conversations. Teachers rarely engaged in a single activity for more than an hour, and Sabrina rarely spoke for more than several minutes in a row. Usually when she spoke it was to set up the next activity, explain the rationale or goals for the upcoming activity, or help teachers make meaning from the activity they just completed.

Cycles of investigation and enactment.

Across all sessions except the Courageous Conversations session, Sabrina focused on engaging teachers in cycles of investigation and enactment; in five sessions I counted 11 episodes of teachers investigating expert practice and 18 episodes in which teachers planned or enacted high quality instruction. The workshop held on December 12, 2009 illustrates how Sabrina orchestrates cycles of investigation and enactment.

The workshop for 28 grade 8 mathematics teachers focused on rigorous tasks and Accountable Talk (AT). The session began with teachers investigating a complex task by *doing* a complex task, in this case, a grade 8 math problem called "Cal's Dinner Card," extracted from ambitious curriculum developed by the Institute for Learning and connected to the Connected Mathematics Project II curriculum. After working alone for 15 minutes, teachers were invited to work in small groups at their table, where participants shared their solutions and solution strategies with one other. While teachers worked, Sabrina, and her mentee, Lars, walked around the room and wrote down examples of AT they heard people using while they talked, later showing those examples on the document camera. Next, Sabrina asked three groups to present their answers and solution strategies, modeling a whole group discussion. Sabrina then orchestrated a discussion about the degree to which the task was rigorous. Throughout, she drew attention to what she was doing and why she was doing it, helping teachers notice key elements of the task and the discussion. By doing the task, and then stepping back to talk about it, teachers experienced what it felt like to engage in a rigorous math task with the support of a learning community organized by the norms of Accountable Talk.

Then, Sabrina and Lars shared a representation of expert practice, in this case, by performing a vignette they wrote in which Sabrina and several volunteer teachers played the part of students working on Cal's Dinner Card, while Lars played the role of the teacher. While the actors portrayed students struggling to complete the task, Lars modeled AT moves that refocused students on the task "without giving the math away." As the teachers and Sabrina fell in and out of character, they laughed and joked with each other: the mood was light, but participants fell back into role and focus quickly.

After investigating the Dinner Card task, Sabrina asked teachers to enact what they were

learning about the role of Accountable Talk in supporting student success on rigorous tasks during the explore phase of instruction in a situation of reduced complexity. Teachers were asked to write their own vignettes in small groups in which they illustrated students working and teachers intervening with strong AT moves. They then presented their vignettes to another small group, who analyzed the AT moves and discussed the impact of their implementation. At the end, the small group watching the vignette suggested possible improvements to the instructional interventions presented.

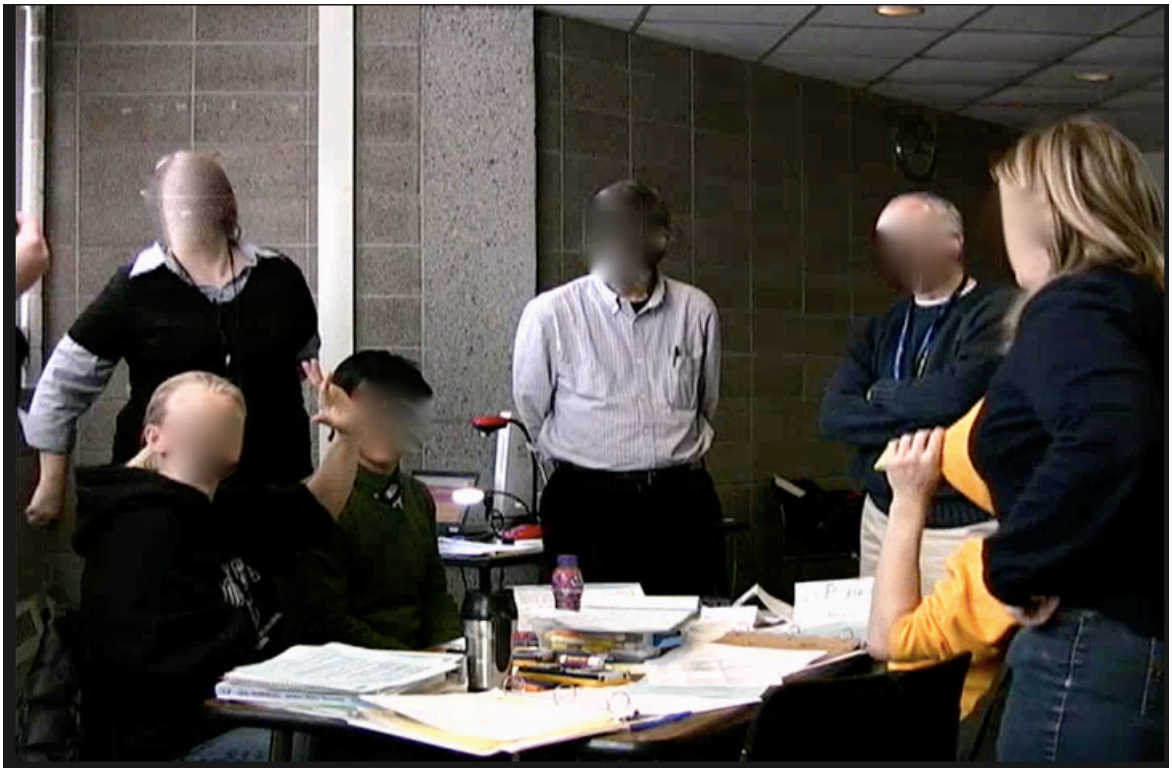

Figure 3. Teachers presented their vignettes to one another in small groups. One group sat around the table, and the other group formed a circle around them. Sabrina, in a black sweater vest, drifted between the groups while they were presenting and discussing.

Note that Sabrina focused the investigation and enactment on high leverage teaching

practices. She focused the day around Accountable Talk, aligning with the high leverage teaching practice of "establishing norms and routines for classroom discourse central to the subject-matter domain" (TeachingWorks, 2015). TeachingWorks, a research consortium housed at the University of Michigan, states:

> Each discipline has norms and routines that reflect the ways in which people in the field construct and share knowledge…Teaching students what they are, why they are important, and how to use them is crucial to building understanding and capability in a given subject. Teachers may use explicit explanation, modeling, and repeated practice to do this. (2015)

The focus on AT throughout this PD session supported teachers to consider how the norms of AT help students learn to talk – and think – like mathematicians by being held accountable to the practices of the discipline.

Secondly, Sabrina focused on the HLTP of "teaching a lesson or segment of instruction." TeachingWorks states:

> During a lesson or segment of instruction, the teacher sequences instructional opportunities toward specific learning goals and represents academic content in ways that connect to students' prior knowledge and extends their learning. In a skillfully enacted lesson, the teacher fosters student engagement, provides access to new material and opportunities for student practice, adapts instruction in response to what students do or say, and assesses what students know and can do as a result of instruction (High leverage practices section, para. 8).

The focus throughout this PD session on the Cal's Dinner Card task becomes the lens through which teachers learn how to articulate mathematical and discourse goals, focus on student thinking, develop better small group routines, adapt instruction in response to student struggle, and assess student performance.

Through an analysis of the structure of one session Sabrina led for teachers, I have established that the PD that Sabrina led met the criteria for high quality PD by leading cycles of investigation and enactment focused on the high leverage practices of ambitious teaching. At the

same time, because we know that engaging in those activities is likely not enough to support the learning that ambitious teaching requires, in the following section, I zoom in to analyze how Sabrina orchestrates this work to generate opportunities for teachers to learn.

Accomplished Facilitator Practice 1: Develop and Maintain a Community of Learners

Scholars who ascribe to situative theories of learning have identified community as an essential feature of environments that support teacher learning (Borko et al., 2005; Wilson & Berne, 1999). Little (2002), for example, argues that "strong professional development communities are important contributors to instructional improvement and school reform" (Little in Borko et al., 2005, p. 936). In their rating of professional development workshop leaders, Borko et al (2015) found "establishing a positive workshop culture" to be of primary relevance in determining the overall efficacy of the workshop. Other research by Borko et al (2005) and Grossman, Wineburg and Woolworth (2001) argue that indeed, in the *absence* of community, it is unlikely that teachers learn to improve instruction. While there is a strong consensus amongst teacher educators that community matters when it comes to supporting professional learning, and there are useful pictures of effective professional development communities at work (Horn & Kane, 2013, 2015; Horn & Little, 2010; Horn, 2005, 2007, 2010), to date, little work has zoomed in on the role of the facilitator in generating teacher community. My coding revealed that *one seventh* of Sabrina's talk moves were explicitly focused on relationship building and maintenance. In this section, I explore how Sabrina develops and maintains healthy community.

First element of building community: Developing trust.

A key feature of community is that the participants trust one another. Environments that

are characterized by trust amongst participants are more likely to be environments that generate opportunity to learn (Bryk & Schneider, 2003; Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). After 12 years of intensive research in the Chicago Public School system, Bryk and colleagues (2003) found that trust was the *key* institutional resource required for enacting ambitious reforms. However, it is not always clear how a skilled facilitator creates and sustains trust with teachers and between teachers. Sabrina built trust by getting to know the teacher participants, sharing information about herself with teachers, making space for vulnerability, and positioning teachers competently.

Sabrina's facilitation reveals that an essential feature of building a trusting community of learners is having personal knowledge of the people in the room. As workshops began, Sabrina talked with teachers, often joking with them about things like weather and parking. More often, however, her talk revealed some personal knowledge of the teacher, such as when asked, "how is life at Alfred [Middle School]?" If she didn't know a teacher, she introduced herself. On December 12, after chatting with teachers, Sabrina turned on her "whole group voice" to formally initiate the session and welcome everyone to the session. Mentioning that there were a few new people in the room, a teacher asked Sabrina to introduce everyone. Laughing, and asking for forgiveness if she made a mistake, Sabrina introduced each participant by name and school, often sharing a few details about the teacher. "I'll start easy," she began, "this is Barb Everhart – we went to college together, so if I don't know her, whoo!" These social interactions, characterized by smiling and laughing, epitomized the tone of her interactions with teachers.

Sabrina also revealed significant interest in what teacher participants already knew about topics that were to be explored in each session. In the Accountable Talk session, for example, there were five explicit episodes of eliciting her participants' prior knowledge. For example, she

began the day by asking teachers to write down everything they remembered from the previous session. Because each session built on each other, it was particularly important to provide teachers with opportunities to remember prior sessions. By frequently asking questions about teachers' prior knowledge, she also primed them for new learning.

Sabrina also helped teachers develop trust by getting to know one another. She shared her knowledge of participants with a positive frame; she shared teachers' strengths and successes publicly:

> Rod Smith passed away this weekend. A lot of you were pretty close to him. He has been a long, long time advocate for math in the state. He was retired from this district the whole time I was in this district, and yet, I felt like he was a math leader here… I know ten of those years he was on the school board. Even when he wasn't on the school board, he was everywhere. Just send out some good wishes his way. Anybody want to say anything about Ross? I know some of you knew him even better than I did…
>
> Teacher: I would not be in this district if it were not for Ross; I absolutely would have just walked away in the first semester, cause you know how tough it is. And he just constantly was: it's gonna get better, it's gonna get better, it's gonna get better. It was very positive. And yet, not in a false way. He didn't have his head in the clouds. He knew how tough it was. I also credit him with the math department in [City] was the strongest math district in [the State]… [He] made for a very strong department. He was a good guy. He wrote textbooks I taught from… He came in to my classroom once when I was teaching from his textbook and I introduced him to the kids, and showed them his name!.. It was fun! …
>
> Sabrina: Remember that magnet trick he did on the overhead? So everyone was attracted? (People laugh, share magnet stories.) (090210: 00:07:28)

In this episode, Sabrina made space for teachers to share their experiences of a key figure in their community. In doing so, she also invited newcomers into the community by introducing them to local personalities and history. She also positioned teachers competently, by highlighting the many contributions one teacher made to the district over time.

Sabrina also shared information about herself with the group, another aspect of building trust. At the same time, Sabrina shared few details about her life outside of her role as a district

leader: I don't know, for example, her sexual or religious orientation, her family status, or her ethnic heritage. She sometimes shared surface information about herself with the group in the context of professional conversations, such as talking about the size of her condo in the context of a math task focused on determining square feet. She frequently shared information about the professional development she attended herself, and what she learned at PD sessions.

More often than sharing information about her life outside of the particular session teachers were attending, however, Sabrina shared her feelings about the workshop with the group. The feelings she shared were almost always focused on what was unfolding in that moment, and they almost always fell into one of two categories: happiness or vulnerability. Sabrina laughed frequently and heartily, and often celebrated the successes of teachers in the room: in six sessions I coded 23 episodes of "making light," or episodes in which she said something that made the whole group laugh. Sharing her joy and remaining in the present with teachers surely contributed to the upbeat and optimistic tone that is palpable in her PD sessions, even on video recordings.

Sharing one's vulnerability is a key feature of developing trust with and amongst teachers; in the absence of vulnerability, trust will not flourish. I coded 34 episodes of Sabrina's facilitation characterized by vulnerability across the six sessions. For example, on March 9, 2009, she asked for help putting up chairs after the session because she needed to attend a funeral directly following the workshop:

> I know I'm gonna be short with some of you today… I just have a lot of things going on in my personal life that are getting in the way of me giving myself to the job. I apologize. If anything, email me and I'll be in a much better space next week (090306; 00:50:44).

As a testament to the relationships she built with teachers, these expressions of vulnerability were always met with support and reassurance from teachers. Immediately following the

statement above, a teacher raised her hand:

> Can I say a general comment?... When you sent out the email that said we had to read another article, I was like oh God! Not another article that's not practical, and it feels like we're in college, but then I started reading this one and I was like, oh! I like this! It's telling me something to do! (090306; 00:51:00).

Here, it seems that the teacher wants to respond warmly and kindly to Sabrina, though the teacher does not explicitly address 'the elephant in the room,' Sabrina's need to attend a funeral. In response, Sabrina smiled, said, "Well good, I'm glad," and moved on with a smile to the next activity. Sabrina consistently built a sense of mutual cooperation with her teachers through opening herself authentically with the group.

On several occasions, Sabrina also shared vulnerable information about others with the whole group. At the beginning of one session, she stated: "Nancy, I hope you don't mind that I share this… [Nancy nodded]… Nancy's father passed away this week. I always say this job is easy if the rest of your life is sane. But there is always something. This is a hard job." The teacher replied, "This is also a great place to be if your life is hard." The group then briefly discussed how kind students could be to teachers when they were struggling. Here, Sabrina modeled tender compassion for the teachers in the room, as well as framing the work of teaching as being 'hard,' valuing the work of teachers.

Sabrina also approached potentially conflictual conversations with teachers with a frame of vulnerability, presenting herself transparently and openly. Asking teachers to change their behavior is difficult, as the following episode reveals. Sabrina only "called for compliance," or asked teachers to comply with her requests, seven times across all six sessions, and three of these episodes were characterized by her own vulnerability. For example:

> I am sorry to be treating you like a class right now, but I feel like I'm struggling to have people "up here" all day. I know it's just the end of… I'm not used to working with adults… and it's been a challenge for me this year. The things I expect of

> students I can't expect of you adults. You come late, you don't read your articles, you leave early, you have all these excuses, you expect to leave… It's hard… you know, like, the things I would say to my students, you know, to get quiet, I can't say to adults…I'm like, I'm not made to work with adults... It's just not in my skill set. And it's been a struggle for me this year. Because I can't do what I do with students. And, you know, that's like, what I've had twenty years doing. And I can't do that with adults. And I'm like, I can't transition. I mean, I shouldn't say "can't." I suppose I could. I am *not willing to* make that transition. So. I'm just gonna be really explicit right here. Could you all just listen up right here, a second? And I know I see myself in you guys too. I'm like, wow. [Teacher interjects, talks over: "You're doin' fine!"]. I am sure I've pissed off some of my leaders in the past. For lack of a better way of sayin' it! (090210; 03:49:00).

Here, Sabrina framed teachers' disappointing participation as stemming from her own lack of expertise. She put herself down: she is sure now that she has "pissed off some of her leaders in the past," presumably from lack of consciousness about the impact of her behavior. Thus, she made explicit her vulnerability in her call for compliance, while framing teachers' non-compliance as unconscious, not malicious. At the same time, because of her framing, she is able to call out teachers' behavior—with "all their excuses"—strongly and clearly.

Sabrina also builds community by positioning teachers competently. As Krause, Louis and Bryk (1994) found, "Teachers must feel they are honoured for their expertise—within the school as well as within the district… Respect, trust, and a shared sense of loyalty build professional commitment and the cooperation required for collaboration and shared decision making" (p. 161). As Bryk (2003) later writes, "human resources—such as openness to improvement, trust and respect, teachers having knowledge and skills, supportive leadership, and socialization—are more critical to the development of professional community than structural conditions" (p. 40). In other words: in order to learn, teachers need to feel valued and trusted. Across the six sessions, I counted 24 episodes of Sabrina affirming the professional competence of teachers in the room. I note that she does not do this through simple affirmations such as "good job" statements, on the contrary, she rarely praises teachers: I coded only seven utterances

of "Affirmation, no explanation," such as "nice work!" across all sessions. On the other hand, she framed her affirmations of competence in professional language: "I want you to know that I am considering you all my experts, and I'm going to ask you some things that are going to become policy in the district" (101028; 00:01:00). She positioned teachers competently:

> We're gonna be better teachers if we know each other and talk to each other. Here's what I know for sure: I don't know sixth grade math. Cause I've never taught it. The experts for 6th grade math are in this room. You can certainly ask me questions, but what I would do is ask the people that sit in this room. Learn from one another and get to talk to one another (110203; 02:39:32).

Similarly, when one teacher shared a difficulty helping her students avoid a common mathematical error, Sabrina responded, "my guess is that the teacher who asks this is not the only teacher that has kids that want to [make that error]. Anybody have any thoughts on this?" (110203; 04:00:07). Here, Sabrina normalizes the concern, and situates it within a developmental framework for which she presumes other teachers have insight.

While I have decomposed the different elements of building trust for the purposes of analysis, Sabrina usually enacted all elements of building trust in the same episode. For example:

> Just so you know, Lisa Guinness left for the afternoon. Whether you know it or not, she is doing the job of two people. She has a huge part of her job that basically she works with [Research, Evaluation and Assessment] and leads an assessment committee, I swear she spends 40 hours a week just dealing with that in the district and going to like, a thousand assessment meetings at the district level. So she had to go to deal with some of that, so, whether you like it or not, today is just me and the other people in this room [*teachers gasp in mock fear, laughter erupts.*] (090210; 03:25:27).

Here, we see how Sabrina shared her knowledge of a participant with the whole group so they could get to know one another. Further, Sabrina positioned Lisa competently by sharing her immense responsibilities within the district. She made space for vulnerability by joking about how the teachers were stuck with her for the afternoon, even as she made them all laugh. Across all sessions, Sabrina's practice reveals how important it is to build trust with and amongst

teachers in order to support teachers to take the risks that learning entails.

The Second element of developing community: Developing expertise.

Sabrina also developed a strong community of learners by supporting individual teachers to move towards more central forms of participation. Sabrina helped teachers develop experience and competence, the two defining features of expertise, according to Wenger (2000, p. 227). For example, in the Accountable Talk session described earlier, Sabrina provided Lars, an accomplished middle grades math teacher, with opportunities to experience being a "co-leader" of the PD session by leading short segments of the workshop. After each segment that he led, she asked him questions and coached him on his next moves. For example, Sabrina asked Lars to model AT moves during a whole group discussion which he led: he orchestrated the discussion by asking questions, pressing teachers for more clarification and elaboration, and leaving wait time. Afterwards, he and Sabrina discussed the moves they made in light of the criteria for AT in front of the group. Here, we see how Sabrina afforded Lars a significant opportunity to learn by asking him to model the practice being taught for teachers, providing him opportunities to experience leading PD for teachers in a situation of reduced complexity with maximum support. Further, she reinforced his own competence with his peers by positioning him as a leader.

Sabrina afforded Lars an opportunity to develop his competence in the community by sharing her professional vision with him between interludes in the activities. Here, we are reminded of Goodwin's (1994) assertion that supporting others to engage in work as professionals requires opportunities for the learner to have access to the professional noticing of the more expert other. For example, after they got teachers working on the math task, Sabrina spoke with Lars in a corner:

> Sabrina: So what I'm gonna do next is pass this out, and then have them share what they wrote. And then we're gonna say, so yeah, there are some moves that we can do

> as teachers that will hold people accountable to these things. So we're gonna work on these moves… We're gonna give you these moves. So this is what it looks like. And then we'll give them another blank one of these. These are in alphabetical order, and I'd have them work in pairs, so just one of these for every pair.
>
> Lars: Without this? *[indicates a sheet of paper]*
>
> Sabrina: Um, they can have this [*indicates sheet of paper*] cause it's just the features and indicators that show you that Accountable Talk is going on. These [*indicates sheet of paper*] are the *moves* that the teacher would make. So it's not like these are on here (091210; 00:43:03).

Here, we see how Sabrina gave Lars a preview of the upcoming activity, with a window into her learning goals for teachers: identifying the moves of teachers who hold students accountable through talk. Further, Sabrina made clear the distinction between *moves*, *features*, and *indicators* of AT, helping Lars develop a technical vocabulary for the work of teaching that teachers were would later grapple with in the session. In these interludes, Sabrina afforded Lars opportunities to develop his competence by being exposed to upcoming activities ahead of time and by having additional opportunities to focus on the key learning goals. These experiences supported him to develop his expertise both as a teacher and as a potential future PD leader. In a broader sense, by nurturing his expertise and developing his competence, Sabrina was building a strong community that would not ultimately depend on her leadership alone to thrive in the future. Thus, by supporting the development of Lars' expertise, Sabrina was building a strong community of learners.

Third element of developing community: Supporting more central forms of participation in the community of practice.

Sabrina also developed a community of practice amongst her participants by choosing activity structures that required teachers to collaborate. The Accountable Talk session reveals

how Sabrina's facilitation relied on a routine of interaction (Coburn & Russell, 2008) that structured and required shared knowledge construction. Sabrina orchestrated a 'think-pair-share' sequence, or a series of brief activities in which teachers had a task to work on by themselves that they then discussed with a partner before turning towards a small group and/or the whole group, 59 times across six sessions. Think-pair-share was Sabrina's most commonly employed activity structure. Research by Appelgate (2012) reveals that this routine of interaction is a high leverage teaching strategy because discourse between participants is at the center of the routine, and the structure of the pair provides the opportunity for equitable participation (p. 57). For example, in the Accountable Talk session, after completing the Cal's Dinner Card task, teachers were supported to discuss areas of the task in which they thought students would struggle. After responding to the initial question alone and then in pairs, Sabrina challenged them to consider why students would find those mathematical elements of the task challenging. Finally, before turning to the whole group, teachers were asked to consider what those challenges indicated about students' emerging mathematical competence. This sequence of questions required teachers to identify the requisite mathematical knowledge required for the task and connect those criteria to what they knew about how children learn key mathematical concepts. The task, considered in the context of a think-pair-share activity, required teachers to build their Mathematical Knowledge for Teaching (MKT). Research has demonstrated that PD focused on development of MKT is associated with gains in student achievement scores (Borko, Koellner, & Jacobs, 2014; Hill & Ball, 2004). Sabrina's facilitation structure provides a model of how one might orchestrate the work of developing MKT and community at the same time.

Sabrina also provided the tools necessary for teachers to keep their group work focused, further supporting teachers to move towards more central participation in the a community of

practice. Edwards' (2010) research reveals that anchoring activities in shared tools that facilitate the work of collaboration is a critical feature of communities of practice that support the development of expertise. Boston and Smith (2009) found that the quality of the tools used to guild teachers' thinking in the context of PD had a significant effect on teacher learning and practice. Engeström's work (Engeström, 2007a in Edwards, 2010, p. 49) explores how the same tool can be used in multiple ways for multiple purposes, depending on how the problem is defined and how the community expects it to be used. Focusing the work of the community on a professional tool also helps facilitate the negotiation of meaning across professional settings. For example, in the Accountable Talk session, following a whole group discussion focused on the Cal's Dinner Card task, Sabrina handed out a reflection sheet to ask teachers to consider how they enacted the principles of AT while working in their groups. Using the tool, teachers engaged in a Think-Pair-Share discussion to reflect on how their contributions advanced the discussion in light of social, language, and content goals. Sabrina explained that they could use this sheet with their own students, and she gave them a blank copy of the reflection sheet. This tool might help teachers enact the new practice, explored in a PD setting, in their classroom.

Finally, Sabrina helped participants move towards more central forms of participation in the community of practice by sharing "insider" information about district leadership with teachers. In fact, Sabrina shared tidbits of information about others who were not present in the room frequently enough I had a code for it: "Sharing District Gossip." For example, Sabrina reported to the group:

> There is a new head of [Curriculum and Instruction], her name is Esther Parks, and whew! We're gonna have some changes in our department in the next month… I have a second new boss who some of you may know, he used to work for our district a long time ago, he's the new director of Secondary Education, his name is Keith Simpson, he's good friends with Doris Thurston, and lots of people I happen to know, and he just started yesterday. The thing he asked me about first, is 'I think

> District-wide we need to think about grading differently.' He had no knowledge of what we'd been doing in our department… I was like, wow, we can be moving this way district-wide. Wow. OK. I was happy to tell him we were already working on this in math! He was like, super excited about that (101028; 02:39:).

Here, Sabrina not only shared news of changes in the central office that potentially affected teachers' lives, she also shared insight into leaders' professional and social networks and exposed the nature of conversations being held by leaders in key positions. The tone of this excerpt is typical of how Sabrina shared district gossip: she only shared 'good news,' and reported on people's friendships and successes. Further, it is an episode of positioning her own work and the work of the department competently: she told teachers that the district leaders were 'super excited' about the work that she had been orchestrating in math and were eager to see that approach extended department-wide. As gossip can draw a huddle at a party, I assume that Sabrina's sharing helped teachers feel like they were 'on the inside track,' and supported them to return to their schools from a PD day feeling more centrally located in the community of practice.

Across all sessions, Sabrina worked to create an optimal learning environment for teachers by building and maintaining community. She worked to build trust with participants by getting to know them, sharing information about herself with participants, making space for vulnerability, and positioning them competently. She helped build community by developing the expertise of members of her community. Finally, she helped build community by helping teachers move towards more central forms of participation within the community of practice by orchestrating activities which partnered teachers meaningfully with one another, providing teachers with tools which help them accomplish the goals of the community of practice, and by sharing insider information.

Accomplished Facilitator Practice 2: Focus Teachers' Attention on Learning Goals

Sabrina's talk moves continually focused teachers' attention on the goals for student and teacher learning. Previous research (Jackson et al., 2015) has demonstrated that articulating and managing clear goals for teacher learning is incredibly complex work for which novice PD leaders need extensive support; thus, it is useful to decompose the ways in which an expert articulates and manages goals for teacher learning. In the section that follows, I detail how Sabrina maintained a focus on goals for teachers' learning through opening all sessions (but one) with a statement of the goals for teacher learning, sharing representations of their thinking, revoicing teachers' statements, and restating her own questions.

In all sessions but one, the Courageous Conversations session, which I discuss later in this chapter, Sabrina opened the PD day with a clear statement of the goals for teacher learning. For example, in one session, Sabrina began:

> Today we're gonna focus on orchestrating a whole class discussion, [which poses] significant pedagogical demand for teachers. They must make rapid online decisions and then move the students towards achieving the goals of the class. We have to be ready to go right away with what's in front of us and make snap decisions (091210; 00:14:33)

She then set up the first task, explaining how it would move teachers towards meeting the goals of the session: to help teachers engage in the five teaching practices required to ensure a successful whole group discussion: anticipating, monitoring, selecting, sequencing, and connecting (Smith & Stein, 2011). Further, in the set up of the task, note how she connected the goals for teacher learning in this session to the goal for teacher learning in the previous session, which was focused on Thinking Through the Lesson Plan (Smith, Bill & Hughes, 2008):

> So you're gonna review the article, "Orchestrating Discussions," keeping your eye on the math to be learned, and here are the two questions I'd like you to think about:

> How do each of these questions assist teachers in whole group discussions? When they say practices, they are referring to those five things that were mentioned in the article: anticipating, monitoring, selecting, sequencing, and connecting. And then how do those five practices align with the Thinking Through the Lesson Protocol, that's the TTLP, that's the thing that's in the tool kit. I'm gonna give you five minutes to think silently with those questions in mind… and then talk to the people in your group (091210; 00:31:13)

Across all sessions but the Courageous Conversations session, Sabrina set up the day with a clear statement of the goals for teacher learning. Further, she framed the activities for teachers in light of those goals for teacher learning.

Another way Sabrina maintained a focus on goals for teacher learning was by representing teachers' thinking publically when their thinking was relevant to the goals of the session. Sabrina represented teachers' thinking publically three times in the Accountable Talk session alone. For example, during the Think-Pair-Share discussion about what students would struggle with while completing the Cal's Dinner Card task, teachers offered up their ideas and Lars wrote them all down on a projected image of a Word document, so they were building a shared list. Sabrina also showed teachers' work on the document camera and posted teacher work around the room over the course of the day. Focusing the groups' attention on the thinking of the group that was linked to the goals for teacher or student learning was one way she focused teachers on the goals.

Research by van Es et al (2014) has demonstrated that revoicing, a key feature of effective PD facilitation, clarifies participants' contributions to ensure shared understanding. In Sabrina's case, her revoicing seemed to serve another function as well: maintaining a focus on goals for teachers' learning. For example, in a discussion about what students might find difficult about the Cal's Dinner Card task:

> Teacher: [Kids would struggle with] contextual issues.
> Sabrina: Contextual issues: there's a *contextual issue* here. Kids might not know

> what a dinner card is. (091210; 03:17:21)

Here, Sabrina revoiced the teachers' contribution—twice—and added on to it, making an implicit reference to an earlier session with teachers focused on how to launch rigorous math tasks with students. In that session, teachers learned that in order to get students engaged in problem-solving questions, they first needed to ensure that students understood the context of the question. For example, if students did not know what a "dinner card" was, they would have struggled to engage with the mathematics in the task. By revoicing this teacher's contribution, Sabrina both affirmed the significance of the teachers' contribution and subtly reinforced the goals for teachers' learning.

A third way Sabrina focused teachers' attention on the goals for learning was by restating the questions she asked, a move she made 19 times across all sessions. For example, in the Accountable Talk session, Sabrina restated her questions 11 times. At the beginning of the session, she activated teachers' prior knowledge by reminding them of their 'homework' from the previous session: they were to work on 'creating an effort-based classroom,' or developing the practices for helping students believe that they can achieve and grow by exerting effort. To launch the discussion, Sabrina asked teachers, "where are you at in terms of having students believe that they can get smarter through their efforts?" (091210; 00:24:04). After giving teachers some time to discuss, she asked teachers to share their answers. After several minutes of discussion, one teacher offered:

> We've been looking at the idea of *abstract* in our class, so I've been introducing students to abstract art. How abstract math leads to higher level math. I'm trying to get each kid to set a goal to improve their ability to do abstract math.
>
> Sabrina: That's interesting. What are we doing in our classrooms to help kids learn that effort leads to ability? (091210; 37:34:58).

Here, restating the original question also served as a subtle way of reminding teachers in the

context of the whole group discussion when they are veering off-course, and she pointed teachers back to the goals for learning.

Thus, one of the key functions of Sabrina's facilitation practice was helping teachers maintain a focus on the goals for learning. While this sounds like an obvious task for a facilitator, it can be difficult to maintain a focus on multiple, complex goals. In the Accountable Talk session, for example, Sabrina aimed to support teachers to learn how to select and enact cognitively demanding math tasks, or those tasks that "engage students at a deeper level by demanding interpretation, flexibility, the shepherding of resources, and the construction of meaning" (Stein, Grover & Henningsen, 1996). She had them learn about the role of cognitively demanding tasks in supporting student opportunity to learn by analyzing the math content in light of formative assessment about student thinking. At the same time, she attempted to teach teachers how to enact and teach students the principles of Accountable Talk. All of these are ambitious goals for teacher learning, and would require significant reorganization of practice on the part of most middle grades math teachers.

Accomplished Facilitator Practice 3: Ground PD in Rich Instructional Tasks

Across all sessions except the Courageous Conversations session, Sabrina's facilitation reveals another element of accomplished PD leader practice: she anchored the workshop in a complex, cognitively demanding math task. By doing so, Sabrina was able to achieve numerous, complex goals for teacher learning, including developing teachers' pedagogical content knowledge, capacity to anticipate student thinking, management of students' social interactions. By providing teachers a mathematical experience, she was able to ground discussions of more abstract and complex concepts in a shared focal problem. I will elaborate below.

Research has demonstrated that PD is most effective when it focuses on subject-matter content and instructional strategies and tasks that are related to disciplinary practices (Boston & Smith, 2009; Elliott et al., 2009). Across the research in expertise, it is clear that the learning environments need to approximate as much as possible expert practice; as Ball and Cohen (1999) argue, "To learn anything relevant to performance, professionals need experience with the tasks and ways of thinking that are fundamental to the practice. Those experiences must be immediate enough to be compelling and vivid" (p. 12). In the context of teaching, research demonstrates that focusing PD in problem solving investigations appears to generate substantial opportunity for teachers to learn to create a vision of effective instruction, to use instructional materials, to deepen professional networks, practice pedagogical strategies, and understand student thinking (Borko, Jacobs, Koellner, & Swackhamer, 2015, p. 24). In this section, I claim that another key practice of high quality PD facilitation entails grounding PD in complex instructional tasks that teachers are able to enact in their classrooms with their students.

By grounding the workshop in a complex math task, Sabrina generates opportunities for teachers to learn pedagogical content knowledge (PCK), a concept originally developed by Shulman (1986). PCK is "a type of knowledge unique to teachers; it concerns the manner in which teachers relate their pedagogical knowledge to their subject matter knowledge in the school context, for the teaching of specific students" (Cochran, King, & DeRuiter, 1991, p. 5). Activities that support the development of PCK are vital for mathematics teachers, who traditionally lack mathematical knowledge for teaching and require opportunities to learn to improve their skills (Borko et al., 2005). I will illustrate how Sabrina uses focusing on a complex math task to support teachers' development of PCK by referring once again to the Accountable Talk session. By focusing on Cal's Dinner Card task, Sabrina's PD day supported teachers to

learn how to engage students in rigorous tasks, which can "lead to a deeper understanding of mathematics as well as the ability to demonstrate complex problem solving, reasoning, and communication skills on assessments of learning outcomes" (Stein, Grover, & Henningsen, 1996, p. 456). By providing teachers with an excellent representation of a task that requires students to actually "do math," rather than simply practice the algorithm presented by the teacher, Sabrina provided a model of ambitious teaching practices to the teachers. Further, by focusing the session on a complex mathematics task, Sabrina helped develop the teachers' PCK by supporting them to learn the conceptual structures that underpin mathematical procedures (Munter, 2014). In Sabrina's workshop, following the whole group discussion about the rigor of the task, Sabrina orchestrated a series of brief activities that focused on the mathematical content of Cal's Dinner Card. First, she asked teachers to use the criteria they generated in the last session to evaluate the rigor of the task. Sabrina then asked teachers to identify the mathematical demands of the task: what were the big mathematical ideas students needed to engage in order to complete the task? The answers to these questions were not readily obvious to the teachers, who struggled to identify the key mathematical principles at work in the task. By providing teachers time and support to respond to those questions, Sabrina supported the development of their pedagogical content knowledge.

By grounding the workshop in a complex task, Sabrina also supported teachers to anticipate student thinking around particular mathematical concepts, a key feature of high quality teaching. As the researchers at TeachingWorks found (2015), "Teachers who are familiar with common patterns of student thinking and development and who are fluent in anticipating or identifying them are able to work more effectively and efficiently as they plan and implement instruction and evaluate student learning." After identifying the mathematical demands of the

task, Sabrina asked teachers to identify the areas in which they thought students would struggle, and they wrote their ideas down on chart paper. In the context of Think-Pair-Share, Sabrina then asked teachers to analyze why students would find those aspects challenging, and interpret the meaning of those struggles. These activities required teachers to analyze a math task, and determine the appropriateness of the mathematical content inherent in the task for their students, developing their PCK by helping them consider how students would learn the math concepts.

By grounding the PD in a complex math task, Sabrina was also able to represent the difficult work of managing social interactions in the context of problem-solving in small group work. Research by Borko et al (2015) reveals that one indicator of expertise in teaching involves spending less time working with students in a whole group, and more time working with students in small groups, a difficult instructional transition for many teachers. In the Accountable Talk session, for example, she supported teachers to understand how to help children who struggled in the "explore" phase of instruction. In the explore phase of reform-oriented mathematics teaching, the teacher walks amongst students while paying attention to what they are doing as they complete the task so that he or she can learn more about how the students are thinking about the mathematical concept, and so he or she can decide what mathematical ideas and solution strategies to focus upon during the whole-class discussion that follows (Jackson, Garrison, Wilson, Gibbons, & Shahan, 2013; Lampert, 2001; Stein, Engle, Smith, & Hughes, 2008). Many teachers do not provide students opportunities to collaborate on complex problem-solving tasks, and even if they do so sometimes, few teachers would likely engage in these kinds of routines in a regular basis. At the same time, it is unlikely students will learn how to solve complex tasks and work together productively in the absence of such forms of instruction. Note that the students' capacity to learn from the task is contingent upon both the complexity of the task, and

the teachers' capacity to maintain the complexity of the task: if the task is too easy, or the teacher has proceduralized the task in the launch phase of instruction, the students will have little to explore (Henningsen & Stein, 1997).

By focusing the Accountable Talk session on a concrete, complex math task, Sabrina represented the complexity of the work of expertly setting up and managing instructional decisions in reform-oriented math instruction. One way she was able to provide a representation of effective instruction was by presenting a representation of a teacher orchestrating small group work effectively. In the afternoon of the Accountable Talk session, Sabrina supported teachers to develop their capacity to work with students in small groups by modeling effective practice. Specifically, Sabrina and Lars invited several teachers to come up in front of the group and act out a small 'vignette' based on a script Sabrina wrote. The vignette featured a small group of students working on Cal's Dinner Card task, and facing typical problems students face when trying to solve the task. One student in the vignette was distractedly flirting with another student, one student was "stuck" and didn't know how to move forward, and one student had copied the work of a peer. Part of the vignette entailed showing the 'student's work' on a document camera so teachers could see examples of how students might solve the problem. Meanwhile, Lars played the role of the teacher and used Accountable Talk moves to get the students back on track and productively focused on their work.

By acting out the vignette in front of the teachers, Sabrina showed how teachers might attend to the social dynamic of students while reorienting them to the mathematics. Second, Sabrina showed teachers how they could attend to the mathematical knowledge of students by representing the different kinds of tables students might make in the Cal Task, showing teachers and how they might respond to work at different levels of performance. Third, Sabrina

represented how teachers might attend to the work processes and habits of students by featuring a student who was copying another students' work in the vignette. In short, the vignette was an opportunity for Sabrina to represent many of the complexities of managing and supporting student learning in the explore phase of instruction.

Working on a shared complex math task also enables teachers to share a "common ground" when discussing instruction. As I described earlier, after sharing the vignette, Sabrina then invited teachers to then write their own vignette of students working on Cal's Dinner Card, asking them to make their own representations of effective classroom practice. This task gave teachers an opportunity to enact new practices in a situation of reduced complexity. Teachers worked in small groups to write a vignette about how they would respond to students who were stuck on the task in the explore phase of instruction. Because teachers had already completed and analyzed the math task themselves, they were well prepared to analyze where and when students might get stuck, and by enacting the vignette, they had a chance to consider what teaching practices would be most effective to get students moving again. After each small group wrote a vignette, they were partnered with another group with whom they shared their vignette for collective analysis.

The learning opportunities made available to teachers through this cycle of investigation and enactment focused on a single complex math task is evident from the nature of the talk between the teachers during this activity. After performing their vignette for another group, the teachers discussed the AT moves they heard, and the impact that they had on them as 'students.' For example, after Kevin, a middle school math teacher, performed his vignette with his group, he asked a teacher from the small group that had just watched him perform: "Was there anything you thought about that we could have done that we didn't do?" This kind of openness to advice

may have been made more possible by the affordance of having teachers work together in small groups and focus on a single, shared task.

Chelsea replied, “no, it was fine, you did what you could in the amount of time for the vignette.”

Kevin pressed, “No, I mean, if it were real life.” Here we see that contrary to Sabrina’s earlier stated fear that the vignette activity would be “cheesy,” the teachers seriously regarded this enactment as an opportunity to rehearse for future, ‘real life’ instruction. Charles, from Chelsea’s group, responded with a practical suggestion:

“I would have stood at the opposite end of the table from the only kid who was on task. Cause that forces the kids to… Cause if you stand right next to her, it invites a one-on-one conversation. Standing here forces the dialogue to happen right next to the impotent kids.” Kevin replied:

“That is something I can definitely use in my class.” The rest of the group assented with enthusiastic “mhhhms!” and another teacher piped in her realization:

“If you get one kid on task then the others are more likely to” (091210; 04:04:00).

This brief conversation reveals the potential for enactments based on shared tasks to generate opportunities for teachers to learn: not only were they learning about rigorous tasks, AT, and the explore phase of instruction, they were learning concrete classroom management strategies for getting and keeping kids on-task from each other.

Thus, focusing PD on a complex math task also allowed Sabrina to support teachers to develop more effective classroom management strategies. In his review of the research on beginning teachers, Veenman (1984) found that the number one concern of new teachers was, predictably, discipline. Not only did teachers attend to questions of classroom management in

their small group discussions, but they also asked Sabrina for advice about how she would manage the launch-explore-summarize phases in her own classroom. Teachers asked, for example, if all of the groups would be presenting their vignettes to the whole group at the end. Sabrina explained that she did not want all of the groups to present individually because frankly, it would be too boring. Having each small group present to another small group provided teachers with an example of an alternative activity structure to the traditional "everybody shares" model. This is an important point for teachers to hear, as research suggests that as teachers learn to implement reform-oriented mathematics instruction, they frequently have all small groups "report out" to the whole group after working in small groups, an unproductive and time consuming process (Chazan & Ball, 1999). Thus, Sabrina's side comment about it being 'boring' is an example of how she embeds advice about high quality instruction throughout her workshop without being pedantic. After all groups presented to each other, Sabrina orchestrated a whole group discussion to analyze the process, allowing teachers to make sense of what they learned and consider how they would implement this routine in their own classes when they taught Cal's Dinner Card – and presumably, other complex tasks.

Thus, by focusing the PD day around the investigation and enactment of a single complex math task, Sabrina helped teacher develop pedagogical content knowledge, attend to student thinking, and support social learning through skillful classroom practices. In this way, she supported teachers to engage in the core practices of the community of practice of ambitious teaching.

Accomplished Facilitator Practice 4: Press Teachers to Develop and Articulate their Pedagogical Reasoning

Prior research reveals that while it might seem paradoxical on the surface, communities that support teacher learning are characterized by not only trust, but also by tension. Research by Grossman, Wineburg and Woolworth (2001) reveals that when the professional community is characterised by politeness and lacks the "essential tensions" (p. 953) that are the inevitable consequence of authentic learning environments, teachers are unlikely to learn. Horn's (2010) research reveals that authentic learning environments for teachers feature detailed representations of practice coupled with explicit conversation about the pedagogical meaning of such practices, what she calls "episodes of pedagogical reasoning," which provide teachers with the vital "conceptual infrastructure" (p. 234) to make sense of their work and learn to improve it. For Horn, rich episodes of pedagogical reasoning are the markers of communities in which teachers learn to develop more sophisticated and equitable epistemic stances. At the same time, few collegial conversations surface rich episodes of pedagogical reasoning, often because teachers, wary about being specific about what exactly they do with their students and why, fear exposing weaknesses or vulnerabilities. While research has established that rich learning environments are characterized by the tensions which can arise when teachers authentically expose their own practice and then publicly reason about why they made those decisions, there are few representations of what it looks like when a facilitator effectively orchestrates these kinds of learning opportunities for teachers.

An analysis of Sabrina's facilitation practice provides a representation of how an accomplished facilitator supports teachers to develop pedagogical reasoning while simultaneously building a culture of trust amongst teachers. One of the ways she does this is by pressing teachers, deepening the "cognitive depth" (van Es, 2011) of conversations. Press is a talk move first described by Kazemi and Stipek (2001), who elaborate how specific kinds of

teacher questioning can elicit students' reasoning in mathematics, thus pressing students to connect their ideas to underlying principles in mathematics. Van Es et al (2014) examine the same concept of press, but in the context of facilitators working with teachers. Their work demonstrates how "pressing explicitly prompts teachers to expand on an idea or further explain their reasoning" (van Es et al., 2014, p. 346). I build on the current conceptions of press by connecting it to what Horn (2005) would call "episodes of pedagogical reasoning," or units of teacher talk where teachers explain their reasoning about an issue in their practice (p. 215), to show how Sabrina generates teacher opportunity to learn by pressing teachers to surface and develop their pedagogical reasoning.

First, I begin by defining how I identified when a teacher had an opportunity to learn (OTL). Greeno and Gresalfi (2008) define OTL as "affordances for changing participation and practice. In this view, understanding a learner's trajectory involves hypotheses about affordances that are available to the learner to participate in particular ways" (p. 172). Horn and colleagues (2015; Horn & Kane, 2015; Horn, Kane, & Wilson, 2015) further specify a model for identifying OTL in a professional learning situation. Horn (2010) argues that teacher workgroups generate the greatest opportunities to learn when "they include rich depictions of connections across students' thinking, teaching, and mathematics." These are three essential domains of teacher knowledge, frequently referred to as the Instructional Triangle (Lampert, 2001):

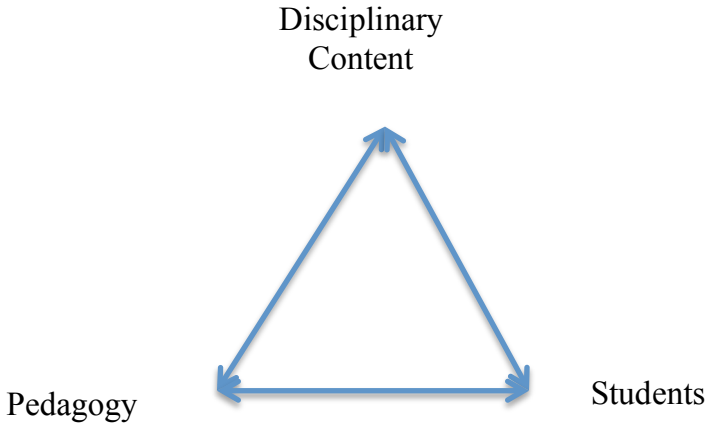

Figure 4: The Instructional triangle

PD for teachers often focuses on just one corner of the instructional: for example, one could attend a course focused on autism (Students), formative assessment (Pedagogy) or algebra (Disciplinary content). However, Horn's work reveals that "rich collaborative discussions draw upon and make *connections* among the three elements of the instructional triangle" (Horn, 2015). I use Horn's model for identifying OTL in the following section. Further, I build on Horn's model to provide concrete instantiations of how a facilitator can *generate* meaningful OTLs for teachers by requiring teachers to make connections between two or more corners of the instructional triangle. My analysis of Sabrina's talk moves reveals that she pressed teachers to make connections between two and more corners of the instructional triangle, generating teacher OTL.

Press for connections between students and disciplinary content.

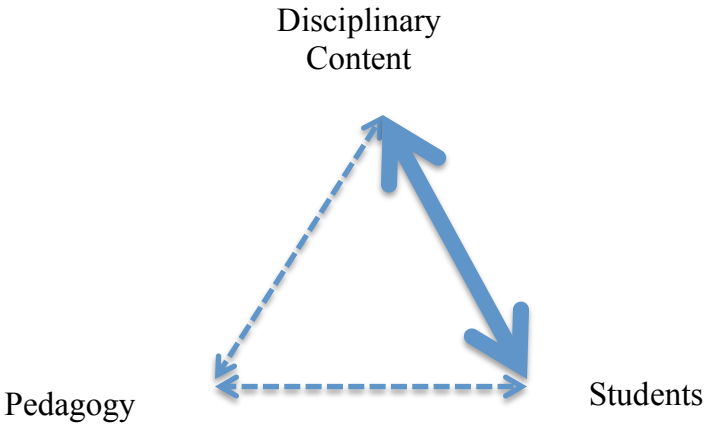

Figure 5: Press for connections between Disciplinary Content and Students

Sabrina pressed teachers for pedagogical reasoning by asking them to make connections between their knowledge of mathematics and their knowledge of students, as illustrated in Figure 5. As an example, in one session, Sabrina supported teachers to learn to enact the key practice of *anticipating student responses* in order to better plan for instruction. After completing a math task, Sabrina gave teachers some time in a Think-Pair to respond to the following question: "What are some of the solution paths, strategies, or misconceptions that students would make that we would anticipate students would bring to this problem?" Here, Sabrina asked teachers to make connections between their knowledge of solution paths for common mathematical problems with their knowledge of how students typically engage in learning how to solve those problems. When returning to the whole group to share, Sabrina repeated, "What are the strategies students will make when they do this problem? Seong replied, "Making a table with info from graph." Sabrina nodded and looked around to the other teachers.

Candace piped in: "Graphing and extending the lines." Sabrina then revoiced Candace's contribution, keeping the now bubbly group focused on one speaker at a time.

"Graphing and extending the lines. What would be a possible misconception that students would do with the lines, as they were extending them?" Again, Sabrina pressed teachers to make connections between the nature of the mathematical problem, common ways students solve these kinds of problems, and common errors in student thinking. Teachers began to all speak at once, so Sabrina spoke over them: "Cause, once you anticipate that some students wouldn't be careful, and extend the line as they should, and that those lines may not cross where we want them to, so, jumping off of hers, that's another misconception students might bring. What else might students do?"

One teacher added, "They might identify variables."

Sabrina revoiced, "They might identify variables (pointing) from here and here. What would they do once they identified the variables?" and so on. Each time, Sabrina pressed teachers to make connections between the mathematics and how students might think about the problem.

Note how many of the talk moves discussed earlier in this chapter appear: revoicing, positioning teachers as competent without praising, and so on. At the same time, in this episode, we see the function of her talk moves as requiring teachers to activate what they know about the mathematical demands of the task while coupling that knowledge with understanding about areas in which students typically struggle. In short, Sabrina asked teachers to make connections between Content and Students. Following this whole group discussion, Sabrina led a small group activity in which teachers were asked to plan the questions they would ask students in order to surface the anticipated misconceptions so they could be taken up by the group.

Press for connections between disciplinary content and pedagogy.

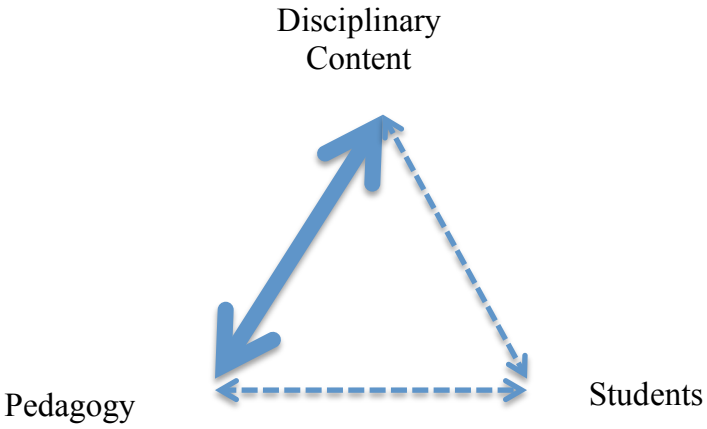

Figure 6: Press for Connections between Pedagogy and Disciplinary Content

Another form of press Sabrina's practice reveals is press for connections between pedagogy and disciplinary content, as illustrated by Figure 6. Specifically, Sabrina pressed teachers for pedagogical reasoning by asking them to make connections between their knowledge of mathematics and their pedagogical practices. For example, at one session, after a discussion about how teachers choose mathematical objectives, Sabrina handed each small group of teachers a problem-solving task extracted from their local curriculum, with copies of four different mathematical objectives, each of which could have been addressed in the task:

> Take a look at each of these [goals]. What would happen in your class if THIS was your mathematical goal? Or if THIS was your mathematical goal? How would that change what you do as a teacher? Read through each of them and think about what would happen in your class if you had those goals (090210; 04:47:42).

After teachers had a chance to discuss with their tablemates, Sabrina returned teachers to a whole group discussion: "How would you act differently in this unit if *this* was your goal for the lesson? Choose one and talk about it." Here, Sabrina was explicitly asking teachers to make connections between their knowledge of mathematics and their pedagogical choices. One teacher

offered, “Number three feels like a Big Idea.” Sabrina pressed: “what questions would you ask yourself when planning this lesson [if that were the objective]?” Teachers turned towards each other to discuss this rich question. Note, as well, that this is also an example of how Sabrina maintains a focus on goals for learning, as discussed earlier in this chapter.

After teachers had a chance to discuss in small groups, Sabrina asked one teacher present, Jon, to share how he identified the mathematical goals for each lesson and what questions he asked himself while planning. She then pressed him to describe how he would launch the task based on his choice of goals, returning teachers to their earlier discussion about how to launch tasks effectively. Throughout this episode, Sabrina required teachers to identify goals for students’ mathematical learning and then choose appropriate pedagogical approaches, depending on their goals, pressing teachers to make connections between disciplinary content and pedagogy. Further, as we see once again, Sabrina enacts multiple elements of high quality facilitation in a single episode: she pressed for pedagogical reasoning even as she maintained a clear focus on learning goals, she provided representations of high quality practice while positioning Jon as competent, and she built community.

Press for connections between pedagogy and students.

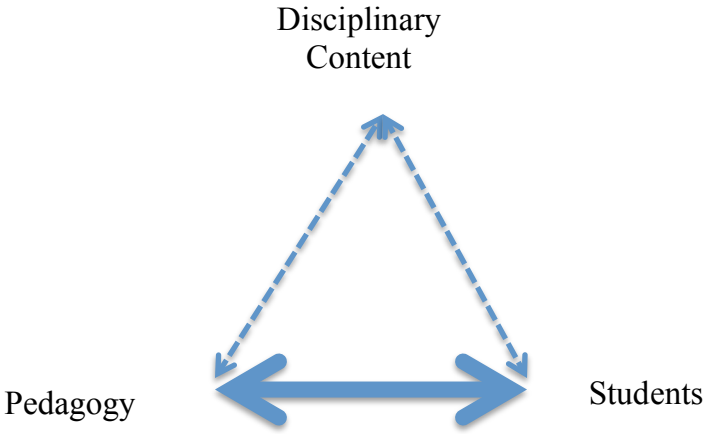

Figure 7: Press for Connections between Pedagogy and Students

Theoretically, another form of press that could be enacted by facilitators would be pressing teachers to make connections between their knowledge of their students and their knowledge of the most effective pedagogical approaches in light of their knowledge of students and student learning, as illustrated by Figure 7. Interestingly, I did not code a single instance of Sabrina only pressing participants to make connections between pedagogy and students. This kind of press might have been, for example, asking teachers about what kinds of pedagogical practices are best suited to teaching students with a particular learning disability, or students from a particular marginalized community. This is particularly notable because press for connections between students and pedagogy is the area literature from the field of equity and diversity emphasizes. All episodes of press that I discovered in Sabrina's practice considered, in some way, *disciplinary content.* My hunch about why this kind of press did not occur is taken up at the end of the chapter, where I explore the centrality of discipline in Sabrina's facilitation practice.

Press for connections between all three corners of the instructional triangle.

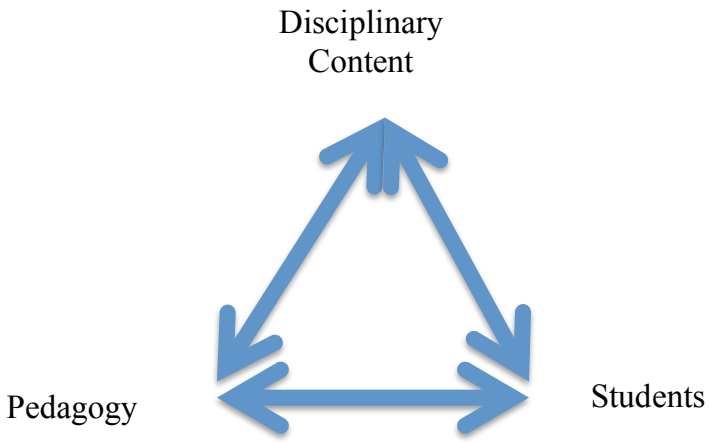

Figure 8: Press for Connections between Pedagogy and Students

While I did not discover an episode of pressing teachers *only* to make connections between pedagogy and students, there were several examples of how Sabrina pressed teachers to make connections between *all three* corners of the instructional triangle, as illustrated in Figure 8. For example, in the following discussion, Sabrina pushes teachers to reconsider their assumptions about acceptable professional practice. Initiating a whole group discussion, Sabrina once again focused on goals for learning, and asked: "Alright, we're gonna examine – does it matter what your stated objective is? Many of you used the objective that's in the book. And sure, that makes sense to give that objective to students. But what is your goal for yourself as you plan your lesson, and how does that affect what you do in the classroom?... How do you choose objectives?... Is the goal in the algebra book [pause] is that the right objective for this?" Teachers were quiet for a few seconds while they considered. A teacher asked for clarification:

"Is this the right lesson for the objective? Is that what you're asking?"

Sabrina responded: "I'm not. I'm actually asking is this objective the right one for this lesson, or

how you would then play it out in your classroom? Like, how do you know if this is what you should be doing in your classroom if you are teaching an Algebra 1 Course?" Here, Sabrina made teachers defend the typical practice of 'teaching from the textbook,' by asking teachers to make explicit their ideas about pedagogy, students, and disciplinary knowledge. In order to determine the right goal for a particular lesson, teachers need to make decisions based on a consideration of content standards, disciplinary knowledge, trajectories of learning, and knowledge of the students in the room.

Sabrina's question about choosing objectives was difficult: after a pregnant, eight second pause, a teacher offered, weakly: "Trust the authors?"

Sabrina pressed: "You trust the authors? Why is that ok to do?"

The teacher responded, "Cause they're the best in the country?" The crowd laughed, almost nervously.

Sabrina replied, "They don't know your kids. You're just going to trust them to know what's best for the kids that you have in front of you that day?" (090110; 2:52:13). Here, Sabrina suggested that teachers adapt the work of math scholars and curriculum developers in order to meet the particular needs of their students based on certain principles. Sabrina pressed teachers for their pedagogical reasoning by asking them to identify how they articulate goals for students' learning, requiring them to make connections between their disciplinary knowledge, pedagogical knowledge, and knowledge of students.

In this episode we see Sabrina pushing teachers hard by asking them to figure things out that they had previously deferred to textbook writers, if they had considered at all. At the same time, this is also a remarkable episode of positioning teachers competently: she asked teachers to use their own professional judgment to decide what was best for their particular students rather

than leaving that responsibility to textbook writers. Here, Sabrina pressed teachers to articulate their pedagogical reasoning by connecting the three corners on the instructional triangle. First, they had to activate their pedagogical content knowledge to evaluate whether the "goal in the algebra book was the right goal for the lesson." Secondly, they had to consider their knowledge of their particular students, and determine whether the mathematical goal was the right goal for "the kids [they had] in front of [them] on that day." Finally, teachers have to activate their knowledge of pedagogy, and determine *how* they will teach those particular children to meet the mathematical goal: "how then do you play it out?" In this section, Sabrina's sequence of questions presses teachers to make connections between all three corners of the press triangle.

Across all episodes, Sabrina's press for pedagogical reasoning supported teachers to transition from a pseudo community, in which teachers were not pushed to reevaluate their positions or develop their thinking, to a real discourse community in which they learned by making connections between concepts of students, pedagogy, and disciplinary content.

An Outlier: The Courageous Conversations Session

While it is well-established in the literature that PD should be as close to practice as possible (Ball & Cohen, 1999; Chung Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009), an analysis of Sabrina's facilitation allows me to further specify this mandate: in order to develop more ambitious instruction, PD must be anchored in disciplinary content. As previously mentioned, one session Sabrina led, the "Courageous Conversations" session, did not reveal her otherwise consistently effective facilitation strategies. I will contrast the Courageous Conversations session with the Accountable Talk session in order to highlight the importance of grounding PD in discipline-specific tasks.

First, a few words about the Courageous Conversations Workshop. In this two-hour evening workshop, Sabrina used the work of Glenn Singleton (2006) and research produced by the Institute for Learning to analyze the achievement gap between White and African American students through the prism of race. The goal of the session was to think about how to use "courageous conversations" to create more equitable learning opportunities for students. The session began with an examination of state data, which revealed significant disparities between subgroups. Sabrina then led a discussion about a quotation from Asa Hilliard, and Sabrina shared the principles of Courageous Conversations. Sabrina then asked teachers to brainstorm responses to the question: "Why do children of colour consistently underperform white kids in [our state]?" Sabrina then had teachers read an article by researcher and activist Gloria Ladson-Billings, and she shared several articles for teachers to read after the session.

In the Courageous Conversation Session, Sabrina does not enact the principles of high quality facilitation I have discussed elsewhere in this chapter. First, the attention to the development of community is not as evident in the Courageous Conversation session as it is in any of the other sessions, perhaps because she had less time. Nonetheless, I was still surprised by how different her social interactions were in the Courageous Conversations session. For example, at the beginning of the session, she asked teachers how their week was. One teacher replied, "pretty bad!" and Sabrina replied with, "Okay. Introduce yourself to the person to your left and to your right. You don't all know each other," skipping over the teachers' comment. A few minutes later, when she introduced the topic, she asked people if they had any previous training on Courageous Conversations. A number of people said they had, but Sabrina just nodded and moved on, without pressing for expansion or details. This turn was unusual, as she revealed great investment in participants' prior knowledge in other sessions. Sabrina gave

teachers little time to work together or collaborate, even when considering the time constraints. Finally, Sabrina did not maintain a clear focus on the goals in this session; she forgot to share the goals till the middle of the session.

Sabrina also expressed tentativeness about the topic of race and achievement.

> I've been really not wanting to offer this training cause I feel like what does this white woman have to say to a bunch of other mostly white teachers about whatever? So I went around to ask a lot of the people of colour that I work with for help and advice, and I said, what's something you would want all secondary math teachers to know? And over and over my colleagues of color said the same thing. They said, 'We do not want to see students of color held hostage to basic skills, rote memorization, can they do skills over and over again.' [My colleagues] use that term: 'held hostage' (100311: 00:21:00).

While she expressed vulnerability with her teachers, a key feature of building a trusting community, she also potentially undermined her own skills as a facilitator. What is remarkable about this interaction is how significantly it varied in tone and content from previous sessions she led. Indeed, Sabrina skillfully and confidently integrated explicit teaching about equity into *all* of her other PD sessions for teachers; the equity focus of the Courageous Conversations session was not unfamiliar territory. In fact, across all six sessions, I coded 10 episodes of "Explaining rationale – equity." For example, in a 2009 session in which teachers were working on disciplinary content, a year before the Courageous Conversations session, Sabrina said:

> We… look[ed] at the subgroups on the [Standardized State Test Scores] data…. [and] it was just so shockingly bad when I saw the numbers. When you look at the [State] scores by district and break it down by race, 74% of all White students passed the [Test], which is above the statewide average of 68%. African Americans, and I'm choosing them because they were the lowest of all the racial groups, (White was the highest and African Americans were the lowest), the African Americans average passing rate is 21%. When you think about the numbers 74 and 21, that was shockingly different. So I thought, 'let's look at the growth data.'… So we looked at teachers who were making the most growth with their African American students… We wondered, 'why are those teachers making the most growth?' So we hired someone to go out to classrooms where we are seeing a lot of growth. And John Franco sits in the corner with his laptop and maps everything the teacher does and everything the students do, and types it out onto a

> computer, and he can show you a pie chart of everything you do and everything kids do. When he came in and did it in my classroom and he showed me my graphs I got really mad at myself because I saw that there was one section, "was not evident" what I was doing, and it wasn't *that* large of a percentage, but I was like, "why *wasn't* it evident what I was doing?' It made me challenge myself. And John told me that when he goes into someone's room, the great teachers get pissed off when they don't get zero percent on that thing. And other teachers are like, 'ya, that's just the way it is' [Sabrina throws her hands in the air with a spirit of mock defeat]. Some of the time he didn't know what I was doing. Anyway, they are looking at that data, and they are looking for commonalities. But one of the things they notice is that those teachers [who are closing the achievement gap] say: I start immediately when the bell rings… with the launch [and move quickly to the explore]." (090210, 00:33:56)

Here, Sabrina framed the problem of the achievement gap as the result of poor instruction. Secondly, she framed the solution as being discoverable in an understanding of what teachers who were closing the achievement gap were doing instructionally. Third, she offered herself as an example of a teacher who was both closing the achievement gap *and* not doing as well as she hoped, once again affirming both her competence and vulnerability. Finally, she pointed to an effective launch and explore as critical elements of classroom instruction which generated equitable opportunities to learn. None of the tentativeness I saw in the Courageous Conversations was present in the sessions that were grounded in disciplinary content.

I only coded 22 talk moves in the entire Courageous Conversations session, as compared to 36.8 in the same number of hours in the Accountable Talk session. For example, in the Courageous Conversations session, she did not once revoice, ask for expansion, or press for pedagogical reasoning. For example, after sharing the data about race and student achievement in the district in the Courageous Conversations session, one teacher responded:

> In the district I worked for before we broke these [numbers about Special Education students] down by race too and that's really eye-opening, cause you'll see there's a high correlation between [students eligible for Free and Reduced Lunch][5], students of color, and [Special Education] students. When you break these down too you can see

[5] A common way of identifying students from impoverished families.

the pop by race (100311; 00:25:00).

This teachers' contribution indicated prior experience considering the intersection of race, poverty, and the construction of disability. This teacher offered her prior knowledge to the group and made an observation which points directly to the goals of Courageous Conversations: to have teachers examine the ways race impacts professional decision-making in schools. In response to this teachers' offer, Sabrina replied: "We're gonna give you one of those things broken down by race in a bit and Linda and I decided we'd only bring in one because we didn't want to be too overwhelming" (100311; 00:25:10). In contrast to her other sessions, here, Sabrina *diminished* the cognitive demand of the conversation, rather than elevating the cognitive demand and pressing the teacher, as we have seen in the other sessions.

In another example, Sabrina answered a question quickly without turning it over to the rest of the group or pressing the teacher, again, lowering the cognitive demand of the discussion. After reading a quotation by Asa Hilliard, in which the author wrote, "we have an historically oppressive society," the following conversation emerged:

> Teacher: The word 'we' – who are they referring to? The African American population?
>
> Sabrina: That's a good question. Linda, do you know? I know not all his writing is specific to the African American population.
>
> Teacher: I'd like to know. I'm just asking about the word WE. That WE live in a historically oppressive society. And I wasn't sure if he was referring to everybody, or if he was referring to the African American community, or what.
>
> Teacher 2: I think it's the global WE.
>
> Sabrina: As I go back and look at it and it doesn't say *we are all oppressed*, it says we all live *in an oppressive society*. Based on how we talked about it I would say it is a global… Anything else strike you as you were reading it? (100311; 00:29:00)

Here, Sabrina missed several interesting opportunities to press on the goals for teachers'

learning: to have courageous conversations about student achievement and race. This white teacher seemed interested in the question of whether or not he, and other white people, presumably, were oppressed by living in an oppressive society. Rather than exploring this concern and opening it up to the rest of the group for inquiry, she positions herself, and another district leader, Linda, as expert interpreters of the author's intention, rather than using the quotation as a jumping off point for discussion, and after she speaks, she moves the conversation away from his question.

Overall, it is unclear how the Courageous Conversations session would support teachers to improve their teaching practices. While teachers were exposed to several ideas about the relationship between race and achievement, they did not explore, investigate, or practice teaching equitable or ambitious strategies that support all children to learn and grow. While the session is for math teachers, there is no math in the session. The Courageous Conversations session is not grounded in an instructional activity or task.

What explains the Courageous Conversations session as an outlier? I have several conjectures. First, this session did not meet the structures and features of effective PD we saw in other sessions. For example, she did not have as much time, or as privileged time, as she had with teachers as in other sessions: she had only two hours in the evening instead of a whole day during regular work hours, severely constraining teachers' opportunity to learn (Chung Wei et al., 2009). Further, this session was not tied to a sequence of learning for teachers: it was a 'one-off' session instead of the other sessions, which followed a trajectory of learning for teachers.

Secondly, the Courageous Conversations session may have been an outlier because the session was outside Sabrina's field of expertise: it was a philosophical session focused squarely on teachers' identities, and the perceptions they have about students, difficult subject matter,

especially for a group of white teachers who teach marginalized students. While the other sessions she led pushed teachers to adopt equitable approaches to pedagogy, the Courageous Conversations curriculum, which was not developed by Sabrina, also pushed teachers to self-identify, discuss their perceptions of race, and to try on new philosophical orientations.

However, I argue that the most important difference between the Courageous Conversations session and the other sessions is that this session was not anchored in disciplinary content enacted through instructional activities. While there was some *investigation* of the relationship between student achievement and race through analysis of the data, there was nothing to *enact.* What were the *practices* teachers were expected to enact after this session? I believe this difference explains Sabrina's less skillful enactment of relational, community-building practices, as it is potentially difficult for her to attend to the relational practices when she is so outside her comfort zone with the content. At the same time, we know Sabrina is well able to support teachers to make connections between student achievement on mathematics and race; in other sessions in which Sabrina spoke about specific math problems, she is uncomplicated and forceful in her assertions about equity. In short, analysis of Sabrina's facilitation reveals that it is difficult to support teachers to enact more equitable forms of instruction in the absence of disciplinary content rooted in instructional activities. This finding builds the research base in facilitation of PD for teachers that the activity structures of the PD workshops can constrain or enable the facilitator's ability to press (Jackson et al., 2015).

To conclude, the Courageous Conversations session illustrates the narrowness of the domain of expertise in leading PD for teachers. As Berliner (2004) writes, "practical knowledge is… person and context bound, providing teachers the skills to succeed in particular teaching contexts. Like expertise in general, teachers' practical knowledge is situated knowledge" (p.

206). While research has well established that experts in one field have no special advantage in other domains (Edwards, 2010; Ericsson, 2006), for example, chess masters do not play checkers better than average folks, the domain-specificity of expertise is poorly understood in the day-to-day life of school districts. Sabrina, as an accomplished teacher and PD leader in mathematics, was assumed to have the necessary skills to lead PD focused on Courageous Conversations. Her highly specific, situated knowledge of leading PD for math teachers did not transition to other domains, even when the lens of equity was consistent across sessions.

Conclusion

In this decomposition of accomplished practice, I identified four key aspects of the work of leading PD for teachers: building community, focusing teachers' attention of the goals for student and teacher learning, grounding PD in complex disciplinary instructional tasks, and finally, pressing teachers for their pedagogical reasoning. An analysis of an outlier, the Courageous Conversations session, suggests that sessions which are not anchored in cycles of investigation and enactment of a disciplinary task significantly diminishes the facilitators' opportunity to enact high quality facilitation practices and therefore diminishes teacher opportunity to learn. There is a cyclic, mutually supportive relationship between the functions of Sabrina's facilitation: as she builds community, she is able to press teachers harder; as she presses teachers harder, she strengthens the learning community.

CHAPTER V

DISCUSSION AND CONCLUSION

Discussion

It is clear that if our collective goal as educators is supporting the development of more ambitious forms of instruction, then teachers need access to rich forms of professional support. Specifically, teachers need opportunities to investigate and enact effective teaching practices in the company of a trusting community. Moreover, they need a skilled facilitator to help them make sense of those learning opportunities. However, previous research has only just begun to clearly delineate what constitutes skilled facilitation of effective PD, particularly when it comes to facilitating cycles of investigation and enactment of teaching practices.

In this study, I analyzed literature from TE and PD as well as video recorded data of an accomplished PD leaders' practice in order to articulate the practices of effective PD facilitation. By documenting the practices of one skillful PD facilitator, this dissertation contributes to the body of knowledge about what it takes to support the development of expertise in leading PD for teachers.

First, this dissertation generates an initial grounded understanding of what expertise in leading PD for teachers might entail, as it provides a clear representation and decomposition of the practices of one accomplished practitioner. This dissertation also provides a way of understanding how to identify when meaningful opportunities to learn for teachers arise so they can be flagged for further investigation and analysis. Most importantly, this research suggests which facilitation practices are most likely to generate teacher opportunity to learn. Finally, this study reveals how facilitation moves that generate opportunities for teachers to learn 'hang together' in a set of learnable practices: (1) developing and maintaining a community of learners;

(2) focusing teachers' attention on the goals for student and teacher learning; (3) grounding PD in complex instructional tasks; and (4) pressing teachers to develop and articulate their pedagogical reasoning. In this chapter, I discuss the central contributions of this study, and I examine the implications for future research and practice in the field.

Contribution to Field of Knowledge

First, this dissertation confirms suggestions from teacher education and professional development by demonstrating that the work of leading PD for teachers is not *natural;* rather, effective facilitation is complex, relational, and technical work that requires both experience and competence to execute effectively. This dissertation, then, answers Elliott et al (2009) and Even's (2003) calls for more vivid examples and decompositions of accomplished PD leader behaviour. This dissertation answers that call and extends the current research by providing lucid examples of the complexity of the work of leading PD for teachers. Recall, for example, the episode of Sabrina's press for pedagogical reasoning I detailed in chapter four. Sabrina asked:

> Take a look at each of these [goals]. What would happen in your class if THIS was your mathematical goal? Or if THIS was your mathematical goal? How would that change what you do as a teacher? Read through each of them and think about what would happen in your class if you had those goals (090210; 04:47:42)

When pursuing this line of questions in a way that would generate opportunities for teachers to learn, Sabrina needed to first understand the critical importance of teaching with a pedagogical goal of grounded math knowledge for teaching. The series of questions suggests her insider knowledge of teachers' current practices: she was clearly aware that the teachers were not teaching in a goal-focused manner. In order to support teacher learning once the teachers responded to the questions, she needed to know the relationship between where teachers were

and where she wanted them to be: she had to have a trajectory of learning for teachers in mind, along with diagnostic capabilities in order to determine where teachers were in that trajectory. Once she was able to diagnose where teachers were in the trajectory of learning, she needed to have the right questions and activities in mind to be able to support teachers' development along the continuum. She needed to have the pedagogical content knowledge to be able to evaluate more productive and less productive mathematical goals for student learning, and she needed to understand how different goals for student learning implied different pedagogical approaches.

Second, this work confirms research in the field of PD for teachers by demonstrating the vital role of the facilitator in orchestrating meaningful opportunities for teachers to learn across activity structures. Previous research has well established the structures and features of effective PD for teachers, by outlining such conditions as the need for extended time for teacher learning, the need to work within the regular school day, and so on. Recent work has focused on how to facilitate high quality PD organized around analyzing videos of practice (Borko et al., 2015; Borko et al., 2011; E. Kazemi et al., 2011; van Es et al., 2014). This research reflects a growing interest in the role of the facilitator in optimizing learning opportunities for teachers, though there is little empirical research that details the practices of effective PD facilitation (Even, 2008; Even et al., 2003). This study extends the current research by demonstrating what expertise in facilitation might look like across multiple activity structures, most notably, in the context of activities which support teachers to investigate models of expertise and then rehearse aspects of upcoming instruction.

Third, this work extends the research base in PD and TE by developing a professional vocabulary for the work of generating opportunities for teachers to learn through facilitation. The extensive appendices that label and provide concrete examples of facilitation moves are one of

the most crucial contributions of this dissertation. By expanding the current vocabulary for the work of facilitation, I contribute to the development of a professional vision of leading learning for teachers. By supporting others to see what might have been previously invisible, this decomposition of practice makes the work of facilitation both more public. By making the underlying grammar of practice more readable by others, I provide a means for discussion and analysis of facilitation practices.

Finally, one of the central contributions of this dissertation is a detailed methodology for the work of decomposing practices, as there have been significant limitations in the methodological approaches to decomposition in the past. The most significant limitation is the lack of a shared lexicon for decompositions of practice. While math and literacy educators have been producing research that describes and analyzes the practices of effective math and reading teachers for decades (cf. Deborah Ball, Magdalene Lampert, Martin Nystrand, Paul Cobb), shared language and methodology for decomposing facilitation practices are still emergent. While there are many paths a scholar can take to meet the goal of decomposing expert practice in education, it would be easier to describe, read, analyze, and interpret the steps a scholar took to meet their goals if there was a shared professional language for those steps. In the absence of a shared professional language, it is difficult to make comparisons or evaluate such studies. Of course, part of the reasons scholars are increasingly looking towards decomposition is to develop such a shared professional language. This paper provides one possible roadmap through the terrain of decomposition, and proposes methodological considerations and vocabulary that can be taken up and further developed by scholars. This dissertation suggests a sequence from transcription to initial categories of analysis, to providing tentative definitions, to constant comparison through the use of StudioCode or similar coding software, to interpretation of

categories in light of criteria for the analysis of opportunity to learn. Further, by suggesting already stable categories of analysis, I have given other scholars a place to start: for example, I suggest that when analyzing teacher education or professional development settings, it is important to examine the broad categories of activities, participation structures, and talk moves.

Need for Future Research

This dissertation suggests the need for future research. Because the findings are specific to one person, it is important that future research look to the facilitation practices of other accomplished PD leaders in order to expand the knowledge base of what constitutes effective facilitation. Just as all high quality teaching is not identical, it is certain that there are many ways to orchestrate learning opportunities for teachers so they will learn. For example, in my own work with PD leaders I have noticed many facilitation moves that Sabrina did not enact. For example, one practice I observed in the facilitation of PD leaders I work with professionally is the practice of what I call "sportscasting." Just as 'experts' narrate elite sports events on television to support the audience to notice the potentially invisible moves of the athletes, several PD leaders I observed narrated the meaning of instructional practices to support teachers to notice potentially invisible moves of ambitious teachers. For example, Willa, a PD leader for ELA teachers in Quebec, frequently pauses the group she is leading when they are watching videos of exemplary practice or examining live enactments of practice to point out meaningful pedagogical moves for the groups' attention. Willa's sportscasting functions as a kind of 'real-time decomposition of practice.' I think sportscasting is likely a facilitation practice that generates meaningful opportunities for teachers to learn, but the research community needs more vivid examples and a deeper analysis in order to be sure. While the practices may vary across

contexts, as with accomplished teaching, it is likely that accomplished PD facilitation shares common principles and forms of practices. For that reason, it is important that future research investigate the practices of other accomplished leaders to look for the common factors in order to shared grammar of PD facilitation. In short, because this dissertation is a case study, it does not provide an exhaustive analysis of effective facilitation practices, and future research is necessary.

Secondly, while this dissertation makes clear that there are enormous knowledge demands for the work of leading PD for teachers, my analysis was not able to suggest which knowledge was most necessary for success in facilitation of PD for teachers. While previous research has suggested that PD leaders need to be relatively accomplished teachers in the domain in which they are leading (Borko et al., 2008; Elliott et al., 2009; Wilson, 2015), little research to date has fleshed out what other factors are required for effective facilitation of PD for teachers. This case study of an accomplished PD leader revealed that Sabrina came to the work of leading PD with a wealth of intellectual and social resources: not only was she consistently optimistic, warm, friendly and funny, she also had superior instructional quality, math knowledge for teaching, views of students' mathematical capabilities, and vision of high quality math instruction. As I analyzed her practice, I wondered: which resources are necessary and which are sufficient to be able to engage in the work of learning the PD leader practices? While this dissertation did not initially attempt to respond to that question, and so I do not have a decisive response, I do believe that Sabrina's case makes clear how absolutely central disciplinary knowledge is in effective facilitation. It is not the case that teachers only learned "math-specific" teaching strategies with Sabrina; as this analysis showed, teachers were also learning how to develop an 'effort-based' classroom, how to engage in meaningful forms of talk to help students become more accountable, or how to keep students productively engaged in small group

discussions. However, teachers were learning these "discipline-neutral" pedagogical concepts through the lens of the familiar, the practical, and the immediate – teaching math. Sabrina's practice suggests that teachers are more likely to enact new orientations to teaching, like developing an effort-based classroom, when those orientations are anchored in familiar disciplinary concepts. As the Courageous Conversations session revealed, when the PD was not grounded in disciplinary concepts, the PD did not generate meaningful OTL. For that reason, it is clear to me that expertise in facilitating PD for teachers requires deep expertise in core disciplinary concepts and pedagogies. The centrality of discipline in expert PD facilitation poses a challenge to the plethora of "PD providers" who provide generalized PD to school districts focused on discipline-neutral subjects, like the well-known Solution Tree PD focused on "how to orchestrate Professional Learning Communities." At the same time, because this study entails an analysis of only one PD leader, further research is needed to test this hypothesis and further specify the knowledge demands of the work of PD facilitation so that we can better prepare PD leaders. While I have some hunches, further research that investigates expert PD leaders needs to examine the common factors across cases of expertise in order to suggest a more generalizable theory of necessary knowledge for the enactment of skilled facilitation.

Third, this dissertation suggests a need for research that considers the discipline-specificity of the facilitation practices elaborated here. For example, ought PD facilitators in the English Language Arts (ELA) context ground their workshops in complex literacy tasks? My hunch is that in the same way that HLPs for teaching cut across disciplines, it is likely that the practices of an accomplished PD leader are broadly applicable across disciplinary domains, though they may require refining. PD leaders in the ELA context, for example, surely must also develop community, focus on goals for teacher and student learning, and press teachers to

develop and articulate their pedagogical reasoning. Further research could investigate in which ways the facilitation practices described here are similar and different across disciplinary constructs. Further research ought also explore which instructional activities have the greatest potential for teachers in different subjects, and how facilitators might differentially press across disciplinary bounds.

Fourth, future research must investigate the degree to which the efficacy of Sabrina's facilitation practices are bounded to the context of *whole group* PD. Do the facilitation practices in this dissertation have the same impact on teacher opportunity to learn in the context, for example, of professional learning communities (PLCs)? PLCs usually entail the deliberate placement of teachers in small groups to collaborate on a variety of professional activities, such as co-planning instruction, analyzing student work, or interpreting achievement data (e.g. Dufour, 2004; Dufour, Eakor, & Dufour, 2005). When PLCs afford teachers greater opportunities to learn, they seem to be led by a more skilled facilitator (Horn & Kane, n.d.). However, what it is, exactly, that a facilitator does to support teacher learning in the context of PLCs is under-theorized (Horn & Kane, n.d.; Even, 2008). This dissertation provides a possible methodological approach for the analysis of effective PLC facilitation, as well as providing a testable construct of effective facilitation; further research might explore the similarities and differences in facilitation practices across learning settings. For example, because PLCs aim to capitalize on peer-to-peer learning and "bottom up" models of leadership, how does the practice of press for pedagogical reasoning look different across settings, if at all? Another teacher learning context in which these facilitation practices might be tested is in instructional coaching. While current literature on content-focused coaching claims coaching is a potentially productive way to provide ongoing professional development to teachers (Gibbons, 2013b, p. 2), that same

literature gives very little guidance on what types of activities coaches and teachers should do together, what goals coaches should hold for teachers, and what questions might be most productive in supporting the development of ambitious instructional practices. While we know, for example, that questions drive the coaching relationship, asking teachers to make connections between the three corners of the instructional triangle, as I described in Chapter 4, might be a useful way of generating and identifying "juicy questions" that support teacher learning in the context of coaching. That said, future research is required in order to investigate the resiliency of the model across teacher learning settings.

Next, future research might investigate the degree to which the facilitation practices outlined in this dissertation are effective in the context of TE settings. Because orchestrating cycles of investigation and enactment is important in both settings, and because we know that high quality learning opportunities in TE and PD are anchored in instructional activities, these facilitation practices are particularly relevant. Further, focusing the preparation of teacher educators and professional developers on similar practices might contribute to more coherent programmes of support for teachers across the continuum of their careers.

This dissertation suggests a need for future research in order to more fully conceptualize and represent the work of accomplished facilitation of professional development for teachers across disciplines and learning contexts. Further case studies which investigate the practices of other PD leaders would be an important place to start, and would allow researchers to more fully investigate the knowledge demands of leading high quality PD for teachers. Further research that investigates the degree to which the facilitation practices outlined in this paper are discipline-specific and specific to whole-group PD for teachers will also help elucidate the generalizability of effective facilitation practices.

Implications for Practice

This dissertation has significant practical implications for those who work with teachers in the field. While scholars in expertise studies have known that expertise is domain-specific for years (Lajoie, 2003), the domain specificity of leading PD for teachers is not well understood amongst school district leaders. Accomplished teachers like Sabrina are often assumed to be accomplished PD leaders, even when they have no special training for this very different kind of work. Further, accomplished PD leaders in one domain, such as leading PD for middle grades math teachers, are expected to be accomplished PD leaders in other domains, such as teaching teachers about Courageous Conversations. As we saw with Sabrina, her facilitation of the discipline-neutral Courageous Conversations did not likely generate opportunities for teachers to learn. Just as we would not assume a chess champion would automatically win a bridge competition, the case of Sabrina reminds that the domains of expertise are narrow, and this research reaffirms the need to hire facilitators to lead PD that is in the domain of their subject-area expertise, and to encourage them to lead PD.

While my argument that leading PD is not natural or intuitive will come as no surprise to those scholars who study expertise, it is common among practicing district leaders to hire accomplished teachers into professional development roles and hope for the best. Rarely are PD leaders given any additional, specialized training in the work of leading PD for teachers. Even more rare are opportunities for PD leaders to engage in cycles of deliberate practice of key elements of the work of facilitation with more expert others. Given the complexity of the work of leading PD for teachers, it is unlikely that accomplished teachers will successfully be able to lead PD without additional support. I know that Sabrina had support for her practices from the Institute for Learning for her work: while I don’t know about the nature of that support, or the

impact of that support on her practice, she is clearly an effective PD leader. This paper shows that PD leaders need support for their work.

This study also suggests to district leaders the importance of supporting *local* PD leaders to lead PD, rather than investing in external providers of PD. One of the major findings of this paper is the vital significance of developing a trusting community of learners when supporting teacher learning. Sabrina knew the curriculum and the tests, she knew the teachers, departments and schools; she was familiar with their struggles; she lived in their communities. Because of her local knowledge, Sabrina had a significant advantage over an external PD provider. Her practices suggest that it might be more effective to support locals, as the Institute for Learning did, rather than drop in outsiders.

This study provides guidance for those who support PD leaders by suggesting four focal areas of development. While writing this dissertation, I led PD for PD leaders across the province of Quebec, and I found the examples of Sabrina's practice were immensely valuable resources. The PD leaders I worked with initially had enormous, vague goals for teachers' learning: "By the end of this session, teachers will be better at helping kids respond to literature," for example. In order to help them articulate goals for teachers' learning that could be achieved in several hours, I shared the detailed agenda of the Cal's Dinner Card PD day Sabrina led. I asked the teachers to label what they thought Sabrina's goals were for each activity, and how each sub-goal might have contributed to her overarching goals. The PD leaders I worked with quickly realized that Sabrina had much more specific, practice-based goals articulated at a manageable grain-size. The next time I saw these PD leaders, they had modified their PD-planning template so that they would be 'forced' to articulate the goal of every activity that they planned for teachers, and show how it connected to the overarching goals. Further, the goals that

they articulated for teacher learning became more practice-focused and achievable once they were shown a model they could steer towards. By providing a model of accomplished practice, this dissertation provides a list of skills that could be developed amongst practitioners to support their development as PD leaders.

A set of tools for better understanding the practices of effective PD facilitation.

This study also suggests a set of tools for the support of learning PD leaders. The ELA PD leaders with whom I have been working have been very interested in the codebook I developed for analyzing Sabrina's practice. They used the moves I articulated in Appendix 3 to label video of themselves facilitating PD for ELA teachers. These labels provide a focus through which the PD leaders could discuss what they observed in videos of practice, and why they thought those moves were important. Further, these tools help anchor a collective language and vision in a detailed language of professional practice.

Another tool for the support of learning of PD leaders is the framework for understanding how press can generate opportunities for teachers to learn. Specifically, this study provides a means for PD leaders to think about how to press teachers. Often PD leaders are not sure how to assess the degree to which teachers have had an opportunity to learn, and they frequently assess their PD days based on how much the participants 'enjoyed' the session; it is important that PD leaders have access to more sophisticated forms of evaluation for their performance. As an example, after I shared what I called the "Press Triangle" with the learning PD leaders, I shared transcripts from Sabrina's PD sessions and had them analyze the nature of the press, and we discussed what they thought the impact of Sabrina's questions might have on learners. Then, the learning PD leaders planned the press questions for upcoming sessions based on their goals for

learning. We then videotaped their session, and watched it together afterwards, analyzing the nature of their press and the impact on teachers' opportunity to learn. The PD leaders argued that these exercises were powerful learning opportunities for their development.

I have seen tremendous growth in the PD offered by these ELA consultants over the course of our work together, in huge part due to the example of Sabrina: PD leaders do fewer "one-off" workshops, their approach is less "stand and deliver" and more participatory, their goals are clearer and more focused on practice, they provide teachers with opportunities to investigate and enact high quality ELA instructional activities, they press teachers for pedagogical reasoning, and they praise less.

Conclusion

As teacher educators, we must prepare teachers with the knowledge and skills necessary to achieve the goals of making ambitious instruction the norm for all students. Doing so requires more effective PD for teachers. While the field of TE and PD has made significant advances in better understanding the structures and features of effective learning environments for teachers, previous research has left unclear how the facilitator of that work ought to manage the work with teachers. The major contribution of this study is a much-needed conceptualization of expertise in facilitating PD for teachers. The framework for expertise will inform teacher education, as well as research on teaching and teacher education. It also makes a significant methodological contribution by showing how to decompose expertise in relational practices.

What we know about expertise is that as more people dedicate themselves to better understanding the nature of expertise in a field, the more the participants improve over time. When we have access to models of expertise, we know how to direct our efforts: people run

faster in every Olympics; music that Mozart deemed unplayable by human hands is now regularly taught to high school students. As we build collective knowledge, we build collective capacity. The onus for the improvement of instruction across schools in North America rests, in part, on the research community's willingness to consider what forms of support are necessary for the development of expertise in facilitating PD for teachers.

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Appendix A: List of PD Participation Structures

Participation Structure	These codes describe how the teachers are engaging with the activity. Teachers are able to do activities in a variety of ways. For example, Teachers can do math alone, or in small groups, or as a whole group.
Gallery Walk	Teachers make posters to hang around the room, then they walk around the room and discuss what they read with the writers, like people at a gallery opening speaking with artists.
Guided Reading	Facilitator provides reading material, a guiding question or prompt, and time to read.
Jigsaw	The Facilitator organizes teachers into small groups that each have a shared task to complete. Then, one member from each group meets in a new group to teach each other what they learned.
Lecturing	Teachers listen to the facilitator speak.
Popcorning Out	Teachers are asked to quickly take turns sharing a brief response to the whole group. F does not usually elaborate upon responses; the goal is usually to rapidly brainstorm many different answers.
Pushing Back	Teachers challenge the Facilitator's ideas.
Rehearsing	Teachers rehearse an element of upcoming instruction.
Share own practice	Facilitator or Teachers share their own teaching experiences.
Think-Pair-Share	Facilitator asks Teachers to consider a question individually, then discuss their answer with a partner, and then share in a larger group.
Whole group discussion	Facilitator orchestrates a conversation amongst the whole group.
Working Alone	Facilitator asks the whole group to complete a task on their own.
Working in pairs	Facilitator asks the whole group to complete a task in pairs.
Working in small groups	Facilitator asks small groups to complete a task.

Appendix B: List of PD Activities

Activities These codes describe *what* the teachers are doing.	Example 1	Example 2
Analyze Math Tasks Facilitator asks teachers to measure products or performance against stated criteria	091210 3:00:39 "We want to look at this task one more time through the lens of, "is it a rich task?" But I'm gonna have you go ahead and take the DL tool for that… In that packet somewhere is what's called the Task Analysis Guide. So I want you to think about Cal's Dinner Card in terms of your students, cause one of the things I started to hear was one of the misconceptions we have about rich tasks. A rich task or a high level task is something that difficult mathematically. We actually had principals sort tasks… and they all said this task was rigorous if the task was hard... just because they didn't know how to do it. So we're much more sophisticated in our math knowledge than the principals were… but still, we want to get clear on what a rich task is.Take Cal's Dinner Card – where would you put it in these five categories? Would it be a memorization task? Is it procedures without connections? Would it be procedures with	090210 02:25:00 S: "What would be the mathematical goal of this investigation? T: Elimination. S: Elimination. This is all about solving systems of investigation. This bit gets into the elimination method. I believe matrices come out in this chapter as well. What do we like and dislike about this investigation? T: Hands on S: Hands on. T: Easy numbers. S: Nice solutions, ya. What else do you like about it? T: It works. S: What do you mean it works? T: We all got the same answer. S: I noticed a lot of you checking your answers by measuring the penny."

	connections? If it is going in one category it should fit most of the bullets that fall there…Assume this task is for grade 7. Then turn and talk to one person in your table – where would you place it and why?"	
Analyze Research Facilitator provides reading material, a guiding question or prompt, and time to read.	090306 00:31:13 "So you're gonna review the article, "Orchestrating Discussions," keeping your eye on the math to be learned. Here are the two questions I'd like you to think about: How do each of these questions assist teachers in whole group discussions? When they say practices, they are referring to those five things that were mentioned in the article: anticipating, monitoring, selecting, sequencing, connecting. And then how do those five practices align with the Thinking Through the Lesson Protocol, that's the TTLP, that's the thing that's in the tool kit. I'm gonna give you five minutes to think silently with those questions in mind…"	090210 03:44:44 Teachers were asked to read a section from Hiebert et al (1997) focused on "Mathematical Residue." They were given guiding questions, and were then asked to read the section silently. They then engaged in a Think-Pair-Share to discuss their responses to the questions.
Do math Facilitator asks teachers to do math that students might do.	090210 02:03:01 "We're gonna do investigation 2.3. But we're not gonna do the entire investigation… For those of you who know it well, I'm gonna ask you to still engage in the	090306 00:08:50 The session began with a reminder of the article teachers were supposed to have read between sessions. Sabrina then asked the teachers, in the context of a think-pair-share, to do the

	problem. It has ten steps and I'd like you to do all ten steps. Engage in it like students would. You're gonna work in a partnership, ideally with someone from a different grade level. You're gonna need a copy of the problem, a ruler, and a pack of pennies and paper clips. Does it make sense what we want you to do?"	math task described in the article.
Examine curriculum standards Facilitator leads teachers in reviewing and analyzing federal, state, or local curriculum or assessment standards.	110203 In the February session, teachers spend a half an hour examining the upcoming month of instruction according to the pacing guides prepared by the District. They were then asked to make the connections between the pacing guides and the state curriculum standards. "If you don't teach em, you're the reason they don't know this stuff." (04:44:30).	101028 00:22:51 S: "Rod, would you guys share what you guys were just talking about? But first, everyone turn to Benchmark 8.3.1.2. A little while ago we were talking about the distance formula. And I heard Rod's group sharing something fairly interesting, if you actually look at that benchmark. Rod? T: (Can't hear) S: Cause it says they have to be in the coordinates system… But to use the Pythagoran theorem you don't really need the distance formula, cause the distance formula is the Pythagorean theorem… T: (Can't hear) You need to make an executive decision. That's why we go back to the benchmarks. I agree – I would introduce the distance formula, but I would say, if you can do it with the Pythagorean theorem, great, you don't need the distance formula."

Examine state/school data Facilitator leads teachers in reviewing aggregate student achievement data from standardized tests	110203 1:02:31 "So, on the interim assessment I asked you to look at: Which answers do you think were the most frequently chosen wrong answers? What questions do you think students got right and which ones do you think they got wrong? Let me start here. I'm gonna start at the end. Anyone have an opinion on a question they think students probably got wrong? Just one of 'em. T: [Inaudible.] S: Give me a number. T: 13. S: Question number 13. Tell me why you think they may have gotten that one wrong. T: Unit rate again, we have this division symbol I don't think they were thinking of it as five customers in 15 minutes as a division and multiplication problem. S: Yup, and it might have to do with people just not getting around to teaching it. If you haven't taught it they probably won't perform well…"	100311 00:17:20 In the Courageous Conversations session, Sabrina opened the session by sharing data that revealed the relationship between student achievement and race. "Here's the data we pulled out. I tired to code it a little. District Data is in red, state data is in blue. The first two columns just shows who is PROFICIENT in grades 6-8 on the MCAs in the spring. Probably not surprising to anyone that our district is behind the state when it comes to proficiency rates… But I'm always interested in growth…So the state defines growth as low/medium/high. If you look at our data as a district one thing I didn't like is that we have a higher percentage of students making low growth instead of the state. So that was a 'mmm, interesting'. Cause I know we have a bigger gap. I would like to see that be a little higher. Then we started looking at the different racial groups. And these are not just groups based on race, but ELLs, free-and-reduced lunch groups. So you'll see those are all the groups that districts and sites are judged based on AYP. What I notice there is that in all categories except one we are behind the state."
Examine models of expertise The facilitator decomposes	110203 At 1:49:00 Sabrina modeled a launch. She	110203 2:44:18 Teachers watched video of

expert model of practice, or shares exemplars of decompositions. Sometimes the exemplars are in video, sometimes she or others model instruction.	showed a picture of the crowds at Tahrir Square. 1:47:57 "One of the things I've done as a teacher that is my favorite things to in the classroom as launches – I know what the CMP wants me to teach in the textbook – and I've talked to you about this before – one of my favorite things to launch it might not be, " up to page 17," that's probably not the way I start, but my favorite thing is to take something that's going on in the world right now and use it. So. I have a pic for you to look at. Anybody know what this is? Ts: [Unison] Egypt! S: That's what's going on the news right now, right? Not all your students would necessarily know that. It's on the news enough, you can't help but know what's happening. So in Egypt right now… [provides some context]. Turn and talk to your neighbor. What do you think a mathematician would think if they saw this picture?" They proceed to discuss how this conversation could be a starting point for discussing crowd size, ratios, comparing things. Throughout, Sabrina shared what she was thinking about when she	Lars launching a math task. "Find something to write on and brainstorm some ideas – what were some elements of the launch that were evident in that video? Don't talk to anyone at your table yet about what are some elements of the launch that you saw evident in that video? You have the transcript of the whole thing you can reference if you like. Go ahead and talk to your neighbors." (Several moments for discussion.) Alright. Couple things. The length of this launch was 8 minutes and seven seconds… So when we talk about a launch being quick, he did a lot of stuff, I think, in 8 minutes. So it is possible to do something in a tight framework. That's one thing I noticed. What elements did you notice of elements that we would hope to see in a launch? T: The objectives for the kids. S: … Tell me what you saw him doing with the objectives. Cause to me it wasn't just 'here's the objective blah blah blah.' T: Had the kids read 'em. S: Had the kids read 'em. What else did you notice?..."

	made instructional choices in the context of this model launch.	
Plan Instruction Facilitator leads teachers to design curriculum, instruction, and assessments.	110203 03:30:35 "I'm asking you to talk through a launch for some lesson on something you are teaching. Make sure whatever you are talking about is in the 6th grade pacing guide, cause not everything in these books is in the pacing guide. Be thinking about: what is the big goal of this lesson? Because your launch should set up the success of whatever that goal is."	090210 Teachers did a math investigation together, and then, after reading an article about the inquiry method of instruction, they co-planned a lesson that made use of the task they had just completed.
Analyze Pacing Facilitator and teachers discuss sequencing of instruction	110203 4:48:43 "I want to talk about the end of the year, the book Stretching and Shrinking. Last year more than half of the sixth grade teachers never taught Stretching and Shrinking. So I want you to look at the 7th grade pacing schedule. Is there any room for that unit in 7th grade? [Several minutes of silence] Ts: [Unison] No. S: If you don't teach it, there's no space. You have to teach that book… There are four seventh grade benchmarks that are not taught in 7th grade. If you don't teach them, you are the reason they don't know that stuff. But I have some concerns about this unit. A couple of us have been	101028 02:04:00 S: "Not to make you cry, but to help you understand where you need to be in order to prepare your kids for the tests. I would gloss over chapters one and two, not that you don't teach them, but don't work it to mastery, because there are no questions on the XCA based on those chapters. Later today I will tell you exactly what is going to be on all the interim tests." Teachers then analyzed the proposed pacing guides and discussed which elements they could skip and which ones they needed to ensure they taught to mastery.

	talking about this today. Really, the book that would help us in 6th grade is Comparing and Scaling, which is right now located in grade 7. It's the whole thing about ratios."	

Appendix C: PD Facilitation Talk Moves

Facilitation Talk Moves	Example 1	Example 2
Asking for expansion Facilitator asks teachers to elaborate upon their response or provide examples.	091210 02:00:22 "Ali, did you want to expand on that?"	090210 01:01:59 "What else clicked with you?"
Been-Are-Going Facilitator reminds participants about "where they have been, where they are now, and where they are going."	091210 03:10:10 S: "Let me tell you what we're gonna do when we come back from lunch. The first thing is that we are gonna talk about all the mathematics that can come out of this task. We'll do a quick list and Lars will type as we talk. The second thing we are gonna do is chart the things students would struggle with in this task. The students in your classroom: what would they struggle with? Then we are going to practice being a teacher with our students and we are going to incorporate our moves based on what happens. What would we do if students struggled with a particular aspect? We'll see a little short play. We need 3 volunteers to help us with our play. We have a little vignette that was written by Lars about Cal's dinner task. And then you are gonna have the chance to write a little play based on the task. It may feel a little cheesy but research shows that we aren't gonna be good at doing thing sin our classroom unless we have a chance to practice it ourselves. Even though it will	092010 00:16:31 "First we're gonna think about inquiry again and get our brains warmed up. One of the things we're gonna look at is the article you all were supposed to read before you got here."

	feel a little contrived. But the goal is also to have a little fun! And then the last thing we are gonna end with today is we are gonna read an article about the instructional conversation and have a little discussion around that. Hopefully we'll have enough time. So it's 11:25 come back a 12:30."	
Calling for Compliance Facilitator frames the necessity of participation as being a requirement of the job.	090306 47:87:25 "I can't make you, but I'm going to ask you to do this between now and spring break… Sometime next week I'm gonna email some tasks that you can use that are related to the MCA exam… And we're gonna ask you to try it once, to try and orchestrate a discussion. Cause if we never start, it's just never gonna happen… The other thing I want to be transparent with you about it is over and over again someone from the superintendent's office or the principals always ask the same thing: 'what are they learning in staff development, and what should I look for in their classroom?' So this is what Linda and I are gonna say starting next fall: "You could expect to see on occasion, not every day, something that looks like what you'll see in this article. It won't look as pretty and pleasant as in this article, cause we're all learners, but our teachers have some knowledge about how to	091210 00:13:29 "Principals like to see Accountable Talk posters in the room when they do their walkthroughs."

	orchestrate a discussion in the math classroom. So, you may be held accountable."	
Connecting Ideas Make connections between ideas raised in the discussion (van Es et al., 2014)	091210 03:17:00 T "…Scale. S: Scale. As Lars said earlier, if it doesn't scale by one they get all confused."	091210 03:20:21 "That's right, a couple of people have said that they start with a table."
Sharing District News and Gossip Facilitator shares news about employment or personal lives from the "head office"	101028 01:41:54 "Those of you who don't know Keith Sampson – he was in our district – help me here – didn't he work with Middle Schools a lot? Specifically with the MS platform? Is that correct? He's good friends with Daniella Cohen, for those of you that know Daniella Cohen, he's also good friends with Patsy Thurston at the U and lots of people I happen to know. He's been brought in specifically by Beatrice to work with middle schools and high schools and it seems like he's been given a lot of power from Beatrice. And it seems like my new boss Emily Pitts has been given a lot of power, which I think is good. It's a brand new era in my department. So. We'll see what I'm working on as the year goes on! I'm less afraid about what's going on cause I've already told them I am planning on going back to the classroom. But it would not surprise me, based on my gut feeling, if my whole department were fresh-started and things were rearranged. Anyone who works in	101028 02:13:28 "DI is such a big word that the district hired someone new, her name is Megan Crawford. She's a spitfire; man, she is out to change our district. She's been hired for two things. She's the new gifted and talented person and she's not considering gifted and talented to be just an elementary programme, but she wants the district to have an answer about how we are meeting the needs of all our gifted and talented students in middle school and high school in every single classroom. She's saying kids are bored in every class. We know that, cause we all have parents say 'Johnny is bored.' The other half of her job is that she is hired to say what DI is and isn't in our district. She's in charge of all training, and it's all on DI. She's talking about the lowest level learner all the way to the highest level learner. So I met with her and for the rest of the day we are going to be talking about some of this stuff that she suggested. I also pulled this quote from the document – "how do we

	[Curriculum and Instruction] knows that happens where there is a new regiment in place."	address the needs of all students." Cause this quote was actually given by a [State] Public School Teacher. So, when I got that, I was like, oh my gosh! I only know that cause she's Amy Denby, and I know her cause she used to teach with me - she's been given a huge national platform, this isn't the only national platform she's been quoted in, cause she's passionate about teaching. She's also my good friend."
Eliciting Prior Knowledge Facilitator asks teachers to articulate their prior knowledge on a particular topic	00:12:28 091210 "So today we're gonna get back to where we left off last time. There are three huge huge things we're gonna work on today. We're gonna do a math task called Cal's Dinner Cards. And whenever we do any kind of math task in DL training we're not doing it always just because of the math, we're doing it to talk about one of the POLs and talk about how that plays out through that task. And so we're gonna focus in on two POLs today, but they are all important. If you don't remember what they are… Well, what is a POL? Ts [in unison]: Principles of Learning S: Principles of learning. And how many are there? Ts: Nine S: There are nine. And if you don't remember, last time you came, I gave them to you on a little place	091210 00:14:43 "So we're gonna start and see if you remember what you did last time... (Put up PowerPoint up with prompt)… What did we do during our DL training on Nov 10th? List all the things you remember us doing or talking about. I'm gonna ask you to do that for 60 seconds on your own, then talk to a table mate for 60 seconds. Feel free to open your binder if you want, that is not considered cheating. 60 seconds: what did we do last time? Brainstorm and just list out everything you remember us doing."

	mat… We are going to talk about Accountable Talk a lot today... We are going to talk about that through the context of the math task. Then we are going to read an article, which we didn't read last time, so we are going to talk about that today. We are going to tie all together after lunch. We have some time to practice, model what it will feel like back in your room with your students, and Lars brought us another one of his lessons to share, so we will have a chance to see that as well."	
Explaining Rationale Facilitator explains reason for making particular choices.	091210 03:20:53 "What we're gonna be modeling with our little vignette is going up to a group and the group is at a point in their work but they are just kinda stuck. And you're gonna try to comment on that work and have the students at that group talk to each other about what's on their paper in an effort to make sure that everyone is moving forward. Focus on the AT moves the teacher would use."	090210 00:33:56 When explaining why teachers would be spending the day focused on the launch phase of instruction: "When you look at the XCA scores by district and break it down by race, 74% of all white students passed the XCAs, which is above the statewide average of 68%. African Americans… average passing rate is 21%. When you think about the numbers 74 and 21, that was shockingly different. So I thought, 'let's look at the growth data.'… So we hired someone to go out to classrooms where we are seeing a lot of growth. And John Frelick sits in the corner with his laptop and maps everything the teacher does and everything the students do, and types it out onto a

		computer, and he can show you a pie chart of everything you do and everything kids do…One of the things they notice is that those teachers [who are closing the achievement gap]…start immediately when the bell rings… with the launch [and move quickly to the explore]."
Making Light Facilitator says something or makes a gesture with the intent of lightening the mood.	091210 1:14:33 [Teacher comes in late while she is sharing instructions.] S: This is Justin Chang who teaches at Alfred. S, to Justin: They made me say everybody's name, and remember everybody's name. So. [Pause]. I wasn't trying to point out that you were late or anything. [Chuckles]. T: Though you did that very well! [hoots]	091210 35:03:67 You know when [the sectary] at [my former school] would [announce a car was parked in the wrong place and request for it to be moved], all the students in my class would jump up at the same time and pretend it was theirs!
Making Personal Connections Facilitator says something to indicate that she knows something about a participant	00:00:00 T: "Can we also talk about Ray? S: We can. T: And we also lost Mary Harrison. S: Oh no! When did that happen? T: I'm not really sure… I think she had colon cancer. The visitation is on Wednesday night. And the funeral is on Thursday evening at Bookside. S: Someone from my church just passed away and had their funeral there, too… Oh, Mary!" T: Ya, I know! S: I love her! T2: I teach her kids now…	091210 00:07:30 [When introducing participants to each other] S: "[She] used to be a science teacher, but we've converted her into a math geek! And I love her because she teaches at Alfred [Sabrina's former school]."

	it's so hard. S: She raised good kids."	
Modeling Teacher Talk Facilitator models how a teacher might say something to an individual or group	101028: 00:23:32 S: "You could say, 'I just learned about this, how can I support you with this? I'd be happy if we could make it our PDP goal, if you haven't written your PDP yet…"	091210 01:11:54 Is there a positive way we could say that, like, "I'd like to disagree with so-and-so because…?"
Orienting Teachers to Student Thinking Facilitator orients participants to consider the thinking students would have to do in order to engage with a particular task.	101028 02:37:37 "Last session I asked you to bring in evidence of student learning on this benchmark. Would someone read 8.3.1.1. out loud to us?... T: "Use the Pythagorean theorem to solve problems involving right triangles. S: That's our benchmark. Take a look at the vocabulary associated with this…Do we have any vocabulary associated with that benchmark? Ts: Pythagorean Theorem. And everything else from previous grades. (Teachers and Sabrina chuckle.) S: That's a lot of stuff! What other words do you think could be there from previous grades? Ts: [unintelligible] S: Hypotenuse, right triangle, for sure…"	091210 03:16:30 "If we were gonna do this task, where can we predict would be some places where kids would struggle?"
Positioning Teachers as Competent Facilitator frames a particular group of teachers, or teachers in general, as having important and specialized knowledge or skills.	101028: 00:01:00-00:02:00 S: "I want you to know that I am considering you all my experts, and I'm going to ask you some things that are going to become policy in the district. I need to get the questions from you about the	091210 47:06 S: "Thank you for struggling with this a bit. Lars and I really believe that you have some natural gifts that you bring to this and you have some smarts that you can share with us. And we wanted

	end of grade 8, what kinds of questions you have about your students going to HS. I am also going to ask you at the end of the year to recommend what you think should go into the end of year assessment for grade 8s. The value of us producing it is that you will be connected to what your students need to know. Be prepared for that at our December meeting."	you to work on it rather just read it."
Pressing for Pedagogical Reasoning Facilitator asks teachers to justify or explain their pedagogical choices	090306 53:37:59 T: "The anticipating part is hardest for me, and it seems like the easiest piece to skip. S: So why would it be important to anticipate? I agree that it's the hardest thing. But why is it important to anticipate? T: Cause ultimately you waste so much more time on the non-learning things, you spend so much time washing away things that aren't residue."	090210 56:30 S: "Alright, we're gonna examine – does it matter what your stated objective is. Many of you used the objective that's in the book. And sure, that makes sense to give that objective to students. But what is your goal for yourself as you plan your lesson, and how does that affect what you do in the classroom? How do you choose objectives? How do you write them? So is the goal in the algebra book, is that the right objective for this? T: Or is this the right lesson for the objective? Is that what you're asking? S: I'm not. I'm actually asking is this objective the right one for this lesson, or how you would then play it out in your classroom? Like, how do you know if this is what you should be doing in your classroom if you are teaching an Algebra 1 Course? [8 second pause.] T1: Trust the authors.

		S: You trust the authors? Why is that ok to do? T2: Cause they're the best in the country? [Laughs.] S: They don't know your kids. You're just going to trust them to know what's best for the kids that you have in front of you that day? 6 second pause. T: Standards S: These are related to the standards? You go back to the standards? [Pause] S: So tell me which standards this relates to? Bunch of you guys teach algebra, so you should know exactly what standards this unit goes with? Teachers chatter with each other for 2 seconds. S: Beth? Beth: 5.3. Read the lesson, look at the objective, and then think, what's the best.. what's the best lesson I've ever seen [mumble] on eliminating? And if I've seen something, or do something, or use something better, like, than what I see in the book, then that's what I do. I go after the objectives. I use the objectives in the book as the skeleton or structure, because that's my history of how I go in, in that order. Fine. Some would say this is the best lesson for ah, this objective, but I would disagree. S: So why is it ok to be choosing to teach systems of equations right now? Why is that appropriate?

		Betsy: You mean in the arc of this unit? S: I-I- There are two reasons I'm kinda pushing you on that One is we are going to go somewhere with this.. I'm goading you on this…."
Repeating the Question Facilitator repeats the key question asked in a whole group discussion	091210 00:37:86 Small groups worked on the question, "What are the key strategies of teachers who create an effort-based classroom?" and then they had a whole group discussion. A teacher shared some ideas about how teachers diagnose students who are struggling. Sabrina repeated the key question: "What are some things we can do to create an effort-based classroom?"	091210 00:40:00 "There are three points of accountable talk. One is?..."
Sharing Goals for Student Learning Facilitator orients the group to what students should be learning in a particular segment of instruction	091210 2:59:59 In setting up why they did the Cal's Dinner Card task, Sabrina explained: "Students should solve problems in which they use tables, graphs, words, and symbolic expressions to represent and examine functions and patterns of change. I really feel like we are gonna make an effect on our students' learning in this district."	091210 00:21:35 "So one of our goals for when we are together today is how we can let students engage in a little bit of intellectual struggle so they can construct meaning for themselves."
Sharing Goals for Teacher Learning Facilitator orients the group to what teachers should be learning in a particular segment of PD	090306 45:47:66 "Here's our goal for the day and here's where we're going with this… My goal for you this year is for you to be intentional with what you do in your classroom. To be thoughtful before you go in	090210 00:41:38 "Today we are going to focus on how we can create a culture of inquiry. What did this teacher [from the article teachers just read] do at the beginning, middle and end of the year to create a culture of

	and have a reason for what you are doing and to figure something out. I'm ok with you going into your classroom and trying something -- and it fails -- and you try something else… but you gotta be intentional."	inquiry? Go to page 273: Creating a community of inquiry. Grab a highlighter and look for what this teacher did at the stat of the year to create this community of inquiry in this classroom."
Sharing Own Teaching Facilitator shares own teaching practice with teachers.	110203 04:03:09 In the following episode, a teacher shared a concern that her students consistently thought that 7/8 was equivalent to 7.8. Sabrina invites the teachers to respond to how they would tackle this misconception. After teachers have shared several strategies, including making the students draw the two items, Sabrina responded: "So what I would do with students with this one, is I will always have a place value chart on my wall until I solve place value. I would have someone read that out loud. When I am back in the classroom, I will not allow the word "point"... So I would have them say that out loud, and I would be pointing to the place value chart, and saying, 'seven and eight tenths'…Not that that is going to solve the whole problem. But I'm telling you there is probably some place value misunderstanding there in addition to some fractional stuff. Point seven eight? Is seventy-eight hundredths. And showing them what that fraction looks like. Can we	091210 04:12:35 "And Lars and I were both reflecting on how we have our kids sing on a semi-regular basis, and dancing - ya, we do graph dancing! Even in high school! At first they might not want to do it, and they might say their weird math teacher is making them do it to their friends, but a lot of them secretly like doing it."

	reduce that [fraction] down to seven eighths? If we can't, it's not the right answer."	
Sharing tools Facilitator provides teachers with tools that they can use in their classroom (e.g., rubrics, checklists).	101028: 01:03:15 After a discussion about how to prepare students for the high-stakes XCAs, Sabrina shared a pacing schedule she developed: "I just want to remind you: the pacing schedule isn't set up to make you cry, it is there because that is the minimum pace you need to keep if you want to cover everything that will be in this years' test. So think about where you are, and where you should be... I would not spend much time on chapters one and two there's almost no benchmarks that will be tested on the XCAs. If you are trying to teach chapters one and two to mastery, it's a ridiculous waste of time. That said, we still need to teach them because there are some things in them we need further in the book. It's one day per section in chapters one and two."	091210 24:04 S: Effort creates ability. One of the optional sheets I had on the table [at the end of our last session] was a list of teacher moves to create an effort-based classroom. I am going to give this to you again, and we would like you to take five-ten minutes at your table, read through these, and have a conversation with your table: are you doing any of these naturally? Did you intentionally do any of these in the last month? Where are you at in your classroom in terms of you having a part in having students believe that they can get smarter through their efforts? So take a look at these and have a conversation with your table. What have you naturally been good at, and what have you been trying to do intentionally since we last met?
Standing Back Teachers talk with one another on topic in whole group setting without interruption or comment from facilitator (van Es et al., 2014)	090210 04:47:00 "Let's start with number one [of a list of different possible objectives for a single lesson they just studied]… How would you act differently in this unit if this was your goal for the lesson? Choose one and talk about it." Teachers then volunteer ideas from 4:47-4:49. Sabrina listens with her arms crossed across her chest, and she nods after	090210 00:23:45 After reading an article about how to support a culture of inquiry in one's classroom, Sabrina asks people what they noticed. Teachers talked, relatively uninterrupted by Sabrina, for 17 minutes.

	each contribution. She does not remark after contributions, merely nods to others who have their hands raised. Eventually teachers don't raise their hands anymore, they just talk when someone finishes."	
Reinforcing Norms of Collaboration Facilitator reminds teachers about how they ought to interact with each other	091210 01:42:30 "Make sure you are making sure every member of your group is a part of the community of the discussion."	091210 04:53:41 "All four people in the group need to be involved in the conversation. Hold them accountable to this small learning community. If something they say resonates with you, add on to it or ask for clarification. Be prepared as a group to have one thing you can share back with the greater group."
Representing Teacher Thinking Facilitator represents a teacher's idea in another way not already presented, ie. Writing their words down	091210 1:41:51 "I want you to look up at the board first. I have participation notes I am going to be putting up. When I hear good participation, good accountable talk moves within the group, I am going to be walking around and writing down your great contributions on the document cam so that we recognize and value your contributions."	091210 03:12:29 "What is the mathematics that kids could struggle with or tackle as they do this task? Lars will write down your answers on the chart."
Revoicing Facilitator restates what a participant has said	091210 03:17:17 T: Kids might not know what a dinner card is. S: There's a contextual issue here, a contextual issue here, in terms of what a dinner card is.	091210 03:17:52 It will just look like a collection of numbers to kids. S: It will just look, like, random.
Sharing Personal Information	090210 Sabrina shared a 7 minute	090210 03:00:05

Facilitator reveals something about her personal life	story from her days as a teacher. She described how she was trying to break up a fight between two students in her class when a kid "waved a lit joint right in front of [her] face!" She yelled at the kid, "Friz, you give me that joint right now!" Just at that moment, her principal walked in, and saw two kids fighting around her, with her holding a lit joint—in her math classroom.	"Here's my little story. My cousin has been bugging me to watch this show on HBO. I pushed back. He gave me the box set. [Shares the plot of The Wire]. The thing I've appreciated about the show so far, is that they look at it from a lot of different perspectives. At the end you have empathy for everyone, but also are a little disturbed by people's choices. There's a little vignette in the show that makes me think. A kid doesn't know that radio shows change when you drive. It made me think about what our kids know and what we assume that we know. This piece of paper is measured in *inches.* How many of our kids are ELLs and don't work with inches? Or know that paper comes in standard sizes?"
Sharing Personal Information about a Participant with the Group (Opening the group to the group) Facilitator shares something about a participant, present or not, to help teachers get to know each other. Often this is coupled with positioning teachers competently.	110203 1:16:53 "Keith Bane loves to use this technique. He covers up the actual question, and shows kids the answers. Then he says, 'based on the answers, what do you think the question is?'"	090210 00:07:28 S: "Rod Smith passed away this weekend. A lot of you were pretty close to him. He has been a long, long time advocate for math in the state. He was retired from this district the whole time I was in this district, and yet, I felt like he was a math leader in the district… I know ten of those years he was on the school board. Even when he wasn't on the school board, he was everywhere. Just send

		out some good wishes his way. Anybody want to say anything about Ross? I know some of you knew him even better than I did…"
Sharing Vulnerability Facilitator shares concerns, or acknowledges imperfections or mistakes.	090210 4:26:35 "When I was a new teacher I trusted whatever book I was teaching, and I didn't take a lot of time to think about what came before and after, mainly cause I didn't have time to think about it cause I was so overwhelmed dealing with all those lessons and students sitting in front of me. So I would do the lesson and turn the page, do the lesson and turn the page. Turn the page, quiz on those things, and then at the end of the year I'd be a little weirded out that they didn't understand things…on the final exam. In the early days, I never thought about what would be on the final exam or what they'd see next year or their next class. I didn't think about it as I planned my daily lessons. I think something I've become MUCH better at as a teacher are the things you guys are describing, and that was purely through just experience of knowing where my kids have struggled over the years and having taught every grade level from 7-12th grade and stuff, and so I started thinking about this stuff the other day, and I was like, "What if I'd been	090306 00:50:44 "I know I'm gonna be short with some of you today. I'm under, like, a lot of stress and I know you all are too, I know you're equally busy! I just have a lot of things going on in my personal life that are getting in the way of me giving myself to the job. I apologize. If anything, email me and I'll be in a much better space next week. T: Can I say a general comment? S: Ya. T: When you sent out the email that said we had to read another article, I was like oh God! Not another DL article that's not practical, and it feels like we're in college, but then I started reading this one and I was like, oh! I like this! It's telling me something to do!" S: Well good, I'm glad."

	intentional about this, and really thought about what came before it, and being intentional about thinking how this fits into the bigger picture, and how can I access that prior knowledge, and I think it changes how I think about things... I think I ruined a lot of kids in my early years."	
Sustaining Wait Time Facilitator allows silence to linger during whole group discussion.	091210 03:05:24 T: We were thinking about exactly was going on and how we could relate it to our own lives. [Four second pause]. S: "I would like to value what Ryan just said…"	101028 03:05:00 "Any other questions about the transition from eigth grade to ninth grade?" [12 second wait.]
Validating Participant Ideas Confirm and support participant contributions (van Es et al., 2014)	090210 01:35:06 "Go take a 15 minute break and then we will regroup at 10. Good morning so far, you guys, thank you."	090306 1:30:20 "I hadn't thought about that last one. That's interesting."