

Supporting learning opportunities in teacher workgroups:  
facilitators' orientations towards tool use.

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## Introduction

Increasingly, educators in the United States are being held accountable to more ambitious goals for students' mathematical learning. Standards documents, such as the National Council of Teachers of Mathematics *Principles and Standards* (NCTM, 2000) or the Common Core State Standards (National Governors' Association Center for Best Practices, 2010), emphasize the need for students to develop both procedural fluency and conceptual understanding as well as engage in disciplinary, mathematical practices. Teaching that aims for such goals has been called *ambitious* (Lampert, Boerst, & Graziani, 2011).

Such instruction is difficult to learn and sustain. For example, one aspect of ambitious teaching involves the selection and implementation of cognitively demanding tasks. Yet researchers have found that even when teachers select cognitively demanding tasks, they often lower the demand of the task by omitting the most challenging parts or by suggesting a solution strategy (Stein, Grover, & Henningsen, 1996). Thus, supports are needed in order to develop and sustain teachers' enactment of ambitious instruction.

One strategy employed by many schools and districts has been the use of collaborative teacher communities such as professional learning communities (PLCs). Research on teacher learning and professional development indicates that content-focused, teacher collaborative time (TCT; I use this more general term to refer to any content-focused workgroup meeting) is a promising approach for developing teachers. Sustained, content-focused professional development is likely to support changes to teachers' practice (Corcoran, 1995) and knowledge and beliefs (Garet, Porter, Desimone, Birman, & Yoon, 2001). Furthermore, schools with strong teacher communities have

consistently demonstrated higher than expected student achievement (Bryk, Sebring, Allensworth, Easton, & Luppescu, 2010; McLaughlin & Talbert, 2001).

Yet TCT is not always used in ways that support the development of ambitious teaching. The imperative to plan for tomorrow's lessons is a dominant force on teachers' limited non-instructional time. Even when teachers do engage in activities likely to support the development of ambitious teaching, *how* they engage in those activities is consequential for what learning opportunities may arise (Horn, 2005). To the extent that researchers can specify and describe how teachers' learning is shaped during workgroup meetings, the field can support educators use of TCT as a support for teachers' development of ambitious teaching practices.

Indeed, a growing body of literature makes such a contribution. Drawing on close analyses of teachers' interactions during TCT, researchers have identified conversational features (Horn, Kane, & Wilson, 2015) – such as conversational routines (Horn & Little, 2010) and representations (Brasel, Garner, & Horn, 2016; Little, 2003) – that shape teachers' learning opportunities. This study adds to this literature by exploring how facilitators can use tools to support teachers' learning during TCT. Drawing on contrasting cases of tool use during TCT, the study draws attention to how facilitators' different orientations contribute to the development of learning opportunities.

### **Literature Review**

Teachers' opportunities for professional learning are distributed across a variety of settings. For example, teachers may attend district-mandated in-service days, enroll in a masters program, or engage in collegial conversations during formal meetings or informally in the hallway or teachers' lounge. Across these settings, the affordances for

and content of learning can vary wildly. This has led scholars to characterize the infrastructure for professional development (PD) as lacking consistency, coherence, and curriculum (Ball & Cohen, 1999).

At the same time, there is ongoing commitment by policymakers and educators to raise standards for students. New standards such as those found in the National Council of Teachers of Mathematics (NCTM) Principles and Standards (NCTM, 2000) emphasize the need for students to develop both procedural fluency *and* conceptual understanding. More recently, the Common Core State Standards (CCSS) have also called for students to participate in disciplinary practices, such as constructing and critiquing viable mathematical arguments<sup>1</sup>. These more rigorous standards not only shape what students are expected to know and be able to do, but also increase the knowledge demands for teaching. For example, in order to support students' conceptual understanding of the division of fractions, teachers themselves not only need knowledge *of* how to divide fractions, but also knowledge *about* the kinds of representations of various metaphors for division (Ball, 1990). Of additional concern is the question of how teachers might assess students' learning of these more rigorous standards. What counts as evidence of conceptual understanding? How might it be measured?

Relatedly, calls for more rigorous standards for student learning have been accompanied by calls for rigorous professional standards for teaching. Efforts to professionalize teaching by organizations such as the NCTM, the National Council of

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<sup>1</sup> To be sure, the practice standards found in CCSS are not exhaustive. For example, in mathematics, the standards include “Attend to precision”, an aspect of which includes the careful use of definitions. However, from a mathematician’s perspective, such definitions do not arise out of thin air; they are negotiated and evolve (Lakatos, 1976). Hence, though the CCSS emphasize the *use* of definitions, this is only a small part of what Kobiela and Lehrer (2015) call *definitional practices*.

Teachers of English (NCTE), and the National Board for Professional Teaching Standards (NBPTS) have resulted in mission statements and standards for teaching that entail more ambitious visions of high-quality instruction. Returning to the example raised in the previous paragraph, one way teachers might engage the challenge of assessing students' conceptual understandings is by eliciting students to publicly share their thinking. As many scholars have documented, students often invent their own, non-standard ways of thinking, which in turn creates "an imperative to reconcile multiplicities" (Ball, 1999) – teachers must determine if students' ideas and solutions are isomorphic to more standard expressions of mathematical concepts and algorithms in order to assess whether students are developing canonical understandings of mathematical concepts.

### **The nature of ambitious instruction**

The examples raised above show how more rigorous standards for students and teachers are shifting what teachers need to know and be able to do. Recent scholarship has characterized these changes as entailments of *ambitious instruction*. Ambitious instruction is teaching that aims for "all kinds of students to not only know academic subjects, but also to be able to use what they know in working on authentic problems in academic domains" (Lampert et al., 2011, p. 1362).

Embedded in this definition are two critiques of forms of instruction common in the United States. First, this definition is a critique of teaching practices that systematically disenfranchise students of color and other historically marginalized groups. Thus, implicit in the meaning of "all kinds of students" is a concern for equity. Other scholars have made this concern more explicit, calling not only for ambitious instruction, but equitable instruction in which "all students participate substantially in all phases of

mathematics lessons (e.g., individual work, small group work, whole class discussion), but not necessarily in the same ways” (Jackson & Cobb, 2010, p. 3).

Second, the definition contains a critique of the oversized role that epistemologies of possession (Cook & Brown, 1999) have played in U.S. schools. Such an epistemology emphasizes knowledge that is possessed by an individual. The critique here is not that such knowledge of academic subjects is bad, but rather that is incomplete; it does not account for the “epistemic work done by human action itself” (Cook & Brown, 1999, p. 382). Thus, Lampert and colleagues call not only for *knowledge* of academic subjects, but – in Cook and Brown’s terms – *knowing* of academic subjects, to “use what they know in working on authentic problems” (Lampert et al., 2011, p. 1362). This call for knowing is consistent with and concomitant to the increasing emphasis being placed on disciplinary practices (for instance, the practice standards found in the CCSS).

Together, these two critiques point to how fundamentally different ambitious instruction is from typical instruction in U.S. schools (Stigler & Hiebert, 2009). For example, in mathematics, ambitious teaching requires teachers to select rigorous tasks (M. S. Smith & Stein, 1998), support students’ engagement with those tasks without reducing the cognitive demand (Wilhelm, 2014), elicit students’ mathematical ideas (Franke & Kazemi, 2001), and foster productive whole-class discussions (Stein, Engle, Smith, & Hughes, 2008), all while managing the complexities of students’ relationships with content, the teacher, and each other (Horn, 2012). To highlight the differences along just one of the dimensions mentioned above, consider the kinds of classroom discourse that might take place when teachers strive for more ambitious instruction. A productive whole-class discussion in an ambitious mathematics class might involve teachers’



elicitation and responses to students' thinking, students' mathematical justifications for their solution strategies (Boston & Wolf, 2005), or discussions of a student's proposed mathematical definition (Horn, 2008). This stands in stark contrast to the inquire-respond-evaluate (IRE) mode of discourse commonly found in U.S. classrooms (Cazden, 2001) in which the locus of epistemic authority is centered on the teacher.

I highlight these differences to argue that teachers' development of ambitious instruction is going to require significant changes to their practice – and will therefore require significant learning by teachers. However, these learning demands run head-first into the extant professional infrastructure described earlier, making wide-spread development of ambitious instruction difficult. This coupling – an incoherent infrastructure for professional learning with increased expectations for teaching – presents an imperative for the field. There is a need to provide teachers with learning opportunities that can support ambitious instruction. Yet in order to increase the likelihood that these learning opportunities support goals for teaching, PD providers and teacher educators need to design learning opportunities with an understanding of how teachers learn.

### **Supports for teachers' learning**

A growing body of literature contributes to the field's understanding of how teachers learn by drawing attention to the *conceptual infrastructure* (Horn, 2005) available to teachers during on-the-job interactions, including TCT. This research has shed light on the interrelated roles that various *conversational resources* (Horn et al., 2015; Horn & Kane, 2015), including activity structure, framings, representations, and epistemics play in shaping teachers' learning opportunities during workgroup interactions.

For example, when teachers employ different framings of a problem of practice, this has the potential to disrupt learning opportunities if intersubjectivity is left unnegotiated. However, those different framings can also be a resource for teachers' learning when teachers are supported – for instance, by re-visioning routines (Horn & Little, 2010) or by adequate representations (Brasel et al., 2016; Hall & Horn, 2012; Lampert et al., 2011). For a fuller explication of these conversational resources, I refer the reader to Horn, Kane, and Wilson (2015).

At the same time, learning theorists, particularly those from a sociocultural tradition, have drawn attention to the centrality of tools for learning [citation?]. In Horn and colleagues' framework of conversational resources, tools arise primarily in consideration of activity structures and representations. Thus, in the next section, I examine in closer detail the literature on these two resources.

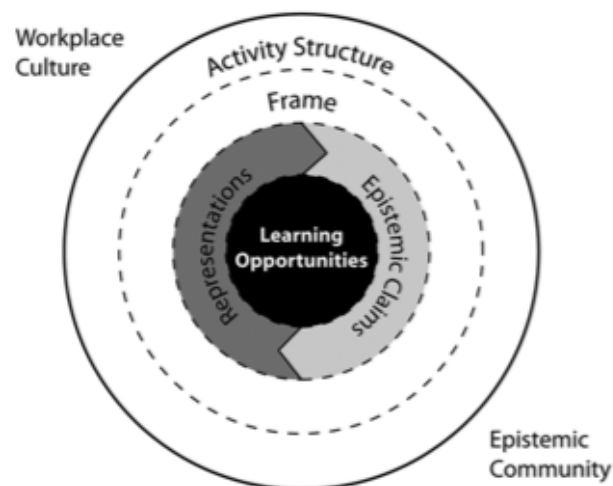


Figure 1: Conversational resources for teachers' learning. (Horn et al , 2015)

**Activity structures in TCT.** Activity structure refers to “the patterned ways that tasks get carried out in group interaction” (Horn et al., 2015). For example, in a lesson

planning activity teachers may choose to plan a unit lesson by engaging in collaborative sense-making around a big mathematical idea. Alternatively, they may use a divide-and-conquer approach to planning by distributing planning responsibilities across teachers. Activity structures may derive from tools (like a protocol); alternatively, over time, repeated activity structures may lead to the development of routines. In particular, patterns in talk can become *conversational routines* (Horn & Little, 2010).

Activity structures can provide an orienting function for workgroup participants. That is, they can attune teachers' attention toward (or away) from certain aspects of practice. For example, Levine and Marcus (2010) studied the relationship between the structure and focus of teachers' collaborative activities. They found that in meetings where teachers intended to focus on instruction, meetings structured by a protocol were more likely to contain talk about instruction and more representations of practice.

Similarly, in Horn and Little's (2010) comparative case study of two teacher groups, they found that different conversational routines shaped learning opportunities available to teachers during workgroup interactions. Though the routines of both groups served to normalize problems of practice, the "walk-through" routine used by the Academic Literacy Group turned teachers away from problems of practice by treating concerns in isolation rather than as an instance of a more general class of problems. Furthermore, talk in the Academic Literacy Group was monologic in nature, positioning teachers who raised problems as passive recipients of tips and tricks (Horn, Garner, Kane, & Brasel, n.d.). In short, the conversational routine deployed in the Academic Literacy Group oriented teachers away from collective examination of problems of practice. In contrast, the "check-in" routine deployed by the Algebra Group also normalized

problems of practice, but teachers were pressed to further specify, and then revise, their initial description of the problem. This press oriented teachers toward the collective examination of those problems.

However, though these studies show that activity structures can support teachers' learning, they should not be considered as sufficient. Both Levine and Marcus (Horn & Little, 2010; Levine & Marcus, 2010) and Windschitl and colleagues (Brasel et al., 2016; Little, 2003; Windschitl, Thompson, & Braaten, 2011) found that protocols can be used to define activity structures that support teachers' learning. However, both of these studies - and others (Curry, 2008; Little, Gearhart, Curry, & Kafka, 2003) - also point to the limitations of protocols. For example, Levine and Marcus (2010) found differences in how the different protocols used by teachers in their study supported teachers' talk, noting that the Critical Friends Group (CFG) protocol allowed teachers great latitude in choosing the content of their discussions; neither did it press teachers to talk in a way that was likely to lead to reframings of problems. Similarly, Windschitl and colleagues (2011) found that the CFG protocol allowed too much to be taken for granted about student thinking and instruction. That is, though they intended the protocol to scaffold teachers into a critical analysis of student work, early in their study, teachers engaged in CFG discussions "as if they had shared understandings of the student thinking represented in the artifacts and of the science being taught" (Windschitl et al., 2011, p. 1326). Taken together, these studies show that protocols can be used to orient teachers toward salient aspects of teachers' practice, but point to the use of protocols as a potential but not sufficient tool to support teacher learning.

**Representations of practice in TCT.** A large body of literature has examined how representations of practice shape teachers' learning. Researchers have examined the role that representations play for teachers' learning through the use of video (Borko, Jacobs, Eiteljorg, & Pittman, 2008; Sherin, 2001; Sherin & Han, 2004), student work (Cobb, Zhao, & Dean, 2009; Kazemi & Franke, 2003; 2004; Little, 2005; Windschitl et al., 2011), and teachers' talk (Brasel et al., 2016; Horn, 2005; 2010; Horn & Kane, 2015). These studies point to how representations of practice – whether in the form of student work, video recordings, or conversational renderings of practice – can be valuable resources for teachers' learning. However, how teachers' *use* those resources is consequential for the kinds of knowledge and knowing that they can develop.

Of critical importance when considering how representations are used by teachers is the issue of representational adequacy (Hall & Horn, 2012). Representations are adequate to the extent that they provide “material for comparing, evaluating, and assembling new ways to work.” (Hall & Horn, 2012, p. 252). However, standards of adequacy are locally negotiated and therefore shape what new ways of work are available to teachers. For example, in the revisioning routine described by Horn (2010), a critical aspect of that routine involves elaborations that lead to a revised representation of the teaching event, which ultimately provides a new vision of teaching. In this way, the revisioning routine is a means of negotiating representational adequacy. The elaborations and revisions teachers provided expanded the horizons of observation teachers' had into each others' practice, providing teachers material to assemble new ways to work.

Additionally, Horn and Kane (2015) add to our understanding of the representational infrastructure by examining how instructional expertise shapes teachers'

opportunities to learn. Their case study compared three groups that varied with respect to levels of accomplishment in ambitious instructional practices. They found that talk in the group with the highest levels of instructional expertise differed from the groups with lower levels of expertise in a variety of important ways. In particular, they found that the more accomplished group

- Used more representations of practice than the other groups
- Used more replays than rehearsals
- Was more likely to include student voices in replays

Together, this trio of findings indicates that the representational infrastructure available to teachers in workgroups with high levels of instructional accomplishment is qualitatively different than that available to less accomplished workgroups. It provides additional evidence to Hall and Horn's (2012) finding that representational adequacy was closely linked to epistemic stance: in the most accomplished group, univocal replays were inadequate as the group collaborated around a collective stance that emphasized the importance of making connections between teaching, students, and mathematics. These findings also develop the notion of a revisioning routine (Horn, 2010), suggesting a class of elaborations (multi-vocal replays that include student voices) that plays a critical role in accomplished teachers' pedagogical reasoning.

Particularly relevant to this analysis, tools can also function as representations as they are reifications of a particular vision of practice (Horn, 2005; Wenger, 1998).

Whether through reform artifacts (Horn, 2005), protocols (Levine & Marcus, 2010), or tool-based routines (Thompson, Windschitl, & Braaten, 2013), prior research indicates that such tools can be supports for teachers' learning. For example, Thompson and

colleagues' describe a rubric and routine – grounded in an ambitious vision of teaching – for making sense of scientific explanations. Novice teachers in their study used this tool to look at student work and examine their own understanding of science content. They found that the use of this tool supported changes to teachers' discourse and practice. For some teachers, the tool-based routines provided teachers with examples of what the “next level” of instruction might look like – what they called “borrowed, but implementable visions of practice” (Thompson et al., 2013, p. 605), and experimentation with these practices lead to refinements of teachers' curricular visions. For other teachers, the tools functioned as a conceptual resource that supported the early development of an ambitious curricular vision, and those visions supported experimentation with multiple ambitious practices.

However, how teachers interact with those reifications shapes teachers' learning. In Horn's (2005) comparative study, both groups engaged with reifications of vision in the form of reform slogans. Yet the learning opportunities that arose from engagement with those slogans varied. The richest learning opportunities arose in the group where there was regularly discussion around the meaning of the slogan. This led to a refining, on the one hand, of veteran teachers' understandings of the slogan while, on the other hand, provided newer teachers in the department the opportunity to adopt the vision of teaching and learning adopted by the group. Together, these studies point to how tool-based reifications can be a resource for teachers learning. However, where meaning is ambiguous, teachers will likely need supports (in the form of activity structures or conversational routines) to engage with the reification in a way that will support their learning.

Together, the literature reviewed here suggests that though tools may be used to build a conceptually richer learning environment, they should not be seen as sufficient for learning to take place. This study lies complements the existing literature by investigating how facilitator tool-use during teacher collaborative time contributes to differences in learning opportunities for teachers.

### **Conceptual framework: teachers' professional learning opportunities**

My conceptual framework draws on prior work that investigates teachers' learning opportunities in workgroup settings. I take a situative view of learning (Greeno, 1997) and define learning as a change in participation in a community of practice (Lave & Wenger, 1991). In this view, learning and context are seen as unfactorable (Greeno & The Middle-School Mathematics through Applications Project Group, 1998). This assumption leads to an analytic approach that takes intact activity systems as its unit of analysis and highlights how the dialectic between individuals and context can support new forms of practice and understanding (Greeno & Gresalfi, 2008). As workgroup participants interact, their participation stands to change along two dimensions. First, their participation in workgroup activities can change; as new concepts are brought to bear on problems of practice, educators' pedagogical reasoning can change. Second, their future work as teachers can change as they *re-vision* (Horn, 2010) their practice.

By focusing on joint interaction of workgroup participants, I refrain from making claims about individual teacher's learning and rather highlight the *opportunities to learn* (OTLs) that arise in interaction. Following the work of Horn and colleagues (Hall & Horn, 2012; Horn & Kane, 2015), I operationalize OTLs by identifying how interactions (a) support teachers' concept development and (b) mobilize teachers for future work.



This approach follows from a Vygotskian tradition in which concept development (Vygotsky, 1986) arises through the interplay between formal and lived concepts (Kane, 2015). On the one hand, formal concepts are generalizable abstractions about the world. In teaching, this includes generalized principles about teaching – for example, for math teachers a formal concept might be “High quality tasks support students to engage in disciplinary mathematical practices.” On the other hand, lived concepts arise from experiences in the world. Continuing the example about high quality tasks, a lived concept might be a statement like “When I used a task like that, my kids couldn’t do it.”

There are two interactional conditions for learning opportunities to develop. First, both formal and lived concepts need to surface. Second, these concepts need to be brought into dialogue. Teachers’ talk emphasizes lived concepts when teachers share past experiences in the form of *replays* (Horn, 2010) or practice instructional techniques in the form of *rehearsals* (Horn, 2010). Alternately, teachers’ talk emphasizes formal concepts when teachers broadcast abstract theories of teaching or general principles like “Right is right” or “Begin with the end” (Lemov, 2010). The richest learning opportunities are available when other participants bring these lived and formal concepts together, and link them to future work (Hall & Horn, 2012).

### **A taxonomy of learning opportunities**

Using the operational definition of OTLs discussed above, Horn, Garner, Kane, and Brasel (n.d.) developed a taxonomy of learning opportunities, seen below in Table 1. The taxonomy is organized from the most limited learning opportunities to the richest learning opportunities. The richest learning opportunities, seen below the thick line, involve the explicit development of concepts for teaching.

<b>Category (Abbreviation)</b>	<b>Concepts Developed</b>	<b>Mobilization for Future Work</b>	<b>Nature of Discourse</b>
<i><b>Conflicting Goals (CG)</b></i>	No teaching concepts explicitly developed	No consensus about future instruction	<b>Monological</b>
<i><b>Pacing (P)</b></i>	No teaching concepts explicitly developed	Pace of future instruction coordinated	
<i><b>Logistics (L)</b></i>	No teaching concepts explicitly developed	Pace and topics of future instruction coordinated	
<i><b>Tips and Tricks (T&amp;T)</b></i>	No teaching concepts explicitly developed	Instructional talk or activities for future instruction coordinated	
<i><b>Collective Interpretation, Separate from Future Work (CI-FW)</b></i>	Analysis of instruction supports concept development	Analysis of instruction <u>not</u> linked to future work	<b>Dialogical</b>
<i><b>Collective Interpretation, Linked to Future Work (CI+FW)</b></i>	Analysis of instruction supports concept development	Analysis of instruction linked to future work	

Table 1: Taxonomy of opportunities to learn (Horn et al, under review)

## **Data and Methods**

### **Data and Case Selection**

**Research context.** The data under analysis come from an eight-year design-research study of how districts support improvement of mathematics instruction at scale (Cobb, Jackson, Smith, Sorum, & Henrick, 2013). Beginning in 2007, our team purposively sampled four large, urban districts for their commitment to improve the quality of middle-school mathematics instruction. Within each district, schools were sampled representatively with respect to their capacity for instructional improvement. In order to study teachers' learning opportunities, we selected teacher workgroups for close

study based on the presence of a catalyst for teachers' learning (e.g., individuals with pedagogical expertise or other unusual resources). We conjectured that such catalysts would spark additional opportunities for teachers to learn about improving their instruction. Over the course of the study, it became apparent that turnover and churn among district and school personnel made the development of longitudinal cases difficult. One exception to this came from an instructional coach, Jane Shepley; we were able to follow her for three years at two different schools, Lakefront and Silver Pond Middle Schools. The data under analysis in this study is drawn from this three-year corpus.

**Data and analysis.** Over the three school years ending from 2012 – 2014, we recorded 12 professional learning community meetings in which Coach Shepley participated (see Table 2). In the course of coding these 12 meetings, I noticed that tools featured prominently in exactly half the meetings. Moreover, among the six meetings in which tools were used, four were coded as either CI+FW or CI-FW, the two codes in our coding scheme which indicated the richest learning opportunities; conversely, of the six meetings in which there was no tool use, four were coded either P, L, or T&T, which indicates limited opportunities for learning. Together, this suggested that tool use may have contributed to or shaped the development of learning opportunities in these meetings. At the same time, there were meetings that did not fit this overall pattern. I hypothesized that these meetings could provide contrasting cases.

School	School Year	Meeting Number	Tool Use	Code
Lakefront	2012	1	Rubric to look at student work	CI-FW
		2	Rubric to look at student work	CI+FW
		3*	Rubric to settle disagreement about Task J	CI-FW
		4	No tools	CI-FW
Silver Pond	2013	5	No tools	L
		6	No tools	CI+FW
		7	No tools	T&T
		8	No tools	L
	2014	9	Content-Process-Context protocol	CI+FW
		10*	Critical Friends Tuning Protocol	T&T
		11	Powerpoint on Questioning Strategies	T&T
		12	No tools	P

Table 2: List of PLC Meetings in which Coach Shepley participated.

(\*denotes focal meeting)

To make progress on my research question, I selected contrasting meetings in which tools were used but the learning opportunities available to teachers were above and below the cutoff for richness, respectively. This allowed me to explore how the facilitators' tool use shaped available learning opportunities. The contrasting meetings – Meetings 3 and 10 – are summarized in Table 3.

	Meeting 10 (Silver Pond)	Meeting 3 (Lakefront)
Workgroup Participants	Principal Claudia Phelps Coach Jane Shepley Teachers Mira Sanchez Imani Wiles Stella Robins Jada McNally	Coach Jane Shepley Teachers Christopher Greene Reuben Campione Sarah Spengler Eve Jefferson Mark Bowman
Taxonomy Code	Tips and Tricks	Collective Interpretation, separate from future work
Facilitator framing of meeting	PLC as a site for teachers' professional learning	Supporting teachers to "maintain rigor" in their classrooms
Tool used	Critical Friends Tuning Protocol	Rubric to evaluate the cognitive demand of tasks
Opening Activity	Ms. Wiles shares her lesson plan; teachers ask clarifying questions	Teachers solve two mathematical tasks and discuss the cognitive demand
Middle Activity	Teachers individually examine the lesson plan materials to determine if it will support Ms. Wiles' stated learning goals	Teachers work in pairs to sort 16 tasks into two piles according to cognitive demand (high and low piles)
Concluding Activity	Teachers discuss lesson plan and share feedback with Ms. Wiles	Teachers discuss differences in sorting.

Table 3: Summary of contrasting meetings

**Qualitative analysis.** My primary unit of analysis is an episode of pedagogical reasoning (EPR; Horn, 2005). EPRs are topically-bounded units of talk where participants reason about an issue of instruction. I first identified EPRs within each workgroup's meetings. Noting that some EPRs afforded richer OTLs than others (Horn & Kane, 2015), I used multimodal interaction analysis (Jordan & Henderson, 1995) to analyze OTLs, paying specific attention to the meeting leader's facilitation and how their facilitation drew on tools. Additional consideration was given to how other

conversational features like framings or representations (Horn, 2012; Horn et al., 2015) interacted with the tools and shaped teachers' learning opportunities.

### **Findings**

As I describe in the following sections, my analysis of these two meetings revealed two orientations related to facilitation that shaped teachers' learning opportunities. In Meeting 1, Principal Phelps used the Critical Friends Tuning Protocol (CFTP) to structure the workgroup's activity. Although she framed the meeting/activity as a site for teachers' learning and emphasized that her role was to support teachers' sensemaking, her facilitation emphasized getting through the protocol and did not press teachers' discourse beyond the sharing of tips and tricks. Her approach suggests an enforcement orientation towards facilitation.

In Meeting 2, Coach Shepley supported teachers' sensemaking by fostering dialogue in which teachers voiced their disagreements about a particular task, and used a rubric – a reification of an ambitious vision of math teaching – as a conceptual resource to foster consensus building and support teachers' understanding. Her approach suggests a sensemaking orientation towards facilitation.

#### **Overview of Meeting 1: Using the Critical Friends Tuning Protocol to Plan (Tips and Tricks)**

This data comes from a math professional learning community (PLC) meeting at Silver Pond Middle School. The meeting is facilitated by Principal Phelps, who uses the “critical friends” Tuning Protocol (Curry, 2008) to structure the meeting. The Critical Friends Tuning Protocol (CFTP) was developed by the Coalition of Essential Schools as

a means of providing feedback on student assessment systems, such as portfolios or design project, to participating schools:

Recognizing the complexities involved in developing new forms of assessment, the project staff developed a facilitated process to support educators in sharing their students' work and, with colleagues, reflecting upon the lessons that are embedded there. This collaborative reflection helps educators to design and refine their assessment systems, as well as to support higher quality student performance. (National School Reform Faculty, n.d.)

Though designed to support the sharing of student work, Principal Phelps adapted the protocol and used it as a way to support teachers' sharing of lesson plans. In this meeting, Ms. Wiles presented a lesson plan on unit conversion and the teachers offered her feedback. Though Ms. Wiles had already taught the lesson, the focus of the meeting was the analysis of Ms. Wiles lesson plans, not the enacted lesson; the teachers' primary task was the examination of lesson plan materials. The analysis of the data shows that though Principal Phelps deployed a framing of the activity that emphasized sensemaking, rigid adherence to the CFTP forestalled the development of teachers' learning opportunities by limiting multi-party dialogue.

**Focus on framing: workgroup activity as a site for teacher learning.** Principal Phelps started the meeting by explaining that she wanted the PLC to “provide professional learning to teachers, not just planning.” Then, she distributed a copy of the CFTP to all of the workgroup members. She went on to explain that she was facilitating

the meeting because she had experience using the CFTP and was therefore modeling its use to others who may facilitate meetings in the future:

Principal Phelps: Everybody should have this. It's called the Tuning Protocol.

It's something I used to use it with my science department, and it's very highly structured and that's why I like it. We're gonna go through just the pieces and components of it and then we'll work through it. Today, I'm the facilitator. So, on the very front page you have the guidelines. So we're going to be respectful of our presenter. [She is reading the guidelines]

Today, we have one, Ms. Wiles==

Coach Shepley: Thank you Ms. Wiles [applause]

Principal Phelps: ==she has volunteered. We'll be respectful of our presenter.

We are going to contribute, so everybody has to contribute.

Umm, be appreciative of my role, although your comments don't offend me, so I'm tough. We're gonna push on through that. My role is also to make sure that the conversations are constructive, so it's not deliberate at what I would have done, it's more of, have you considered, or, I wonder if it would look like if. And then, don't skip the debrief.

In this introduction, the juxtaposition of her stated goals ("provide professional learning to teachers") and her introduction of the CFTP (as a tool that provides structure to the meetings) suggests a framing of the CFTP as a way to support the kind of professional learning that Principal Phelps desires for PLC meetings. Furthermore, she emphasized



that her role was to ensure “constructive” conversations and ask question that elicit new perspectives (“Have you considered?” or “I wonder if ...”). This is an elaboration of the fourth guideline (see Appendix A) and is consistent with how Principal Phelps framed the meeting; such questions can support teachers’ sensemaking of the materials being shared by the presenting teacher (Elliott et al., 2009). By pressing teachers for rationale in this way, a facilitator can elicit statements likely to contain formal concepts and support teachers to make connections between formal and lived concepts (Andrews-Larson, Wilson, & Larbi-Cherif, 2016).

After Principal Phelps’ introductory remarks, Ms. Wiles’ shared her lesson. She started out by *rehearsing* (Horn, 2010) how she would introduce the lesson, asking the teachers a series of IRE-style questions (Cazden, 2001). The teachers played along, providing responses to Ms. Wiles’ questions. After several minutes of this, Principal Phelps interjected and asked Ms. Wiles to state which standards this lesson was intended to address:

Principal Phelps: Ms. Wiles, because we have eight minutes left, because you are going first, I'm going to interject and kind of guide you.

Ms. Wiles: Ok

Principal Phelps: So, can you go over the learning goals of this lesson? Based on the SE, what would be the learning goals?

Ms. Wiles: Learning goals for this lesson is that students are able to convert, using different functions, such as multiplication, adding. They need to be able to do the regrouping, as I mentioned. To be able to do those things, that's one of the

standards, I don't know exactly which one off the top of my head that we're using.

In this exchange, Principal Phelps asked Ms. Wiles to discuss the learning goals for the lesson. Though she has not yet made it explicit, she later clarified her framing by asking the teachers to compare the lesson plans and the standards to see if they “tie in.” Thus, Principal Phelps saw the comparison of stated learning objectives and the presented lesson plan as a central focus of the activity. This is a potentially productive framing because in order to determine whether the lesson plan would be adequate for meeting her stated learning objectives, teachers would have to take lived concepts (represented by Ms. Wiles’ lesson plan) and compare them to formal concepts.

However, as the meeting proceeded, such learning opportunities never developed (recall that the meeting was coded T&T; see Table 2). In providing feedback to Ms. Wiles’, teachers took turns sharing ideas for improving the lesson plan, but those ideas were broadcast monologically and never connected to generalized concepts about what constitutes a high-quality lesson. In the next section, I argue that how Principal Phelps used the CFTP in her facilitation of the meeting forestalled the development of such learning opportunities.

**Focus on facilitation: rigid and flexible adherence.** After Ms. Wiles shared additional details from her lesson plan, Principal Phelps transitioned the workgroup into the next section of the CFTP, which prompts teachers to ask “clarifying questions” (see Figure 2) that will shed additional light on the context of the student work (Blythe, Allen, & Powell, 2015).

Principal Phelps: This next part, we're going to take five minutes for clarifying questions. So in this section, clarify for me what this activity would be. What else would you do for this? Now is your opportunity to ask clarifying question, not judgmental questions, just clarifying. It could be based on the SE and the work that you see or any questions that you have that you need clarity on.

Here, Principal Phelps maintained rigid adherence to the protocol, providing the teachers exactly five minutes for clarifying questions, as outlined in the protocol.

**3. Clarifying Questions (5 minutes)**

- Participants have an opportunity to ask "clarifying" questions in order to get information that may have been omitted in the presentation that they feel would help them to understand the context for the student work. Clarifying questions are matters of "fact."
- The facilitator should be sure to limit the questions to those that are "clarifying," judging which questions more properly belong in the warm/cool feedback section.

Figure 2: Excerpt from the Critical Friends Tuning Protocol

In response, the teachers asked questions that surfaced additional details of the lesson plan. For example, Ms. Okafor asked Ms. Wiles to explain the choice of a particular standard:

Ms. Okafor: Why do we have Standard 2 up there? [Gestures towards white board that has the standards written up]

Coach Shepley: I went into the classroom when she was teaching, and I just took what was on the board for the standards that she had on the board already.

Ms. Wiles: The reason it was like that is that classes have different levels. I have to make sure I cover everybody.

Coach Shepley: But it would work as well because it==

Principal Phelps: You're not the teacher.

Ms. Wiles: It would be appropriate because they do have the units, measuring the time. So when you look at B, you're looking at appropriate units, whether it is hours, or minutes.

Interestingly, Coach Shepley made a bid to offer her own sensemaking of the standards that Ms. Wiles selected. However, Principal Phelps interrupted, insisting that instead Ms. Wiles – the presenting teaching – be the sole responder. This facilitation move is an example of Principal Phelps' *rigid adherence* to the protocol. Seemingly based in her understanding of the CFTP, it limited the OTLs available to the group by preventing multi-party dialogue from developing. Instead, the facilitation move encouraged duologues between Ms. Wiles and her colleagues. Indeed, this characterizes the remainder of this portion of the meeting – the teachers took turns asking clarifying questions, and Ms. Wiles responded to each one. To be sure, Principal Phelps' impulse to limit discourse between the inquiring teacher and Ms. Wiles may accurately reflect the intent of the CFTP, though that intent is not made explicit in the handout provided to teachers and shown in Figure 2. At the same time, rigid adherence to the protocol prevented multi-party dialogue from taking place, thereby limiting teachers' opportunities to learn from their colleagues.

After five minutes of clarifying questions, Principal Phelps moved the workgroup onto the next section of the CFTP. The written protocol passed out to the teachers

indicated that this would consist of 15 minutes dedicated to examination of student work samples, followed by 2 – 3 minutes of individual reflection for teachers to prepare feedback for Ms. Wiles (ALLCAPS are used to indicate prominence/emphasis made by the speaker).

Principal Phelps: Now we are moving on . . . we are going to look at the worksheet, the sample that she gave us, and we're going to do it SILENTLY and INDEPENDENTLY.

Ms. Okafor: How many minutes do we have?

Principal Phelps: We're going to have five minutes.

Coach Shepley: She ain't asking you to work out these problems

Principal Phelps: I'm asking you to look at the work, and decide if it ties in to what the standards are.

In this brief exchange, Principal Phelps gave the teachers directions for the next portion of the meeting, emphasizing that teachers should work individually to examine the student worksheets Ms. Wiles provided as part of her lesson plan. Whereas the CFPT calls for 15 minutes to examine the provided student work, due to time constraints, Principal Phelps limited teachers' time to five minutes. This choice was a means of supporting teachers to get through all parts of the protocol. However, it is a choice that is consequential for teachers' learning, limited the time available for sensemaking. To be fair, Principal Phelps may have deemed the full 15 minutes as unnecessary given the particular lesson that Ms. Wiles presented. However, given her stated goal of modeling how to facilitate the protocol, she has provided a model to future facilitators that

foreshortened teachers' opportunities for sensemaking without making her rationale for the truncation public.

After five minutes, Principal Phelps prompted the teachers to share their feedback. The next 8 minutes of the meeting is dedicated to this talk. First, teachers shared positive feedback, then took turns offering *tips and tricks* (Horn et al., n.d.) for how Ms. Wiles might improve the lesson. This part of the meeting was primarily characterized by monologic turn-taking by teachers. For example, Ms. McNally raised a question about how Ms. Wiles' plans to handle the possibility that students may not have the pre-requisite knowledge necessary to engage in the task:

Ms. McNally:     When you start this lesson and you realize that 80% of your class couldn't tell time or convert minutes to seconds or minutes to hours, do you stop the lesson and go back to teach the lesson what they don't know and then bring the lesson back up? Or do you continue but filter in the parts they don't know about minutes? Because they might not know there's sixty seconds in a minute. Do we go back and start from the basics and build up, or do we continue from here and try to filter in the basics and hope that they can catch it?

Here Ms. McNally raised a question endemic to teaching – what to do when students do not have the necessary prerequisite knowledge. Her question is a potential opening for teachers to make connections between the specifics of this lesson (lived concepts) and deeper principles of teaching (formal concepts). In other words, how teachers take up her concern could lead to concept development – and therefore learning opportunities.

In response, first Ms. Robins, then Ms. Okafor, each offered plausible suggestions for how to handle the situation raised by Ms. McNally. Yet the conversation did develop into collective interpretation because their ideas were never put into conversation with each other:

Ms. Robins: I think that makes sense in the opening, when you're launching the activity, when you're talking about the seasons, you can also assess whether they can tell time, in that portion. You can say, so what time is it right now? So you can see if they can tell time, and then do a mini-lesson on telling time before moving into the full lesson.

Ms. Okafor: I would suggest reference material. The student, for most times, they don't remember it. So if they ask me, "How many days do you have in a year?" I don't know, check your reference material. Because when you're taking your test, I'm not going to be there.

Both Ms. Robins and Ms. Okafor made suggestions for how to respond to students unable to participate in the lesson. Ms. Robins suggested using a brief formative assessment during the introduction to the lesson to determine whether students can tell time and, if necessary, suggested that Ms. Wiles could teach a brief mini-lesson on telling time. Ms. Okafor's response emphasized the use of reference materials (specifically, reference materials that students would also have access to during state testing) as a scaffold for participation. Though not incompatible, their responses can be understood as evidence of differing framings of the problem posed by Ms. McNally. Whereas Ms. Robin's response

indicates a framing of the problem that emphasizes responsiveness to what students know and can do, Ms. Okafor's response reframes the problem as an issue of students' (in)ability to remember. Yet because the two framings were uninterrogated, concepts about teaching remained undeveloped.

During this part of the meeting (last about 8 minutes), Principal Phelps' participation consisted of five turns of talk. In the first, she explained how the feedback portion of the protocol would work. In particular, she noted that because of time constraints, the feedback section would only take six minutes (instead of the allotted 15 in the CFTP). In the second, she interrupted Ms. Okafor to explain that "We're not talking to Ms. Wiles. She's not even here." In fact, Ms. Wiles was in the room, but this was intended to enforce the directions in the CFTP. In the third, she specifically prompted Ms. Logan and Ms. Sanchez to participate, reinforcing her expectation that all teachers would participate. In the fourth, she transitions the teachers from "positive" to "full" feedback and reminds teachers to direct their comments not to Ms. Wiles, but to the group. Finally, in the fifth, she elicits additional comments from the group by asking "Anyone else?" I summarize Principal Phelps participation here to highlight that her talk primarily served to move the workgroup through the protocol (Andrews-Larson et al., 2016).

**Meeting 1 Discussion.** In this section, I have argued that although Principal Phelps deployed a productive framing of the workgroup activity that emphasized professional learning, how she facilitated the CFTP forestalled the possibility of teachers' engaging in sensemaking and therefore limited the development of teachers' OTLs. In one instance, by adhering rigidly to the protocol, Principal Phelps interrupted a



potentially rich discussion when Coach Shepley started to make a connection between the lesson and the standards. In another instance, time constraints and the imperative to get through the protocol reduced the amount of time available for teachers to engage in sensemaking. Given that one of Principal Phelps' goals was in modeling how to use and facilitate the protocol, it might be the case that this goal took primacy over her stated goal of supporting teacher learning in the choices she made as facilitator. Indeed, the data here indicate that she successfully met this goal by modeling how to facilitate the protocol.

Even so, what she modeled – facilitation that emphasizes adherence to and completion of the protocol – did not accomplish her stated goal for the PLC (supporting teachers' learning) in this meeting. Her facilitation suggests an *enforcement orientation* towards facilitation that emphasizes getting through the entire protocol. To the extent that teachers emulate her modeling in future meetings that make use of the CFTP (or other protocols), such modeling is unlikely to support the kinds of professional learning that she emphasized in her introductory remarks.

This analysis highlights the power that facilitators have in shaping learning opportunities; even when workgroup activity is productively framed as a site for teachers' learning and the workgroup uses a protocol designed to support teachers' sensemaking, how the protocol is facilitated can forestall teachers' learning opportunities. Although Principal Phelps explained that her role as facilitator would be to ask questions like "Have you considered ...?" or "I wonder if ...?", these kinds of questions were never asked. Rather, her facilitation focused on moving teachers through the protocol.

## **Overview of Meeting 2: Using a rubric to determine the cognitive demand of a task (CI-FW)**

In this meeting at Lakefront Middle School, Coach Shepley established her goals when she explained that as the school year draws to a close, “the main thing is maintaining rigor in our lessons . . . our goal is to keep the tasks at a higher level.” In order to support this goal, she planned a series of activities, drawn from Smith, Stein, Arbaugh, Brown, and Mossgrove’s (2010) professional development guidebook, in which teachers determined the cognitive demand of various mathematical tasks that might be used in a lesson. First, she had teachers solve two tasks in order to decide which one was high and which one was low. After a brief discussion, she then had the teachers work in pairs to sort a collection of 16 tasks into a “high” pile and a “low” pile. She concluded the activity with a whole-group discussion of how the teachers sorted the tasks. During this discussion, one task, *Task J*, became the topic of intense focus and extensive disagreement. During the discussion around Task J, Coach Shepley used a conceptual tool – in the form of a rubric – to help guide the discussion.

The rubric, shown below in Table 4, makes a four-level distinction between tasks. The lowest two levels do not require students to engage with mathematical concepts or disciplinary practices, whereas the highest two levels do:

Level	Description
“Doing mathematics”	Task requires students to engage in “doing mathematics” – making and testing conjectures, reasoning inductively, constructing and critiquing mathematical arguments, etc.
Procedures with connections to concepts	Task requires students to use/replicate mathematical procedures, algorithms, or formulas and make connections to underlying mathematical concepts
Procedures without connections to concepts	Task requires students to use/replicate mathematical procedures, algorithms, or formulas without making connections to underlying mathematical concepts
Memorization	Task requires students to memorize or recall information



Decreasing cognitive demand

Table 4: Rubric for analyzing the cognitive demand of mathematical tasks

**Focus on framing: How teachers parse cognitive demand.** At the beginning of Meeting 2, Coach Shepley gave the teachers two tasks: “Martha’s Carpeting Task” (see Figure 3) and “Mr. Brown’s Fencing Problem” (see Figure 4). The teachers were directed to take a few minutes to solve the two tasks and discuss with another teacher whether they thought the tasks were “high” or “low”. This activity began without any discussion of any potential criteria on which to decide whether a task is considered high or low. Thus, teachers’ talk provides insight into how teachers, without additional scaffolds, framed the activity of task-sorting.

## Martha’s Carpeting Task

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Martha was recarpeting her bedroom, which was 15 feet long and 10 feet wide. How many square feet of carpeting will she need to purchase?

Figure 3: Martha's Carpeting Task

## Fencing Task

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Ms. Brown’s class will raise rabbits for their spring science fair. They have 24 feet of fencing with which to build a rectangular rabbit pen to keep the rabbits.

1. If Ms. Brown’s students want their rabbits to have as much room as possible, how long would each of the sides of the pen be?
2. How long would each of the sides of the pen be if they had only 16 feet of fencing?
3. How would you go about determining the pen with the most room for any amount of fencing? Organize your work so that someone else who reads it will understand it.

Figure 4: Mr. Brown's Fencing Task

Coach Shepley: Okay, let's, let's look at Martha's Carpeting Task first, that should be quick and simple.

Ms. Jefferson: We said it was comprehension level.

Coach Shepley: Comprehension level. Why comprehension?

Ms. Jefferson: Because it's a little more than knowledge. It's not just asking me what's 15 times 10, but I'm actually having to go pick through the word problem and get the information=

Mr. Greene: Right.

Ms. Jefferson: =to get my answer.

In this exchange, Ms. Jefferson invoked levels from Bloom's Taxonomy (Bloom, 1956) and Mr. Greene gave his assent to Ms. Jefferson's characterization, indicating that "knowledge" and "comprehension" are terms understood by the teachers in the group.

The exchange continues, and the teachers explicitly name Bloom's Taxonomy:

Mr. Greene : It's actually not that bad of a problem, for us.

Ms. Jefferson: But it's lower level. When you look at it on Bloom's Taxonomy.

Coach Shepley: So can we agree that this is a lower level task=

Ms. Jefferson: Yeah it's lower.

Coach Shepley: =Especially lower than the one that's on the other side?

Mr. Greene: Lower than?

Coach Shepley: Lower than the fencing task?

Mr. Greene: Yes ma'am. Yes, very much so.

Coach Shepley: But again like Ms. Jefferson, said, I would classify it as more than “knowledge” because they have to decide that they’re looking for area and they have to decide what shape they’re dealing with and uh what it is that they’re looking for.

In this exchange, Ms. Jefferson, Mr. Greene, and Coach Shepley jointly characterized Martha’s Carpeting Task as a low-level task. In particular, their talk indicates that they see “comprehension” and “knowledge” as lower levels on Bloom’s Taxonomy.

After the teachers discussed “Martha’s Carpeting Task”, they moved on to discuss “Mr. Brown’s Fencing Problem”. This task involves determining the dimensions of a rectangular pen that maximizes area, given a fixed amount of fencing materials (see Figure 4). Coach Shepley started the discussion by asking teachers to explain why this task was higher than Martha’s Carpeting Task:

Coach Shepley: Now looking at Mr. Brown’s fencing problem. What, what was the discussion that went on? What makes this task higher level than the other?

Ms. Jefferson: The last one for sure you have to evaluate.

Mr. Greene: Because it, th==

Mr. Campione: There’s options.

Mr. Greene: ==Yeah there’s options, it’s not really too much of a definite answer, they kind of leave it somewhat ambiguous.

Mr. Campione: Spell that. [laughter]

Mr. Bowman: You have to do a lot of exploring with the problem, it’s not just handed to you, here’s the way you solve it, go for it.

Coach Shepley: Right.

Mr. Bowman: There's a lot of exploring and so, and you can do it any, you can go about in a lot of different ways to come up with an answer.

In this exchange, Coach Shepley asked the teachers to provide justification for why they considered this task higher than Martha's Carpeting Task. Ms. Jefferson responds by once again invoking a category of Bloom's Taxonomy ("evaluate"), but her response is not taken up by the other teachers. Rather, the other workgroup participants jointly constructed an explanation for the tasks "highness" that involves dimensions not accounted for by Bloom's Taxonomy. Mr. Greene and Mr. Campione noted that the task admits "options"; that is, there are multiple ways for the students to solve it. Mr. Bowman added on to this, explaining that, because there is no solution strategy "handed to you", the task requires students to explore, and Coach Shepley gave her agreement.

Together, the workgroup's discussion of these two tasks highlights different framings of the task-sorting activity. On the one hand, teachers employed a framing that invoked various categories of Bloom's Taxonomy – *knowledge*, *comprehension*, *evaluation* – in order to describe the tasks' demands. In this framing, determining cognitive demand is about matching the task to appropriate category of Bloom's Taxonomy, and is often accomplished by identifying or characterizing *key verbs* associated with each category. This is potentially problematic because it is particularly susceptible to mischaracterization. For example, a mathematical task might ask students to *evaluate* an expression (e.g.  $3 \times 2 + 9 \div 3$ ). Employing the key verb heuristic described above, one might characterize this as a high-level task because evaluation is considered to

be a high level in Bloom's Taxonomy. Furthermore, this framing draws on a formal concept of task rigor that is linked to Bloom's – *task rigor depends on the verbs used in the task.*

In contrast, in the discussion of the second task, teachers employed a framing that emphasized how mathematical nature of a task contributes to its cognitive demand. In the case of Mr. Brown's Fencing Task, they noted the extent to which a task admits multiple solution strategies. As Mr. Campione noted, this increases the demand of a task because the solution strategy is not "handed to you"; the task requires students to explore and determine a viable method. In this framing, task sorting involves characterizing the *mathematics* of the task. This framing draws on a lived concept of task rigor linked to teachers' experiences with students - *task rigor depends on whether a solution strategy is provided to students.*

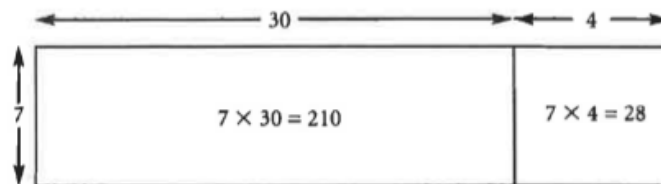
Recall that with respect to concept development, the interplay of (a) formal and lived concepts through (b) multi-party dialogue were central. Thus far in the data, both formal and lived concepts have been voiced in workgroup discussion. Yet the learning opportunities thus far have not emphasized one conception over another. Indeed, as Horn and colleagues (n.d.) note, the categories in their taxonomy of learning opportunities is agnostic with respect to any underlying instructional vision; any concepts developed may not necessarily support ambitious goals for teaching. When multiple, conflicting visions of instruction are voiced in workgroup meetings, transformative learning opportunities (Horn, 2005; Mezirow, 1997) – those likely to support ambitious teaching – can still arise, particularly when workgroups have revisioning routines (Horn & Little, 2010) or are scaffolded into more ambitious forms of participation (Brasel et al., 2016).



**Concept development – discussing Task J.** In the remainder of the meeting, the learning opportunities available to teachers became more transformative in nature. After the teachers discussed the two tasks above, Coach Shepley had the teachers work in pairs to sort a collection of 16 tasks into high- and low-rigor piles. After they sorted the tasks, they teachers compared their piles and discussed disagreements. During this discussion, formal and lived concepts about cognitive demand were pressed into direct contact with each other when Coach Shepley employed a rubric to help mediate the dispute.

**Manipulatives or Tools Available: None**

One method of mentally computing  $7 \times 34$  is illustrated in the diagram below.



Mentally compute these products. Then sketch a diagram that describes your methods for each.

- a)  $27 \times 3$
- b)  $325 \times 4$

Figure 5: Task J - Mentally computing multi-digit products

When the teachers compared their piles, one task teachers disagreed about was Task J (Figure 5). The discussion began with teachers sharing their thinking about Task J. First, Ms. Jefferson argued that the phrase “mentally compute” implies that the task is “just knowledge based”, once again invoking a Bloom’s-based framing of cognitive demand that keys in on the verbs found in the task. Mr. Greene countered and argued that sketching a diagram means the task is “going beyond just multiplying numbers” and

requires students to explain “why these numbers are like this.” Later, Ms. Jefferson recast Mr. Greene’s argument in terms of Bloom’s, noting that the task involved the “creation” of a diagram, referencing the highest level of the revised Bloom’s (Krathwohl, 2002).

After about three minutes of discussion, during which every member of the workgroup participated, Coach Shepley opened the materials from the PD Sourcebook (M. S. Smith et al., 2010) and announced that Task J was high level:

Coach Shepley: J is high level.

Mr. Campione: High level, thank you. Mr. Greene, gotcha, I love it.

Ms. Spengler: They say high level?

Mr. Campione: High level.

Ms. Jefferson: Cause they’re creating something.

Coach Shepley: You have a, uh piece of chalk?

Mr. Greene: Is it high level?

Ms. Jefferson: I guess it’s the creation of the diagrams.

After Coach Shepley announced that Task J is a high-level task, Ms. Jefferson’s initial response was to make sense of the new information in terms of the framing she deployed earlier. That is, she attributed Task J’s high-level status to the “creation of the diagrams” – a reference to Bloom’s Taxonomy. However, Coach Shepley went on to share additional information from the PD sourcebook – formal concepts about the mathematical rigor of tasks – and as the teachers discussed these ideas, there was a reorganization in how they framed cognitive demand:

Coach Shepley: This is what they, this is how they broke it up, they had memorization and pro-, uh procedures without connections as

low level. Then you have procedures with connections and then physically literally doing math as high level.

Mr. Greene: Yeah.

Coach Shepley: So procedures with connections and doing mathematics as high level, memorization and==

Mr. Campione: Check it.

Coach Shepley: ==procedures without connections is lower.

Mr. Bowman: So if you're doing any math, that's high level?

Coach Shepley: Not doing any math,

Mr. Greene: Oh you're doing math and you have connections with your math,

Mr. Bowman: Oh okay.

Coach Shepley: Right. Procedures with connections.

Mr. Bowman: So that makes that high level then.

Ms. Jefferson: So that makes a lot of this stuff like=

Ms. Spengler: Oh because you connect it to the diagram?

Ms. Jefferson: Yeah.

Mr. Greene: Yeah and that and you can even go back and talk about area too.

Ms. Jefferson: So we connected it to something

In this exchange, the introduction of the 'true score' of the task from an authoritative source (the rubric) opens up a discussion about an entirely new framing for cognitive demand that required significant sensemaking from the group. Mr. Bowman immediately

sought clarification of a phrase that – taken at face value – is confusing (“doing mathematics”). Coach Shepley and Mr. Greene clarified, though did so in a way that is problematic, as they collapsed the highest two levels of the rubric when they conflated “doing mathematics” with “procedures with connections”. This left the intended meaning of “doing mathematics” unexplored. Even so, this exchange represents an OTL because of the concepts that are developed: teachers linked generalizable abstractions about teaching (a framing of cognitive demand that emphasizes the mathematics of the task) to specific details of their work (consideration of specific task that could be used to teach the distributive property). In particular, Ms. Jefferson, who was drawing heavily on Bloom’s taxonomy in the prior discussions, recognized and reframed the cognitive demand of Task J in terms of the rubric – “we connected it to something.”

**Focus on facilitation, with and without tools.** In contrast to the facilitation of Principal Phelps, Coach Shepley’s facilitation suggests an orientation towards fostering dialogue and sensemaking in the workgroup. Indeed, Coach Shepley – accomplished herself in ambitious teaching – organized the meeting at Lakefront in a manner similar to the organization of a Launch-Explore-Summarize lesson common to the district’s adopted curriculum – *Connected Mathematics Projects, II* (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1998). She launched the activity by engaging teachers in a comparison of Martha’s Carpeting Task and Mr. Brown’s Fencing Task. This was followed by an “exploration” in which teachers sorted the collection of tasks, and the meeting concluded with a whole-group discussion in which teachers compared their decisions and explained their reasoning. Throughout the majority of the meeting, Coach Shepley facilitated the meeting without the use of any tools. Rather, the activity structure may have been routine

in the sense that it followed a structure familiar to teachers from the district curriculum and professional development.

Furthermore, much of her facilitation focused on pressing teachers to explain their thinking, justify their choices, or provide alternate ideas. This was particularly evident during the “explore” phase of the meeting when teachers were sorting tasks. To take just one example, during this portion of the meeting, Mr. Bowman and Mr. Campione disagreed about how to sort one of the tasks. Coach Shepley listened in to their discussion before joining. When she did, she elicited the teachers’ thinking, asked them to justify their claims, and did not give away the answer:

Coach Shepley: So what did y’all say? Did you agree?

Mr. Bowman: We’re still on low, we’re still on pretty low, cause it’s not.

Coach Shepley: Low?

Mr. Bowman: Yeah we’re still on pretty low.

Mr. Campione: Cause there’s no real calculations. I mean as long as they understand that if it’s straight,

Coach Shepley: Does calculation make it high level?

Mr. Bowman: No.

Mr. Campione: Sometimes.

Coach Shepley: Is that one of your, is that one of the things that you look for in a problem to say that it’s high level or low level?

Mr. Campione: They need to understand what operations and what procedures you need to use.

Coach Shepley: So for them to justify the drops and the rises and those things, would that be low level?

Mr. Campione: They need to under-, yeah they just need to understand==

Mr. Bowman: Nah.

Mr. Campione: ==if it's a straight line then it remains the same and if it drops, cause they need to be able to distinguish between the X axis and the Y axis and the 2 variables.

Coach Shepley: We're gonna see in a second what it is. Let's see where everybody else put it. We'll see where everybody else puts it too in a minute.

This exchange exemplifies Coach Shepley's approach to facilitation in this meeting. Her rhetorical question "Low?" gave the teachers an opportunity to elaborate on why they thought the task was low. When they did, she pressed them ("Is that one of things . . . ?" and "So for them to justify . . .?"), positioning the teachers to revise the justifications they gave for putting the task in the low pile.

It was only at the end of the meeting that Coach Shepley drew on a tool – in the form of a rubric – to settle the teachers' dispute. In this way, the rubric – drawn from the materials not part of the teachers' regular curricular materials – brought new, formal concepts to bear on the conversation, providing additional conceptual resources for teachers' sensemaking.

### **Discussion**

The data here point to two ways of enacting the role of facilitator. On the one hand, Principal Phelps' facilitation of the meeting points to an *enforcement orientation* of

facilitation that seeks to make sure the meeting proceeds according to the dicta of the protocol. The purpose of her talk was primarily concerned with making sure workgroup participants adhere to the norms and procedures of the protocol. At times she elicits additional participation – for example, during the “positives” portion of the feedback, she specifically calls out two individual teachers that had not yet offered any feedback. Yet even this can be interpreted as a matter of norm enforcement, given that she emphasized the norm of participation for all workgroup members.

To be sure, I am not making a general claim about how Principal Phelps always facilitates meetings, or suggesting that such an orientation is a fixed trait. Rather, I am giving a name to a collection of talk moves whose purpose is to orient *the workgroup* towards adherence to the protocol. In this way, to talk about an enforcement orientation is to point to the interactional influence of such discourse.

On the other hand, Coach Shepley’s facilitation points to a *sensemaking orientation* that emphasized productive and constructive conversation. Such an orientation draws on discourse and activity that position teachers as learners. Ironically, Principal Phelps stated at the beginning of the meeting that this was in fact her role: “My role is also to make sure that the conversations are constructive, so it’s not deliberate at what I would have done, it’s more of, have you considered, or, I wonder if it would look like if.” Yet, in this meeting at, her facilitation focused on modeling the *completion* of the protocol while de-emphasizing the *use of* the protocol as an aid in fostering teachers’ sensemaking.

These two orientations are not mutually exclusive. A facilitator can enforce group norms and activity structures while at the same time support the kinds of conversations

that support the development of teachers' learning opportunities. Indeed, one of the promises of using a tool like the CFTP is that some of the enforcement can be offloaded onto the tool, leaving the facilitator to focus on supporting teachers' sensemaking.

To be sure, there are key difference between the tools. Yet I contend that the differences in learning opportunities between the two meetings can be explained primarily by the differences in how the meetings were facilitated. It may be that the CFTP protocol admits an enforcement orientation in a way that the rubric does not. Yet one could imagine – as alluded to in the previous paragraph – a facilitator that uses the CFTP to provide structure while simultaneously using discourse moves that reflect a sensemaking orientation. Alternatively, the rubric employed by Coach Shepley as an aid in fostering sensemaking could also be subject to enforcement if its use was primarily about sorting tasks correctly without a concomitant promotion of teachers' sensemaking.



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## Appendix A: Critical Friends Tuning Protocol

B2, TCT-VMTT-131212-2Chery13Marsha-9Diana



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### Tuning Protocol Guidelines

*This protocol was developed in the field by educators affiliated with NSRF.*

Participation in a structured process of professional collaboration like this can be intimidating and anxiety producing, especially for the teacher presenting student work. Having a shared set of guidelines or norms helps everybody participate in a manner that is respectful as well as conducive to helpful feedback. Below is one set of guidelines; teachers may want to create their own. In any case, the group should go over the guidelines and the schedule before starting the protocol. The facilitator must feel free to remind participants of the guidelines and schedule at any time in the process.

1. **Be respectful of presenters.** By making their work more public, teachers are exposing themselves to kinds of critiques they may not be used to receiving. If inappropriate comments or questions are posed, the facilitator should make sure they are blocked or withdrawn.
2. **Contribute to substantive discourse.** Resist offering only blanket praise or silence. Without thoughtful, probing questions and comments, the presenter will not benefit from the tuning protocol.
3. **Be appreciative of the facilitator's role,** particularly in regard to following the norms and keeping time. A tuning protocol that doesn't allow for all components (presentation, feedback, response, debrief) to be enacted properly will do a disservice to the teacher-presenters and to the participants.
4. **Facilitators need to keep the conversation constructive.** There is a delicate balance between feedback that only strokes and feedback that does damage. It is the facilitator's job to make sure that balance is maintained. At the end of the session, the presenter should be able to revise the work productively on the basis of what was said.
5. **Don't skip the debrief.** It is tempting to move to the next item of business once the feedback section is over. If you do that, the quality of responses will not improve and the presenters will not get increasingly useful kinds of feedback.

Protocols are most powerful and effective when used within an ongoing professional learning community such as a Critical Friends Group® and facilitated by a skilled coach. To learn more about professional learning communities and seminars for new or experienced coaches, please visit the National School Reform Faculty website at [www.nsrharmony.org](http://www.nsrharmony.org).



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## Tuning Protocol

*Developed by Joseph McDonald and David Allen*

### 1. Introduction (5 minutes)

- Facilitator briefly introduces protocol goals, guidelines, and schedule
- Participants briefly introduce themselves (if necessary)

### 2. Presentation (15 minutes)

The presenter has an opportunity to share the context for the student work:

- Information about the students and/or the class — what the students tend to be like, where they are in school, where they are in the year
- Assignment or prompt that generated the student work
- Student learning goals or standards that inform the work
- Samples of student work — photocopies of work, video clips, etc. — with student names removed
- Evaluation format — scoring rubric and/or assessment criteria, etc.
- Focusing question for feedback
- Participants are silent; no questions are entertained at this time.

### 3. Clarifying Questions (5 minutes)

- Participants have an opportunity to ask “clarifying” questions in order to get information that may have been omitted in the presentation that they feel would help them to understand the context for the student work. Clarifying questions are matters of “fact.”
- The facilitator should be sure to limit the questions to those that are “clarifying,” judging which questions more properly belong in the warm/cool feedback section.

### 4. Examination of Student Work Samples (15 minutes)

- Participants look closely at the work, taking notes on where it seems to be in tune with the stated goals, and where there might be a problem. Participants focus particularly on the presenter’s focusing question.
- Presenter is silent; participants do this work silently.

### 5. Pause to reflect on warm and cool feedback (2-3 minutes)

- Participants take a couple of minutes to reflect on what they would like to contribute to the feedback session.
- Presenter is silent; participants do this work silently.

### 6. Warm and Cool Feedback (15 minutes)

- Participants share feedback with each other while the presenter is silent. The feedback generally begins with a few minutes of warm feedback, moves on to a few minutes of cool feedback (sometimes phrased in the form of reflective questions), and then moves back and forth between warm and cool feedback.

Protocols are most powerful and effective when used within an ongoing professional learning community such as a Critical Friends Group® and facilitated by a skilled coach. To learn more about professional learning communities and seminars for new or experienced coaches, please visit the National School Reform Faculty website at [www.nsrharmony.org](http://www.nsrharmony.org).

- Warm feedback may include comments about how the work presented seems to meet the desired goals; cool feedback may include possible “disconnects,” gaps, or problems. Often participants offer ideas or suggestions for strengthening the work presented.
- The facilitator may need to remind participants of the presenter’s focusing question, which should be posted for all to see.
- Presenter is silent and takes notes.

**7. Reflection** (5 minutes)

- Presenter speaks to those comments/questions he or she chooses while participants are silent.
- This is not a time to defend oneself, but is instead a time for the presenter to reflect aloud on those ideas or questions that seemed particularly interesting.
- Facilitator may intervene to focus, clarify, etc.

**8. Debrief** (5 minutes)

- Facilitator-led discussion of this tuning experience.

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