

Supporting Inquiry into Professional Development Facilitation:

The Potential of a Practical Measure of Teachers' Experiences

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This article reports on a study of a mathematics professional development (PD) facilitator's use of a practical measure that elicits teachers' perceptions of key aspects of collaborative PD. The facilitator administered the practical measure in a set of PD sessions with a middle-school math department and debriefed teachers' responses with other accomplished facilitators. Based on qualitative analysis of the debrief conversations we show that the facilitator used the practical measure to engage in conceptual inquiry about her practice, and to set goals and to assess changes in facilitation practice. Further, we specify characteristics of the facilitators' conversational routine that supported conceptual inquiry. The study illustrates the possibility of the practical measure and has implications for fostering facilitators' learning.

Keywords: facilitation; professional development; practical measure

Skillful facilitation of collaborative professional development (PD) focused on ambitious mathematics teaching is complex work (e.g., Prediger et al., 2019; Sztajn et al., 2017). Facilitators must support teachers to engage in authentic inquiry focused on mathematics, students' learning and experiences, mathematics teaching, and relations among these elements (e.g., Lefstein et al., 2020). Further, they must support teachers to deprivatize their practice for collective inquiry (e.g., Little, 2002), view the PD as relevant to their own instructional contexts (e.g., Putnam & Borko, 2000), and see themselves as valued members of the group (e.g., Grossman et al., 2001).

Given these demands, a critical issue for the field, therefore, concerns how facilitators continually learn about and improve their practice (Krainer et al., 2021). An emerging body of research has focused on how facilitators learn to design and lead PD for mathematics teachers (e.g., Borko et al., 2021; Elliott et al., 2009; Seago et al., 2017). As part of these efforts, researchers have developed both professional learning experiences and tools that support facilitators' enactment of particular PD programs. Tools include detailed agendas for workshops and artifacts of teaching to use in a session. However, to our knowledge, few tools currently exist to support facilitators to assess and improve their ongoing facilitation.

In this paper, we focus on how facilitators of collaborative mathematics professional development use a tool intended to support them to engage in inquiry into their facilitation practice. The tool was designed as a *practical measure* and takes the form of a survey that elicits teachers' perceptions of key aspects of the mathematics PD learning environment that prior research has linked to teachers' learning. We explore how one facilitator used the practical measure in a series of PD sessions with a middle-school math department, and how she interpreted teachers' survey responses in collaboration with other accomplished facilitators. As we will show, the facilitators' use

of the practical measure was generative. It supported them to consider how facilitation decisions may have shaped teachers' experiences; to set goals for facilitation practice; and to consider whether deliberate changes to facilitation practice resulted in desired improvements. Further, we specify characteristics of the "conversational routine" (Horn & Little, 2010) with which the facilitators made sense of the resulting data that supported generative inquiry. Exploring this case allowed us to "evoke images of the possible" (Shulman, 1983, p. 495) regarding facilitators' use of the tool for ongoing inquiry into and improvement of their practice.

A Practical Measure of Collaborative Professional Development

A great deal is known about what makes for high-quality professional learning experiences that aim at ambitious and equitable goals for students' mathematics learning (e.g., Cohen & Ball, 2001; Lefstein et al., 2020). However, educators often lack tools and routines to "learn along the way" (Bryk et al., 2015), for example, to understand whether a professional learning strategy is resulting in the intended outcomes, and if not, to prompt inquiry into what might be changed to improve it. In response, practitioners and researchers associated with "improvement research" (Peurach et al., 2022) have found value in *practical measures*, which are specifically crafted to support practitioners in quickly gathering data about processes they want to inquire into and improve (Takahashi et al., 2022).

Key characteristics of practical measures include that "what is being measured is meaningful to its users," administration of the measure and analysis of resulting data is "minimally burdensome," and "data collection and analysis processes are timely" (Takahashi et al., 2022, p. 428). Users administer practical measures as part of inquiry cycles to assess whether deliberate changes to their practice result in desired improvements, and to set goals for their future work. Practical measures differ in

important ways from *research measures*, which are typically used to generate or test theory about the relations between variables and aspects of contexts, and *accountability measures*, which are typically outcome data that are used to identify “exemplary or problematic ... districts, schools, [or] teachers... in order to take some specific action, such as extending a reward or imposing some sanction” (Yeager et al., 2013, p. 9).

In partnership with educators in several school districts pursuing ambitious and equitable goals for students’ learning in secondary mathematics, our team developed a practical measure of collaborative PD that takes the form of a quick teacher-facing survey (3-5 minutes) that elicits teachers’ perceptions of key aspects of the PD session that prior research has linked to teachers’ learning. It is intended to support PD facilitators’ ongoing inquiry into and improvement of their facilitation practice.

Development of the Practical Measure

To develop the practical measure, we first identified aspects of collaborative mathematics PD, described below, that research indicates makes a difference for teachers’ learning opportunities. We then generated initial survey items to assess each aspect. We engaged in 18 iterative cycles of design, analysis, and revision to ensure that the items assessed what they were designed to measure and that they communicated well and were meaningful to teachers and facilitators. In each cycle, researchers observed the PD session and administered the then-current measure to teachers at the end of the session. The research team then conducted cognitive interviews with three to five teachers during which they asked teachers to explain their response choices and probed their interpretations of the items. Researchers shared the resulting data with facilitators to understand their interpretations of the items and whether they perceived the data as helpful for informing their practice. The research team revised the survey based on qualitative analysis of the various forms of data.

Focus of the Practical Measure

Based on a literature review, we identified four key aspects of collaborative mathematics PD that enable teachers to engage in authentic inquiry focused on mathematics, students' learning and experiences, mathematics teaching, and relations among these elements (Cohen & Ball, 2001; Horn, 2020; Lefstein et al., 2020). Table 1 displays each of the aspects and corresponding survey items; we briefly describe each aspect below. (See PMRR, 2021 for further elaboration.)

One key aspect concerns the *discussion practices* of the group (Items 1-4). Engaging in authentic inquiry into teaching and learning requires that teachers feel able to share and revise emergent thinking, press one another for reasoning, and challenge ideas (Lefstein et al., 2020). For example, participants must be able to press one another to elaborate their ideas and the reasoning underlying their contributions (e.g., van Es et al., 2014). Surfacing these for further exploration and discussion can support the group to refine general principles of teaching and learning (Horn et al., 2017). A second key aspect of collaborative PD concerns the extent to which teachers *deprivatize their teaching practice* (Items 5-7). Teachers need opportunities to open their own teaching practice for inquiry and see value in doing so (e.g., Cohen & Ball, 2001; Gibbons et al., 2021). This includes participants explicitly sharing their ongoing questions, dilemmas, and challenges in a group (e.g., Horn & Kane, 2015; Little, 2002), and runs counter to the tendency for teaching to remain a private endeavor. A third aspect concerns whether teachers *experience the PD as relevant* (Items 8-9). It is important that teachers view the PD as possible in their own instructional contexts (e.g., Putnam & Borko, 2000) and that they make commitments to act in their own classrooms (Horn & Kane, 2015). Fourth, for participants to engage in authentic inquiry in a community, they must feel as if they are a *valued member of the group* (Item 10). Otherwise, they are unlikely to open

up about their own practice, or to engage meaningfully with the ideas and experiences of others (Grossman et al., 2001).

Table 1

Practical Measure of Collaborative PD

Key Aspects	Teacher-Facing Survey Items
Discussion practices	<ol style="list-style-type: none"> 1. I feel like I can share a <i>mathematical idea</i> I am unsure about with this group of teachers and leaders. <i>○ Yes ○ No</i> 2. I feel like I can share an <i>idea about teaching</i> I am unsure about with this group of teachers and leaders. <i>○ Yes ○ No</i> 3. I feel like I can ask others to elaborate on an idea with this group of teachers and leaders. <i>○ Yes ○ No</i> 4. I feel like I can push back on an idea with this group of teachers and leaders. <i>○ Yes ○ No</i>
Deprivatization of practice	<ol style="list-style-type: none"> 5. In today's session, I felt like I could share something I'm wondering about my own teaching (examples: a question, a dilemma, a challenge). <i>○ Yes ○ No</i> 6. I would be open to sharing the following with this group of teachers and leaders: (Select all that apply.) <ul style="list-style-type: none"> <input type="checkbox"/> <i>an anecdote about what my students said or did</i> <input type="checkbox"/> <i>an anecdote about something I said or did when teaching</i> <input type="checkbox"/> <i>samples of my students' written work (examples: exit tickets; photos of students' work)</i> <input type="checkbox"/> <i>a math task or activity</i> <input type="checkbox"/> <i>video of my students solving problems</i> <input type="checkbox"/> <i>video of my teaching</i> <input type="checkbox"/> <i>I would not be open to sharing any of the above.</i> 7. I would be open to inviting members of this group of teachers and leaders to join a lesson of mine. <i>○ Yes ○ No</i>
Relevance	<ol style="list-style-type: none"> 8. Today's session was relevant to my work as a teacher. <i>○ Yes ○ No</i> If yes, what did you find relevant? If no, why not? 9. I feel ready to try something I learned today in... <i>○ All of my math classes</i> <i>○ Some of my math classes</i> <i>○ None of my math classes</i> If applicable, what are you planning to try? If applicable, in which classes are you hesitant or not ready to try something, and why?

Using the Practical Measure in Service of Conceptual Inquiry: The Role of Conversational Routines

The practical measure was designed to support facilitators to make sense of teachers' survey responses in service of *conceptual* inquiry into their facilitation practice (Moss, 2016; Murnane et al., 2009). As Moss, Murnane, and others have argued, a conceptual approach to data entails connecting data to one's "own practice and to consider explanations and explore solutions" (Moss, 2016, p. 237) to problems that are signaled in the data. Moss (2016) and Murnane et al. (2009) contrast a conceptual approach the more common instrumental approach to data, in which educators make decisions without first exploring *why* the data are as they are.

In designing the practical measure, we conjectured that engaging in conceptual inquiry would include facilitators using the teachers' responses to, for example, notice variation in teachers' experiences, pose and explore questions about why teachers might have experienced a session in a particular way, and consider how their planning and/or facilitation decisions may have shaped teachers' experiences. Conceptual inquiry would also entail bringing additional data sources (e.g., observations of teachers' participation in a PD session) to bear on making sense of teachers' responses. Grounded in conceptual inquiry, facilitators could generate goals for their future facilitation practice, which they could then gather more information about in a subsequent administration of the measure.

Whereas our intention was to support facilitators' conceptual inquiry into their practice, whether they would is an empirical question. And, as with any tool, the "social

processes and routines of sensemaking” that surround its use – that is, how people actually use the tool and interpret the resulting data – matter just as much as the design of the tool itself (Coburn & Turner, 2011; Takahashi et al., 2022). In this paper, we selected a case in which a facilitator and her colleagues engaged in conceptual inquiry into teachers’ responses, and then analyzed the “*conversational routine*,” or the “patterned and recurrent ways that conversations unfold within a social group” (Horn & Little, 2010. p. 184) that supported their inquiry.

Horn and Little (2010) identified the importance of conversational routines in a comparative analysis of interactions among teachers in two high school academic departments (mathematics and English language arts). In each department, a subset of teachers met voluntarily on a weekly basis for 90 minutes to focus on improving ninth grade instruction, and often identified and discussed “problems of practice.” However, there were distinct differences in the conversational routines the two groups of teachers engaged in, and thus, Horn and Little argue, teachers’ opportunities to learn.

In both groups, it was common for a teacher to share a problem of practice and for their colleagues to offer “*normalizing responses*”, in which teachers expressed that the problem is usual or expected (p. 192). However, Horn and Little (2010) identified a critical difference in what happened after teachers provided normalizing responses. In the mathematics group, teachers tended to engage in a set of “moves” that focused the conversation “toward teaching” as “an object of collective attention” (p. 192), whereas in the English language arts group, teachers would turn away from teaching (e.g., give reassurance and brief advice before moving to other departmental tasks).

Horn and Little (2010) further specified the components of the mathematics group’s generative conversational routine, as well as the “moves,” or “turns of talk” that constituted each component of the routine (p. 184). Upon *normalizing a problem of*

practice, teachers would engage in moves to further *specify the problem*; moves included inviting and offering further detail about the problem. In addition, teachers would *revise the account of the problem*; they would offer conjectures about the source of the problem, and talk was often provisional (p. 195). There was a back and forth between specifying and revising the problem; as a new conjecture was offered, participants invited and offered more detail, and in so doing, often ended up revising the account of the problem.

As teachers in the mathematics group moved back and forth between specifying and revising, they began to make connections to the particulars of an episode of teaching and *generalize* to “principles of teaching” (Horn & Little, 2010, p. 193). The linking between “the particular and the general” provided a “means of developing teaching knowledge that is deeply rooted in the embodied accounts of classroom life” (p. 197). In addition, the group often generated ways of responding to the problem of practice that were grounded in principles of teaching and responsive to the particulars of their classrooms. In Moss’s (2016) and Murnane et al.’s (2009) terms, the conversational routine Horn and Little identified supported the mathematics teachers to engage in sustained *conceptual inquiry* with respect to the problems that were identified. As the teachers specified and revised a problem of practice, they considered multiple explanations for what they observed or experienced, including how their own actions may have resulted in the identified problem. Only after refining their understanding of the problem did teachers generate “solutions.” As we elaborate in what follows, we found that the facilitators’ conversational routine had a very similar character to the routine Horn and Little identified.

Methods

In the 2019-2020 and 2020-2021 school years, facilitators administered the

practical measure in 18 PD sessions across 10 contexts. We focus on the case of how one PD facilitator, Reina, used the measure to inform her ongoing work with a middle-grades mathematics department and ask: *How does a facilitator use a practical measure of collaborative PD to inquire into and make decisions about facilitation practice, in conversation with other accomplished facilitators?* As we indicated earlier, Reina's use was of special interest because she worked for an extended time with a consistent group of teachers, and she was engaging in ongoing professional inquiry with other accomplished facilitators. Therefore, her use allowed us to understand the possibility of the measure – how a facilitator could use the measure in a supportive context.

Research Context

Reina worked for a PD organization that provided ongoing, job-embedded mathematics PD to schools around the USA. Reina had taught secondary mathematics for 28 years and had been an instructional coach for two years. As a coach, she collaborated closely with the PD organization because they provided PD to the teachers in her district. She joined the PD organization as a full-time facilitator in 2019-2020.

The PD organization's leaders, Sally and Alice, aimed for PD to be anchored in research on mathematics teaching and learning as well on teachers' learning, and to be responsive to teachers' needs and interests. Both Sally and Alice had over 10 years of experience as teachers and as PD facilitators (Sally: 15 years; Alice: 23 years). Sally supported facilitators in the field, before, during, and after PD sessions. Alice led the PD organization and collaborated closely with Sally to, in turn, support facilitators. Sally and Alice provided ongoing, structured opportunities for the organization's PD facilitators, including Reina, to develop their facilitation practice.

During 2019-2020 and 2020-2021, Reina facilitated PD for a five-person middle-school mathematics department in the Northwest USA. The teachers'

experience ranged from 15 to 30 years, and they had worked together at the school since 2014-2015. In 2019-2020, the PD focused on orchestrating whole-group mathematics discussions. In 2020-2021, given COVID-19, the five-session PD sequence focused on orchestrating discussions in virtual instruction. In 2020-2021, Reina administered the measure at the end of Sessions Two (March) and Five (May). In each of the five sessions, Reina facilitated the teachers' engagement in a mathematics task, including a discussion of multiple strategies for solving the task. She then focused on supporting teachers to lead whole-group discussions of students' strategies in their virtual classrooms, and teachers met in small groups to plan for an upcoming lesson around the same task they had solved. Sally observed Sessions One and Two in the sequence.

Data Sources

Observations of Focal PD Sessions

Members of our research team attended Sessions Two and Five. Researchers took field notes focused on the structure and content of the PD session, and on the key aspects of collaborative PD the survey was designed to provide information about. They also collected artifacts, including teachers' survey responses.

Debrief Conversations Focused on Teachers' Survey Responses

After both Sessions Two and Five, Reina, Sally, Alice, and members of our research team met virtually to interpret teachers' survey responses. These 60-minute debrief conversations serve as the primary data source for this analysis. Each conversation was video recorded and transcribed. The Session Five debrief involved looking at teachers' survey responses from Session Two and Session Five, side-by-side. Researchers took field notes during these conversations, focused on the group's interpretation of teachers' responses and modifications Reina considered making to the facilitation of future sessions.

Semi-structured Interviews with the Facilitator and PD Organization Leaders

As a secondary data source, we conducted a 60-minute semi-structured interview with Reina two weeks after Session Five to understand her background, facilitation goals, and perspectives on how, if at all, the measure informed her work. We also conducted a 75-minute interview with Sally and Alice one month after Session Five to understand their roles in the PD organization, goals for facilitators' learning, and perspectives on the measure. Both interviews were video recorded and transcribed.

Methods of Analysis of the Debrief Conversations

To prepare the debrief conversation data for analysis, we first demarcated episodes of the debrief conversations according to topic. Given that the conversations were organized by the survey items, we defined episodes, first by the key aspect of collaborative PD being discussed (Table 1) and then by the survey item or, when applicable, a set of items that were discussed simultaneously (e.g., Items 5 and 6).

We then explored our conjecture that the group's conversations afforded conceptual inquiry into facilitation. We began by open coding the data, guided by analytic questions such as: *How does the facilitator make sense of the data (teachers' responses)?* We generated an initial set of codes including codes such as "poses questions about teachers' experiences," "brings additional data to bear," and "connects teachers' experiences to facilitation." We applied these across the episodes. This initial phase of analysis gave us confidence that the facilitators were using the measure in service of conceptual, rather than instrumental, inquiry.

Next, we observed patterns in the moves the facilitators made across episodes and noted substantial resonance with the generative *conversational routine* Horn and Little (2010) identified in supporting teachers' conceptual inquiry. Table 2 displays our final codebook, which includes four components of the conversational routine: (1)

making an aspect of teachers’ experiences focal; (2) specifying and revising a problem of facilitation practice; (3) generating principled change ideas and/or generalization; and (4) assessing change. The table also details connections to the components and moves identified by Horn and Little (2010). (Differences we observed likely relate, in part, to differences in the roles, relationships, and activity in our context and Horn and Little’s context.) With the final codebook, the first and second authors each independently coded three of the 27 episodes of conversation, resulting in almost perfect agreement (0.902 kappa). The first author then coded the entire dataset. We then investigated patterns in enactment of components of the routine. We elaborate and substantiate these components, moves, and patterns in the findings.

Table 2

Generative Conversational Routine Among PD Facilitators

Component of conversational routine	Characteristics of the moves associated with the component(s) of the routine
<i>Making an aspect of teachers’ experiences focal</i>	<ul style="list-style-type: none"> • Participants identify an aspect of teachers’ responses that is of interest • Talk often reflects a tone of curiosity
<i>Specifying and revising a problem of facilitation practice (its nature and possible causes)</i>	<ul style="list-style-type: none"> • Participants offer “conjectures” about the source of the problem (Horn & Little, 2010, p. 195) • Participants invite detail about the problem and/or focal participant offers detail • Talk is often provisional
<i>Generating principled change ideas and/or generalization</i>	<ul style="list-style-type: none"> • Participants generate ways of responding to the problem that are grounded in principles about supporting teacher learning • Participants link “particular instances of practice” to “abstract ideas” about supporting teacher learning (Horn & Little, 2010, p. 200)

*Assessing change*¹

- Participants consider whether a change made in facilitation resulted in intended improvement(s)

Note. The conversational routine above is informed by what Horn and Little (2010) identified as a generative conversational routine in a group of mathematics teachers.

Using the Practical Measure to Engage in Conceptual Inquiry into Facilitation

As we will substantiate in what follows, Reina engaged in conceptual inquiry about her facilitation practice as she interpreted teachers' survey responses with Sally and Alice. Specifically, Reina posed and explored questions about why teachers might have responded to the survey as they did; considered how her planning and facilitation decisions may have shaped teachers' experiences; generated principled ideas for a change for the facilitation of an upcoming session; and considered whether deliberate changes to her facilitation practice resulted in desired improvements. Further, Reina, Sally, and Alice connected the particulars of Reina's practice to principles of facilitation.

In what follows, in the first section, we elaborate the three core components of the conversational routine that characterized Reina, Sally, and Alice's debrief conversations through two episodes (Table 2). In a second section, we use two episodes to illustrate the fourth, additional component of the conversational routine, made possible by administering the survey in multiple sessions. In a final section, we comment on the patterns that characterized the facilitators' enactment of the components of the conversational routine.

Core Components of a Generative Conversational Routine

We illustrate the core components of the conversational routine through two

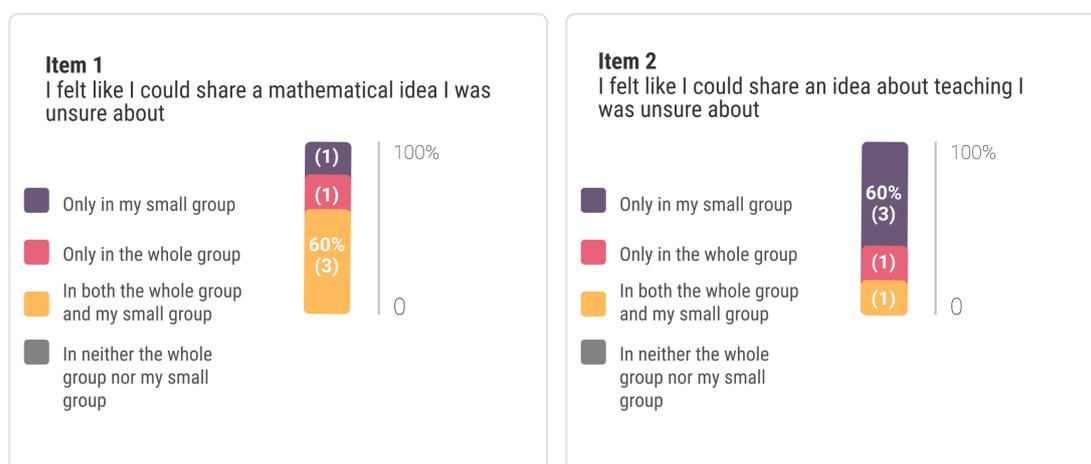
¹ We use a dotted line to indicate that *assessing change* happened only in debrief conversations once the measure had been administered more than once. We refer to the other three components as "core components" of the conversational routine.

representative episodes in which Reina, Sally, and Alice make sense of the teachers' responses in their Session Two debrief. Reina administered the survey at the end of the session, and all six teachers present (the five department members and a student teacher) completed the survey. The next day, Reina, Sally, Alice, and members of our research team met for a debrief conversation.

Episode 1: Inquiring into Teachers' Opportunities to Share About Their Teaching

At the start of the debrief, the group reviewed teachers' responses to Items 1 and 2 (Figure 1), and Sally *made an aspect of teachers' responses focal*. She highlighted that more teachers indicated they could share a *mathematical* idea in both the whole group and their small groups, as compared to sharing ideas about *teaching*: “I think it's interesting that more people said they only wanted to share about teaching in their small group. 60% said they could share [about math] in both whole and small [group], and 60% said they could only share about teaching in their small group.” In identifying an “interesting” difference in teachers' responses, Sally prompted the group's inquiry.

Figure 1
Responses to Items 1 and 2 in Session Two (n = 5)



Note. While six teachers were present, only five responses are included in these representations because of a technical issue with the survey.

Like the teacher group in Horn and Little's (2010) analysis, once an aspect of

teachers' experience was made focal, facilitators then moved back and forth between *specifying* and *revising a problem of facilitation practice*. They posed conjectures about why teachers may have responded as they did. They also filled out the account of the problem by inviting and offering details, for example, about what happened in the PD session or contextual details about the district or school, or teachers' histories.

In response to what Sally made focal, Reina then began to *specify and revise a problem of facilitation practice*, proposing a conjecture about the teachers' responses: "That's good information for me as a facilitator. I need to focus more on giving them that opportunity to reflect publicly on their teaching practice and have those conversations." She implied that she had not given teachers adequate opportunity to share about their own teaching practice in discussions among the whole group. Through this turn of talk, a problem of facilitation practice has now begun to come into view.

Sally then proposed a different conjecture for why teachers responded to the items as they did: "Reina, it makes me think that it is the nature of their more confident thinking about math ideas. ... 'I don't want to share publicly about my teaching, but I feel okay about sharing publicly about math.'" Two conjectures for teachers' responses are now at the center of the conversation – one related to their opportunities to reflect publicly about their teaching practice, and one related to teachers' experiences with sharing in-process mathematical ideas versus ideas about teaching. Sally's contribution served to highlight the complexity of teachers' responses, opening possibilities for inquiry (Mason, 2011). In addition, Sally's insertion appeared to slow the conversation down, prompting Reina and the group to linger a bit longer in their inquiry into why teachers may have responded as they did.

In the next turn of talk, Reina made space for both possible interpretations of teachers' responses: "It may be somewhere in the middle, you know, a combination."

Reina then returned to her initial conjecture regarding teachers' opportunities to share about their own teaching, and began to further specify this conjecture:

I didn't give them enough time to talk about how they were going to ... incorporate [the ideas from the PD] into their practice. [Teachers' responses] could be based a little bit on the time that they were allotted in each of those.

Here Reina contributed additional details related to the session's agenda and the time (or lack thereof) for teachers to make connections from the PD to their own teaching.

Next, Sally added further detail to the problem and in doing so, she linked the particulars of Reina's account to something facilitators "across lots of contexts" might be able to take up in their practice:

When we've got these short chunks of time, do we [frame it] upfront by saying, "Today we're going to spend more time thinking about math ideas and have less time thinking about the instruction. But, next time, maybe we'll have more time to focus on instructional ideas and less time to think about math." That's just good information for us across lots of contexts.

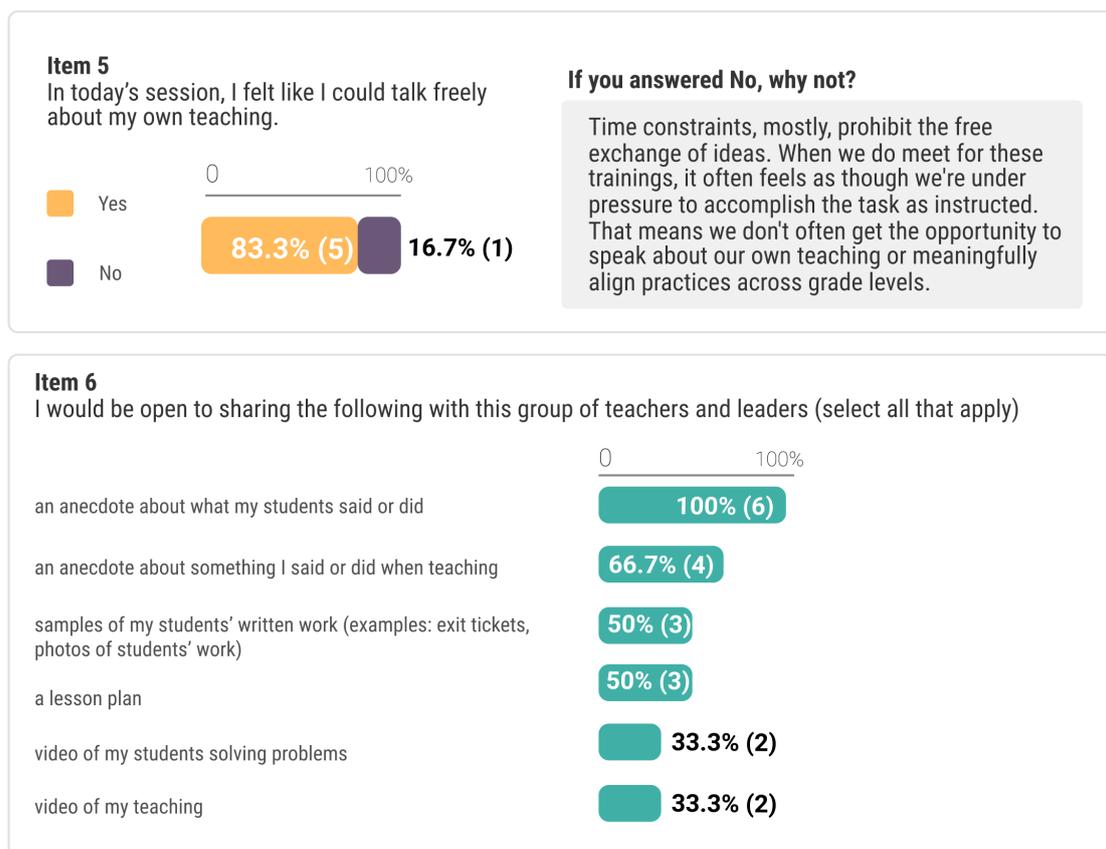
Here, we see the third component of the conversational routine: *generalizing to principles about supporting teacher learning*. Sally linked the specific account of Reina's practice to a more general problem in the PD organization (and perhaps PD in the COVID-19 era more broadly) – the problem of supporting teachers' learning within "short chunks of time." In doing so, Sally implicitly pressed the group to consider the sequence of sessions; that some sessions may dedicate more time to "thinking about math" and others "more time to focus on instructional ideas." And Sally named the importance of framing this differential focus explicitly for teachers.

Episode 2: Clarifying a Change Idea to Support Teachers' Opportunities to Share

About Their Teaching

The group continued to inquire into teachers' opportunities to share about their own teaching, when they turned to teachers' responses to Items 5 and 6 (see Figure 2).

Figure 2
Responses to Items 5 and 6 in Session Two (n = 6)



Note: The language of Item 5 is from an earlier version of the item shown in Table 1.

Again, the facilitators engaged in aspects of the conversational routine. Reina began by *making an additional aspect of teachers' responses focal*, orienting the group to a teacher saying "time constraints" and lack of "opportunity to speak about our own teaching" were why they did not feel they could share about their own teaching in the session. Reina used the teacher's response to triangulate the group's earlier

conversation: “Again, reflecting the time that we have more time for math and with the math task, than reflecting on our teaching.”

Sally again linked from the particulars of Session Two to more abstract ideas about supporting teacher learning, saying, “That is just something for us to think about across all these [PD programs], especially the short sessions. There's this balance. What can we accomplish and what do we need to let go?” She again named the tension in short sessions of determining what is possible given time constraints.

The group had converged at this point on there being less opportunity than necessary for teachers to connect to their own practice. They then looked together at Item 6, in which teachers indicated which artifacts they would be open to share with the group. Their conversation turned toward *how* to support teachers to connect their own practice to the PD sessions. Reina *generated a change idea*: “The focus on the teaching needs to be brought forward, I think. ... It appears to me that the focus is on the math and what students ... do in a certain task, rather than the teacher moves.” Sally made focal half of the group’s willingness to bring student work and offered a *change idea*:

They might not be willing to bring a video [of their teaching] right now. But could we get them to bring some written work as a way to deprivatize [their teaching practice]? Because even though it's *students'* written work, it says a lot about the *instruction* too, just because of the nature of the task.

Reina agreed with Sally’s change idea and offered that asking teachers to “bring in student work” would “put the focus [of the session] ... onto their teaching.” At this point, the back-and-forth between particulars and abstractions had led Reina to consider how she might invite teachers to bring artifacts from their practice to help center teaching in the PD sessions.

Use of the Practical Measure to Assess Change in Facilitation Practice

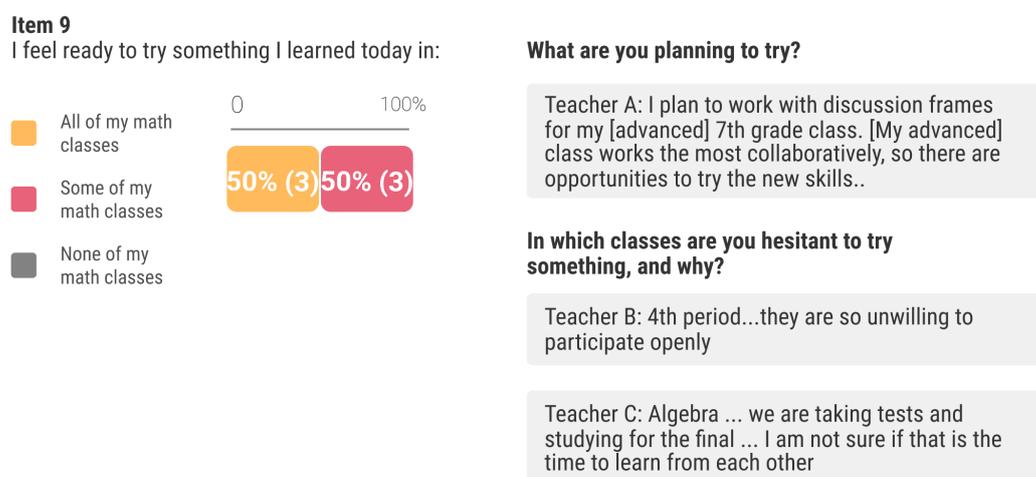
In the episodes above, we illustrated the components of the conversational routine in which the facilitators consistently engaged while interpreting teachers' survey responses. Here, we elaborate an additional use of the survey data made possible when a facilitator administers the survey more than one time in a PD community: to assess whether a change made in facilitation results in the intended improvement(s). To do so, we focus on the group's discussion of teachers' responses to Item 9 in the Sessions Two and Five debriefs. Item 9 provides information about the relevance of a PD session to teachers' own work, especially opportunities to make commitments to act in their own classrooms.

Episode 3: Inquiring into Teachers' Commitments to Act in Their Own Classrooms

In Session Two, Reina had introduced the tool of a "discussion frames," or sentence starters to scaffold students sharing in discussion. She hoped that teachers would commit to using the frames prior to their next session. However, at the end of Session Two, as shown in Figure 3, half the teachers indicated that they felt ready to try something in *some* of their math classes following the PD session. In reviewing teachers' responses to Item 9, Reina focused on several teachers' open-ended responses and said, "that [the use of discussion frames] is not applicable in [all] classes just blows me away, you know?" She then posed a conjecture for teachers' responses related to her facilitation:

Those comments ... are concerning to me, because I apparently haven't pressed that this is good teaching and good teaching happens every day ... it's not something that we pick and choose. ... I need to focus on that with this group – that this is good for all [students]...

Figure 3
Responses to Item 9 in Session Two (n = 6)



Note. All six teachers provided responses to the open-ended prompts. For the sake of space, we included the responses facilitators focused on in their conversation. As evidenced here, Reina’s conjecture for teachers’ responses concerned the extent to which she had supported teachers to connect the PD focus to “good teaching” which “happens every day”, and she identified the beginning of a change idea (“I need to focus on ... this is good for all [students]”).

Reina used teachers’ responses to prompt principled changes in her planning for and facilitation of Sessions Three, Four, and Five. One key change concerned engaging teachers in discussing key excerpts from *Principles to Actions: Ensuring Mathematical Success for All* (NCTM, 2014). In an interview with Reina following Session Five, she described the discussion prompts she had posed to teachers: “What are we doing when we don’t provide deep rich math conversations and we exclude kids from those? What

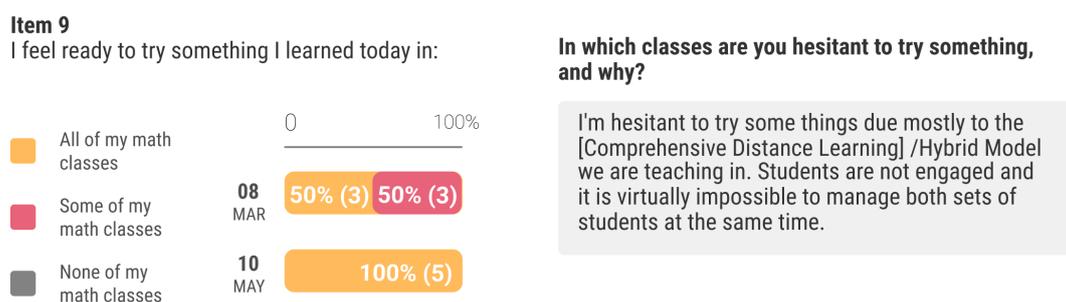
are we doing to their futures as mathematicians?” and how those led to what Reina described as a rich discussion among the group. Another key change concerned a shift in her framing of the mathematical tasks teachers engaged in during the PD sessions, in which she focused on providing access. For example, she described saying the following to the department as she introduced a task:

[This task is] set up in ways that allow students to stop and think privately, share their ideas in a small group, and then come together and share the groups’ ideas or individual ideas out loud. It gives [students] more access and more comfort.

Episode 4: Inquiring into Teachers’ Responses to Assess Changes in Facilitation

Having administered the survey again in Session Five, Reina, Sally, and Alice were then in a position to *assess change* in teachers’ response to Item 9 and consider whether deliberate changes in Reina’s facilitation practice resulted in desired improvements. Figure 4 illustrates the change in teachers’ responses to Item 9 from Session Two to Session Five.

Figure 4
Responses to Item 9 in Sessions Two (08 MAR; n = 6) and Five (10 MAY; n = 5)



Note. All six teachers provided responses to this open-ended prompt. For the sake of space, we included the response facilitators focused on in their conversation.

Seeing that all five teachers indicated they were ready to try something in all their math classes, Reina said, “I’m almost relieved to see that change ... It looks like

we've reached a little more to [teachers] believ[ing] that they will implement this with all students, in all classes.” Reina used the longitudinal data to assess the changes she had made between Sessions Two and Five: engaging teachers in discussion about their responsibility, and carefully framing mathematics tasks as providing access to students. She regarded the shifts in teachers’ responses as indicating that the changes she made to her planning and facilitation of the PD may have contributed to teachers increasingly viewing ambitious instructional practices as appropriate for all their students.²

Reina then made a teacher’s open response focal (Figure 4), one which focused on the challenge of the “hybrid model” of teaching in a classroom in which some students were in person and others participated virtually. Reina again began to specify and revise a problem of facilitation practice:

This has been brought up to me in our sessions numerous times, and I think I tried to press upon at the beginning of [Session Five] that ... we're trying to model how to [facilitate mathematics discussions] in virtual settings. ... I just think with them balancing different groups of students, it's a challenge.

As evidenced in this episode, Reina both appreciates that the survey responses indicate that the deliberate change she made to her facilitation practice appeared to result in desired improvement, and she recognizes that there is still work to do to support the teachers to view what they were learning in the PD as possible to implement.

Patterns in Enacting the Conversational Routine

Having illustrated the facilitators’ conversational routine, we now report on patterns related to enacting the various components of the conversational routine. In most episodes, the facilitator and leaders engaged in each of the three core components,

² Of course, the change in teachers’ responses cannot be taken as evidence that teachers shifted their practice. However, it did suggest to Reina that her efforts to more explicitly highlight issues of access had supported a shift in a desired direction.

making aspects of teachers' responses focal, specifying and revising a problem of facilitation practice, and generating and principled change idea and/or generalization, and in that order. In addition, we investigated who tended to initiate the components. As we comment on further in the Discussion, this is a somewhat uncommon case in that Reina was able to inquire into teachers' responses with other accomplished facilitators; we were curious about the role of the leaders in the conversation.

Reina typically made an aspect of teachers' responses focal (12 of the 19 total instances) and posed the initial conjecture for teachers' responses. When leaders³ posed a conjecture (7 of the 21 total instances), it was often an *additional* conjecture. As an example, recall in Episode 1 that, after Reina had posed a conjecture for the differences in teachers' ability to share in-process ideas about mathematics and about teaching, Sally posed an additional conjecture related to their "confidence" in "talk[ing] about their teaching ideas." As we noted above, these interjections appeared to open possibilities, orienting the conversation toward conceptual inquiry.

Given that Sally, Alice, and the researchers did not observe every PD session, it makes sense that they tended to *invite* detail (Sally and Alice: 6 of 12 instances; researchers 5 of 12 instances). The facilitator most often (29 of the 34 instances) *offered* detail, typically drawing from her knowledge of teachers' histories and experiences, or from her planning or experience of the PD session. When leaders offered detail (4 instances), they described trends across various facilitators' experiences or the organization's broader goals for the PD sequence.

Reina generated most (9 of the 14) *change ideas*, and all of these were specific to her planning a subsequent session with the department. When leaders generated

³ Sally tended to participate in the conversations more than Alice, which made sense given their respective roles in the organization, Sally's being on-the-ground support of facilitators' work.

change ideas, they typically built from a change idea suggested by Reina. Leaders most often (5 of the 6 instances) generalized to principles for supporting teachers' learning, perhaps because of their vantage point in being able to connect across multiple facilitators' experiences and learning. Reina generalized in one instance, connecting what she had identified as a change idea in Episodes 1 and 2 to abstract ideas about teachers' opportunities to make connections between their experiences as learners and their own teaching practice.

Discussion and Conclusion

There is substantial evidence that facilitation of PD is critical to teachers' learning and the quality of the professional community that develops (e.g., Prediger et al., 2019; Sztajn et al., 2017). While there has been growing attention to preparing facilitators (e.g., Borko et al., 2021; Elliott et al., 2009; Krainer et al., 2021), less attention has been paid to how they can be supported to inquire into and learn from their facilitation practice. One contribution of this paper is to illustrate the potential of using the practical measure of collaborative PD to inform facilitation and, by association, the improvement of PD. Using a practical measure is no guarantee that improvement will result (Jackson et al., in press). Our findings underscore that *how* facilitators interpret the resulting data is critical in whether the tool enables learning.

A second contribution of this paper is to show what that conceptual inquiry looked like as it played out in a generative *conversational routine* for facilitators' interpretations of teachers' survey responses. We found that the group consistently *made an aspect of teachers' responses focal; specified and revised a problem of facilitation practice; and generated principled change ideas and/or generalization about supporting teachers' learning*. So, in addition to showing that the practical measure can be used to support conceptual inquiry, this case analysis allowed us to give

“detailed example(s) of *how* [the facilitator’s conceptual inquiry] was organized, developed, and pursued” (Shulman, 1983, p. 495, italics added). This analysis echoes Horn and Little’s (2010) in suggesting the value of attending to conversational routines to understand collaborative interactions, and our study extends their argument to include interactions among facilitators.

Below we discuss features of the design of the measure and the enactment of the conversational routine that appeared to enable the facilitators’ conceptual inquiry. We close by discussing implications for future research and practice.

Key Features of the Design and Use of the Practical Measure of Collaborative PD

On the basis of our analysis, we argue that the use of the practical measure, paired with the conversational routine, enhanced the facilitator’s opportunity to engage in ongoing, conceptual inquiry about facilitation practice. One reason the debrief conversations were especially powerful is because the practical measure oriented the facilitators to focus on those aspects of the PD learning environment that prior research indicates matter for teachers’ learning. Further, the practical measure pointed them to focus on aspects of teachers’ experiences that otherwise might have been invisible to them. For example, as Reina indicated, she may not have been aware that teachers did not see the Session Two PD as possible in all their classrooms, without having administered the survey. In this sense, the practical measure served a “signaling function” for the facilitators by emphasizing the importance of those aspects of the PD learning environment on which survey items focused (Jackson et al., in press).

Further, the conceptual inquiry we witnessed in Reina, Sally, and Alice’s conversations was, in part, a product of *how* they interacted with the tool. Throughout their conversations, the facilitators took a tone of curiosity, especially about teachers’ experiences and potential relations between those experiences and facilitation. When

making an aspect of teachers' experiences focal, they treated teachers' responses as legitimate and as worth learning from. They then inquired into facilitation, specifying and revising the focal problem. In particular, the leaders (Sally and Alice) invited detail and offered alternative conjectures that served to slow down the inquiry, supporting a conceptual rather than an instrumental approach to the data. Whereas we could imagine others might have tried to quickly explain away teachers' responses, the facilitator and leaders dwelled in the particulars; they both invited and offered detail that helped elaborate multiple explanations for teachers' responses. And, as they specified and revised the focal problem, they were then able to explore relations between teachers' experiences of key aspects of the PD learning environment, and decisions the facilitator made in either planning or facilitating the session. In doing so, they made the connections between facilitation practice and teachers' learning visible and available for further inquiry.

We see connections to the literature on generative teacher inquiry. It is well documented that a critical distinction in teachers' inquiry into their teaching concerns whether and how they investigate *relationships* among the three vertices of the instructional triangle: teacher, students, and content (e.g., mathematics) (e.g., Horn, 2020; Kazemi & Franke, 2004; Stein et al., 2021). Similarly, a critical distinction in facilitators' inquiry into their facilitation practice concerns whether and how they investigate the relationships among three vertices of the PD triangle: the facilitator, teachers (as learners), and the PD content (Borko et al., 2021; Prediger et al., 2019).

For example, teachers' survey responses prompted the facilitators to pose and explore questions about a problem of practice the facilitators identified: teachers' (lack of) opportunities to make connections between the mathematics they engaged in together and their own teaching practice. This supported Reina to conjecture about how

the design of the PD session and her facilitation might have contributed to the teachers' difficulty in abstracting from their experiences doing math together in the PD to their own teaching practice. Discussing these connections supported facilitators to generate *principled generalizations about supporting teachers' learning*, for example that teachers need explicit opportunities to “step back” from doing mathematics in a PD session and consider the specifics of the facilitation that shaped their experiences as learners. Thus, the facilitators were focusing on all three vertices of the PD triangle: themselves as facilitators, the teachers as learners, and the PD content. Because of these types of inquiry, the facilitators were in a position to generate *principled* ideas for change and set well-informed goals for future work. For example, Reina considered how she might better support teachers to make connections between their experiences of doing mathematics in the PD community and their own teaching practice.

In this analysis, we have shown *what is possible* as facilitators use a carefully designed practical measure to support their inquiry into facilitation, and we have demonstrated the integral role of the *conversational routine* in supporting conceptual inquiry. We anticipate that Reina's opportunity to engage in conversation about the sessions with other accomplished facilitators shaped the nature of her inquiry. We also anticipate that the facilitators' inquiry-oriented stance toward students, teachers, one another, and the discipline of mathematics shaped the nature of their inquiry.

Implications for Research and Practice

This analysis has implications for future research on facilitators' ongoing learning. First, this analysis suggests that the practical measure and its theoretical underpinnings hold promise for supporting facilitators' inquiry. The practical measure focuses on aspects of collaborative PD that research suggests matter in relation to teachers' learning. Of course, the measure is selective. One omission concerns what we

have termed the “focus of discussions” in PD. Our team has not yet developed reliable survey items that provide information about the extent to which discussions are focused on mathematics; students’ learning and experiences; mathematics teaching; and relations among these elements (e.g., Cohen & Ball, 2001; Horn, 2020). In addition, it is possible that a facilitator might choose to work on an aspect of facilitation not addressed by the practical measure. Despite this, the generative nature of the debrief conversations among Reina, Sally, and Alice suggests that the survey as is – including the aspects of collaborative PD undergirding items and the items themselves – can support meaningful inquiry into facilitation.

Second, we anticipate that the elaboration of a generative conversational routine among facilitators may be of use to others designing professional learning for facilitators, regardless of whether this specific practical measure is used (cf., Brown et al., 2021). Relatedly, our analysis raises questions about the limits of using the practical measure to engage in inquiry about one’s facilitation practice without colleagues who share an inquiry-orientation to the work of facilitation and teaching. We are aware that many facilitators may not have colleagues in their immediate context with whom to make sense of their practice. This analysis suggests the value in creating communities for facilitators to engage in conceptual inquiry about their practice.

We are continuing to investigate the use of the practical measure by PD facilitators in different contexts, and with different opportunities to interpret teachers’ responses. We anticipate that these explorations will support revisions to the practical measure as well as the elaboration of conditions in which the tool is supportive of conceptual inquiry; and will generate further knowledge regarding what enables PD facilitators to learn in and from their facilitation practice on an ongoing basis.

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