Abstract

Improving professional learning for educators is a crucial step in transforming instruction and providing students with rich opportunities to learn mathematics. This study examined an organizational routine, Teacher Time Out, that emerged in a school-wide professional development effort to improve learning opportunities for students in mathematics. The routine is enacted when teachers and school leaders design and enact lessons together with students present, pausing regularly within the lesson to think aloud, share decision-making, and/or determine where to steer instruction. Drawing from a larger data set, we conducted a fine-grained analysis that examined multiple Teacher Time Out episodes from one full day of professional development for elementary mathematics teachers. The findings delineate the potential of the routine to support the learning of educators and the formation of school-wide community. Implications for designing professional learning opportunities that support mathematics teachers to learn collectively about practice in the midst of authentic teaching settings are discussed.

Introduction

Imagine a team of elementary teachers, school leaders, and teacher educators regularly coming together for a daylong, job-embedded professional learning event. They discuss what students need to know about a particular mathematical idea and design an instructional task they believe will support students in learning to reason about mathematics. With plans in hand, they walk into one of their classrooms to try out the lesson together with their students. All of the teachers are responsible for teaching. As the team aims to be responsive to the mathematical ideas that students raise, they will think together, in the moment, about how to steer the lesson and make suggestions for what to do next. Working together, they attend carefully to how students are engaging with each other and the mathematical ideas. All members of the team know they have permission to pause instruction, by taking a Teacher Time Out (TTO), to think aloud together and consider their instructional decisions before continuing with the lesson.

As we will explain, TTOs enable teachers and leaders to take collective responsibility for a lesson, as it unfolds, and give them permission to pause within the lesson to think aloud, share decision-making with one another, and/or determine where to steer instruction. By using TTOs to consider and make changes in the moment, there is less of a need to reflect hypothetically after the fact by asking, “What would have happened if we had just done or said x?”
Instead, TTO interactions shift the focus from one of judgment and evaluation to one of collective consideration and opportunistic experimentation in the midst of teaching mathematics. Through an analysis of a representative lesson in which several TTOs were taken, we aim to contribute to the growing body of research focused on understanding the possibilities for improving mathematics instruction that reside in professional communities and classroom-based learning experiences.

**Cultivating Professional Inquiry and Learning**

In our work with teachers and school leaders, we are interested in generating opportunities for them to plan for and enact practices together while students are present. We desire to support teachers in using insights they acquire while engaging in professional development away from classrooms (where they rely on artifacts like videos of instruction or student work) into practice (where they can respond immediately to students’ thinking). We view the TTO routine to be what Grossman et al. (2009) called a *pedagogy of enactment*, and our analysis contributes to building a literature base for it.

**Toward a Vision for Ambitious Teaching**

Over the past two decades, prominent professional organizations have articulated goals for students’ learning (e.g., Common Core State Standards Initiative, 2010; National Council of Teachers of Mathematics [NCTM], 1989, 2000). These goals emphasize both conceptual understanding and procedural fluency in a range of mathematical domains, the use of multiple representations, mathematical argumentation to communicate mathematical ideas effectively, and productive dispositions toward mathematics (U.S. Department of Education, 2008; Kilpatrick, Swafford, & Findell, 2001; NCTM, 2000). These goals for student learning have implications for what mathematics teachers need to know and be able to do.

To this end, mathematics teachers need to learn to elicit, observe, and interpret student reasoning, language, and arguments, and to adapt tasks and instruction in response to students in order to promote learning (Franke, Kazemi, & Battey, 2007; Kazemi & Stipek 2001; Silver & Smith 1996; Stein, Grover, & Henningsen 1996). Teaching in this way cultivates learning environments where all students can do substantive mathematics and are treated as sense-makers (Lampert et al., 2013). For us, this vision of mathematics teaching and learning sits within and pushes back against everyday experiences of societal and school structures that have typically labeled and sorted children and schools as being capable or not. We aim to give voice to students’ and teachers’ experiences. In our work with teachers and leaders, we want to create schools where children and adults are known and cared for, as well as where they feel invested (Martin, 2009). The work we describe in this article is part of advancing an equity agenda where students’ and teachers’ multiple knowledge bases are seen as assets rather than deficits (Aguirre, Mayfield-Ingram, & Martin, 2013; Turner et al., 2012).

**Math Labs: A Job-Embedded Professional Learning Design**

In a research-practice partnership, we have worked with school leaders to co-develop school-wide professional learning structures, which are informed by the wide body of research on how students learn mathematics, how teachers develop ambitious practices, and how to develop effective institutional support for that development. The professional learning structure highlighted in this article is called math labs, which are either half-day or day-long gatherings of grade-level teams, instructional specialists, and the principal, facilitated by a school-based coach. The aims of the professional development included cultivating a principled vision of ambitious teaching in elementary mathematics with specific tools and practices that could be implemented school-wide to promote teacher and student learning. TTOs emerged within math labs.

There are four parts of a math lab: (1) unpacking ideas about teaching and learning mathematics, (2) co-planning instruction, (3) co-enacting instruction during classroom visits, and (4) reflecting on the enactment, the teachers’ learning, and the planning for future instruction (see Figure 1). In the examples we write about in this article, the mathematics coach and a university-based teacher educator typically co-facilitated the math lab. As the mathematics coach learned the math lab structure, she facilitated the learning experience for teachers on her own. Primed with particular content and student learning ideas, the team engaged in a cycle of collaborative planning, enactment, and reflection around an instructional activity (see Lampert, Beasley, Ghousseini, Kazemi, & Franke, 2010).
Significant and distinctive to the professional learning design were the two classroom visits during the math labs and the ways in which these visits were conducted. By design, classroom visits were exploratory in nature. They gave teachers opportunities to take risks and try out new instructional practices. The visits took place in the classroom of a teacher who was participating in the math lab. The guest substitute teacher would step aside to allow the team to co-enact the lesson.

The visits allowed for the team (i.e., the teachers, specialists, the coach, the principal, and the university facilitator) to engage in joint inquiry around mathematical concepts, student thinking, and particular pedagogies that support students’ learning. During the co-planning before the classroom visit, the team considered the mathematics and focal pedagogical practices that they wished to use to support student learning. During the visit, the team’s role was to bring the lesson to life and to listen closely to student thinking in order to consider how to orchestrate instruction to be productive for students. Because the tone of classroom visits was one of experimentation and playful curiosity about students’ thinking, one team member typically began the lesson and others interjected opportunistically during the lessons. After the first classroom visit, the team debriefed the lesson before making a second visit to a different classroom. After the second visit, another debrief conversation was focused on what the team learned about students’ mathematical ideas and how their instructional practices influenced student learning.

Educators who hear about TTO for the first time often wonder what the impact of TTO is on students and their learning. Although we do not have systematic data to answer this question, we can speak to our experiences over many years and many schools in how students typically respond. We have found that students enjoy the experience of having many teachers listen carefully to their thinking and work together within TTOs to make sense of their thinking. Because the lesson is portrayed as playful, students look forward to classroom visits and look wide-eyed as the team enters the classroom, often counting how many adults have entered the room. Before the lesson begins, the team thanks the students in advance for their assistance on this special day and positions them as the true teachers since they will help teachers learn. Many teachers remark that they appreciate how the TTO positions them as learners and further develops their classroom community as a place where people work together to support each other’s learning. Often, students are curious about what the teachers are talking about and may even have suggestions for teachers on how to proceed: “We think you should do this,” or “Do you want to take a teacher time out?” TTO discussions are relatively short (typically taking anywhere from 8-45 seconds); thus, many teachers have commented about how they do not interfere too much with the pacing of the lesson. Further, students get to see their teachers positioned as learners.

It is this exploratory nature of the classroom visits in the math lab model that makes the purpose and nature of time in classrooms distinct from other professional development models. For example, lesson study (Fernandez, 2002) has a classroom visit component as well. In lesson study, however, when teachers go into classrooms together, the observing teachers do not interject or take turns teaching the lesson. Typically, observing teachers have particular roles that involve circulating among students in order to take notes on various features of the enacted lesson. The purpose of a lesson study visit focuses on the execution of a carefully crafted lesson that has taken a considerable amount of time to research and design in order to consider whether lesson objectives were met, how students engaged and made sense of key ideas, and whether further refinements may be needed. Discussion about refinements happens after, not during, the enactment and is ultimately published for other teachers to use.
In contrast, classroom visits in math labs were intentionally designed to allow educators opportunities, in real time, to experiment with ambitious instruction. In effect, the team members collectively own the lesson they design, trying out different representations and pedagogical moves to elicit and respond to students’ thinking. The lesson plan itself is more loose and flexible and planned in a comparatively short amount of time. All of the educators have the responsibility to enact the lesson together, through eliciting and collectively responding to student thinking. The classroom visit model allows teachers to interject at any time as the team co-engineers the enactment. Participants signal a TTO to ask a question of one another (e.g., “Should I ask x question next or y?” “Is this a good time to try to represent this students’ ideas?”), to pose a question for the students (e.g., “Wait, let’s ask students about . . .”), or to narrate their decision-making (e.g., “I think I’d like to pursue this mathematical idea next with students”).

**Conceptual Framework**

Learning to teach in ways that elicit and respond to students’ mathematical thinking and that centers on learning about the resources that children bring to the classroom from an asset-based perspective is not trivial. Because we are asking teachers to create conditions in their classrooms which they have not typically experienced themselves as students, much of the professional learning literature has repeatedly argued for designing experiences that deprivatize practice and that give teachers ample opportunities to create a new shared vision for this type of teaching practice (Kruse, Louis, & Bryk, 1995).

Educators learning together is important for the improvement of classroom practice. By practice, we mean the work that teachers do in the classroom to engage students in the forms of learning that are valued by the community. This view is in line with how Cook and Brown defined the term practice as “the coordinated activities of individuals and groups in doing their ‘real work’ as it is informed by a particular organizational or group context” (p. 386). Moreover, this view of practice includes the understanding that how one engages in teaching motivates, gives meaning, and shapes identities as particular kinds of teachers (see e.g., Lave & Wenger, 1991).

Professional communities can provide opportunities for educators to develop a common professional discourse that names important aspects of instructional practice and student learning, which is essential for productive discussions about teaching and learning (Ball & Cohen, 1999; Cobb, Zhao, & Dean 2009; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Horn & Little, 2010; Kazemi & Hubbard, 2008). Such communities can provide support for teachers to take the risks necessary to reorganize their instructional practice, as well as result in a greater consistency in instruction and in opportunities for student learning (Horn & Little, 2010).

The literature on organizational improvement indicates that carefully designed organizational routines are an important means to support learning (Sherer & Spillane, 2011). These routines can embody what is valued in an organization. Feldman and Pentland (2003) defined organizational routines as a “repetitive, recognizable pattern of interdependent actions” (p. 311) that teams of people enact as they work together. In our analysis of TTO, we were concerned with understanding how TTO, which became an organizational routine at the school site, enabled teachers to work collectively on learning about teaching and to realize the community’s goals of learning from and with students about their mathematical thinking.

**Method**

The primary purpose of the paper is to present an in-depth analysis of the TTO routine in order to examine the potential of the routine to support learning of educators and the formation of school-wide community. In this analysis, we use an illustrative case in order to examine how the routine opens up instructional practice in a collective learning environment for experimentation.

**Participants and Case Selection**

The school-based professional development was situated in an urban, high-needs school, Hilltop Elementary (all names are pseudonyms). The professional development implementation was the result of a three-year university-school partnership. The data for this analysis came from a larger data set collected across three years. The classroom visit we analyzed came from a math lab that occurred in the project’s second year with a team that included nine participants: three fourth grade teachers, two fifth grade teachers, the school mathematics coach, the school principal, the ELL teacher, and the university mathematics educator acting as a co-facilitator (see Table 1).

This classroom visit was selected to examine the TTOs that were taken by the team, because the routine had already
been established across the school. By this time, the routine was commonly used across all of the different math lab learning events that took place for each grade level across the school, as well as when the coach was in teachers’ classrooms working with them one-on-one. By analyzing an episode after the routine was established, we could understand the routine’s potential for supporting teacher learning and school-wide improvement. For a portion of the participants, this was the 11th math lab in which they had participated spanning across two school years. For teachers, who were new to the school in the fall, this was the fourth math lab they had attended. The principal and coach participated in all math labs; this was approximately their 36th math lab.

Data Sources

The classroom visit was videotaped and lasted 45 minutes. The TTO routine would not serve its purpose if it were not situated within broader aspects of the professional development model – including the collaborative planning, enactment, and debriefing cycle within the structure of math labs, as well as other school-wide activities and norms (e.g., a strong school-wide culture of professional learning and attending to students’ experiences and thinking) (Gibbons, 2017; Gibbons, Kazemi, & Lewis, 2017). Although it is beyond the scope of this paper to account for all of the broader aspects that influenced the learning environment for teachers, we do attempt to situate the TTOs in the larger professional development context by examining: (a) field notes to explore the groups’ co-planning session, (b) field notes to examine the educators’ collective reflection on the classroom visit after enactment, and (c) individual end-of-day written reflections about how TTO supported their thinking and learning. Two university researchers, the first and third authors, were present to collect data.

Data Analysis

Identifying TTO episodes. To generate a description of what constituted a TTO episode, we systematically reviewed the recording of the focal classroom visit to document instances where educators paused instruction. We identified a TTO as a time when instruction was paused so that educators could make sense of and/or act on student thinking, pedagogical decisions, and/or mathematical content. Using this description of TTOs, the four authors agreed that there were six TTO episodes in the selected case. For the sake of space, four TTO episodes will be reviewed in this analysis.

Coding TTO episodes. Like us, Little (2002) was concerned with how to understand the relations among teacher community, teacher development, and the improvement of practice. As a result of her examination of a teacher study group within a high school English department, Little offered a framework for analyzing how teachers’ engagement with one another was related to improvement of their instructional practices. Although our context involved facilitators and elementary teachers, the framework proved useful in our analysis of how the TTO functioned as an organizational routine to support teacher development and professional community for school-wide improvement. The framework attends to the relations among three ways teaching practice is construed in learning opportunities: (a) how practice is represented in teacher interactions, (b) what orientations toward practice participants take, and (c) how norms of interaction around practice come to be organized. Taken together, these three analytic tasks enabled us to show how TTOs created an environment that was organized toward the improvement of practice. Each of the components are described separately in the following paragraphs.

Representations of practice. How does practice come to be known and shared in the public exchanges within TTOs? We attended to what Little (2002) called the face of practice (i.e., what parts of classroom teaching were made visible in TTOs) as well as its transparency (i.e., how completely and specifically teaching decisions became

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<th>Participant</th>
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rendered in TTOs). Examining both the face and transparency of practice enabled us to make visible what aspects of instructional decision-making and moves were resources for teacher learning. Moreover, we examined how those decisions were characterized as “simple or complex, static or dynamic, certain or ambiguous” (p. 934).

**Orientation toward practice.** A second analytic task was to understand what stance teachers were developing toward practice and its improvement by engaging together in TTOs. We asked: (a) how teachers were organized to take up issues of practice, (b) whether the interactions among teachers opened up or closed down particular considerations of practice, and (c) what human and material resources were employed during classroom visits. Engaging these analytic questions enabled us to interpret how TTOs were contributing to a stance of collective learning and how those public interactions broadened participants’ instructional decision-making in relation to students’ thinking.

**Norms of interaction.** Our third analytic task was to unpack the norms that governed TTOs. This meant understanding the typical ways that teachers planned for and conducted classroom visits. We examined how TTOs were initiated and structured, what roles team members assumed within TTOs, what tones and interactional conventions were used during public exchanges, and how team members positioned themselves both physically and socially.

**Additional coding.** Given the difference between our context and Little’s context, we also coded for emergent components or patterns that contributed to our understanding of how TTOs supported learning. We coded the character, tone, and substance of interactions in dialogue and participation. We also coded for how the routine supported leaders (i.e., school-based coaches, principals, and university facilitators) in their work to assist teachers. For each episode, all four authors came to consensus on the codes we assigned and wrote analytic memos to capture whether and how the TTO episode showed potential to support the learning of educators and foster the formation of schoolwide community.

One note for the reader: what will likely not come through in this paper, through the use of transcription, is the ways this routine happens naturally and seamlessly. When people watch video of TTO, they are often surprised at how comfortable and undisruptive the routine seems. It is a challenge to portray the invigorative and fluidity of the routine in a written narrative.

**Findings**

Before we examine the TTOs that were taken by teachers as they co-enacted instruction, it is important that we first situate the lesson enactment within the full math lab event. In the first section below, we examine the collaborative planning portion of the math lab cycle. We then present the four TTO episodes in chronological order. Using our analytic framework, we examine how particular components of practice were conveyed through interactions, how interactions created a stance toward practice, and how educators’ participation was organized through each TTO. Finally, we present a cross-episode analysis, elaborating on the potential of the organizational routine to support collective learning and develop a professional community.

**Context: Planning for the Classroom Visit During the Math Lab**

The math lab analyzed here focused on how children relate decimal quantities and notations to already familiar fractional quantities. This math lab took place during a fifth-grade instructional unit that examined big mathematical ideas about fractions and decimals. Students had just begun work with decimals. The facilitators planned to focus on decimals during the math lab to support teachers’ understanding of how to engage students with this content and to help uncover which conceptions of students about decimals were stable and which needed to be further supported.

For the day’s classroom visits, the facilitator suggested leading the students in counting by tenths, first using fractional notation and then using decimal notation so that students could make connections between the two. This suggestion led the team to adapt an already familiar counting routine used across the school with the students (Turrou, Franke, & Johnson, 2017). The group decided to set the count in a linear context, counting by tenths from 8 to 10 in the context of training for a 10 kilometer run. They hypothesized that a linear context would support students in connecting the notations with the quantity. Further, students could consider how to partition a whole kilometer into ten equal-sized parts (see Figure 2). Using strips of papers to represent one kilometer, the facilitator could represent the tenths between eight kilometers and the finish line (10 kilometers). The team planned to coordinate this quantitative representation with written
(or symbolic) notation, so students could visualize the amount each number represented. Ultimately, the team was interested in how the counting activity could support students in coordinating their understanding of fractions with decimals.

The group nominated the university facilitator to initiate the instructional activity in the first classroom visit. At this point in our research-practice partnership, who led the lessons was more a matter of turn-taking. Typically, the teacher who hosts the visit is not the lead teacher (but can provide teaching support) because it is an opportunity to see their own students in a new way. Early on in the research-practice partnership, the university facilitator volunteered to lead lessons for a number of reasons: to model that it is okay to take risks with one’s teaching, to demonstrate that no one is perfect or an expert, to develop trust in the group by initiating TTOs, and to show that listening to children’s ideas is paramount to the classroom visit. In early enactments, she started the lesson as the lead teacher and the other educators (i.e., the teachers, principal, and coach) played an active role in enacting the lesson. The coach began to use the TTO routine as she worked one-on-one with teachers in their classrooms, changing the nature of her work with teachers to working together throughout the lesson to solving problems of practice together. As teachers and the principal became comfortable with the TTO routine, they volunteered to take the lead teacher role.

It is important to note that the whole team had to collaboratively plan the lesson and understand the mathematical aims and goals of the lesson. Before going into the classroom, the lead teacher rehearsed what she would say and received input from the team around how to launch the count. A central problem of practice, to which the team planned to respond, was how to work with students on understanding how to write the decimal number that comes after 8.9. They anticipated some students would write 8.10 to represent eight and ten-tenths and others would write it as 9.0. This conversation laid the groundwork for what the educators aimed to understand about students’ thinking.

**Focus Classroom Visit**

**Introduction to students.** At 9:45 a.m., just a little over an hour after they began the math lab, the team walked into Amy’s fifth-grade classroom. Amy invited the students to sit on the carpet at the front of the room and the team settled in among them. Many of the students had experienced classroom visits before and were accustomed to adults sitting among them during this time. The university facilitator explained the purpose for the educators’ being in the classroom, setting the stage for both student learning and teacher learning.

Lead Teacher (University Facilitator): Okay everybody, so all the teachers are here with me today because we want to see what you think about this problem. . . . Sometimes teachers think of things that they can try with kids, but they are not exactly sure how it’s gonna go, and they might need to talk to each other. You know how we do Teacher Time Out? [Some children nod and others say ‘yes’] Yeah, this might be a lesson where I am gonna need to do a Teacher Time Out. Or, other people are gonna say, “Wait, wait, wait, I have a great idea.” If you hear other people jumping in, it’s cool, it’s because this is our work. We are getting to play.

In this interaction with the students, the lead teacher explained TTO in a manner that continued to normalize pausing instruction in order to engage in professional interactions. She spoke to the students and to the team in order to nurture the idea that it is okay for her to seek guidance and that anyone could try out an idea they wanted to pursue with the students. When the lead teacher said, “Sometimes teachers . . . are not exactly sure how [the lesson is] gonna go,” she signaled that teaching is a complex practice, and therefore the experience is going to pull on the collective capacity of the educators who will try different instructional ideas or pedagogical moves. This move opened up inquiry into practice by inviting teachers to “jump in” to make critical considerations of teaching practice and underscored that to be inquisitive about how to support students’ understanding is “our work.”
Additionally, by saying, “We get to play,” the lead teacher set the tone that this activity is exploratory and playful. Finally, by saying, “We want to see how you think about this problem,” she positioned students as the teachers. Another common phrase often used with students, “You are our teachers,” communicates to students that educators want to learn from their thinking.

**Launching the problem.** The lead teacher launched the problem about training for a race, explaining that her goal was to eventually run ten kilometers. She explained to students, “Right now I can only run eight kilometers comfortably. In my training . . . [I plan] to run one tenth more of a kilometer each time I run.” She connected this problem context to the linear representation that Amy was creating by placing strips of paper up on the board (see Figure 2), and then she led a discussion about the size one tenth of a kilometer. After the group established that one-tenth is one part of a whole broken into ten equal-sized parts, the lead teacher explained that they would count altogether by one-tenths, starting at eight kilometers.

Students began counting and the lead teacher notated the count using fractional notation. With the accompanying fraction notation (see Figure 2), the lead teacher completed the count from eight to ten and then introduced the idea of writing the same quantities in decimal notation. They recorded the count with decimal notation, the lead teacher intentionally allowing the students to use the more informal way of reading decimals (eight point one) hoping this would raise the focal issue for this lesson. Students said, “Eight point one, eight point two, eight point three.” After they said, “Eight point nine,” some mumbling and confusion followed. Some students said “eight point ten” (for eight and ten-tenths), while others protested that it should be “nine.” The lead teacher asked the students to talk with a partner, “What should I write? Talk to your neighbor [about what I should write].”

When the lead teacher called the students back together, she elicited ideas from multiple students about whether they should write “8.10” or “9.” One girl offered, “Nine in front of the decimal point means that it’s a whole, and if the nine is . . . behind the decimal point, that means it’s a tenth.” As teachers had predicted in their co-planning prior to the classroom visit, this girl shared what she knew about how to read decimal notation by describing what happens to the value of the digit if placed before or after the decimal point.

**Episode 1: How to tie back to fractions.** Wanting to make a transition from the decimal notation to the fractional notation, the lead teacher called a TTO to signal to her team that she sought some input on how to do that. The one-minute exchange unfolded in the following way:

Lead Teacher: Can I do a quick Teacher Time Out?
Students respond: Yeah. [giggling]

Lead Teacher: I am wondering how to tie back to the fraction?

Julie (principal, who is sitting among the students) [to Lead Teacher]: Can I ask them a question?

Lead Teacher: Yes!

Julie: [to students] Can anyone explain your thinking about how you, using decimals, can show the ten-tenths part? That's where everybody went, “Ahhhh!”

Lead Teacher: We got to 8 and ten-tenths.

Julie: So, we got 8 and ten-tenths and then we heard all kinds of answers. Can you write ten-tenths, ten-tenths as a decimal? How do you write ten-tenths as a decimal?

Students: [some students murmur, while some are unsure]

Julie [to the lead teacher]: Should we do a turn and talk?

Lead Teacher [to Julie for a quick clarification]: Is that the question you are asking?

Julie [responding affirmatively and directing a question to students]: How do you write ten-tenths as a decimal?

Lead Teacher [adding a question of her own to students]: What does ten-tenths equal?

[Students then turn and talk to each other with teachers listening in]

As a result of this TTO, students heard two questions to discuss with a partner: how does one write ten-tenths as a decimal and what is it equal to? As students talked with one another, the teachers sitting among students on the rug listened carefully to their sense-making. This question was at the heart of what they were curious about students’ thinking. In this first TTO episode, the lead teacher genuinely sought assistance with generating a question that would help students connect the two notation systems. At this
critical junction, teaching was portrayed as a complex practice that was improved when the collective capacity was pooled to make decisions. Students responded to the TTO call with giggles and a permissive “yes.” This conveyed the curious and playful tone that often accompanied the TTO exchanges.

These interactions were quick and telegraphic. Julie politely asked for permission to ask a question directly to the students, indicating the norm that anyone, including the principal, can jump in and help enact the lesson being developed. The lead teacher did not hesitate and responded enthusiastically, “Yes!” The TTO opened up instances of improvisation for other educators to help identify the right phrasing to support students’ understanding.

These brief interactions demonstrated how the team made aspects of practice visible: teaching entails helping students make sense of certain ideas, and the team does not want to do the thinking for students. By noticing students’ reactions to an earlier question – when they said, “Ahhh” – Julie suggested asking, “How do you write ten-tenths as a decimal?” The lead teacher confirmed Julie’s question, saying to her, “Is that the question you are asking?” In the moment, the lead teacher rephrased the question asking, “What does ten-tenths equal?” Julie’s question, “Should we do a turn and talk?” signaled to team members that this was a time in the lesson to listen closely to how all the students would attempt to answer the question, thus making further instructional decisions dependent on what teachers learn by listening.

**Episode 2: How do you write T-E-N T-E-N-T-H-S?** The second TTO episode, which lasted about 90 seconds, took place right after the students finished talking with their partners about the questions posed by Julie and the lead teacher. The lead teacher initiated a discussion about decimal notation.

Lead Teacher: So, Damien, you had an idea about this? [Julie] said, you have something that might be good for us to hear.

Julie: So my question to everybody was, how do you write ten-tenths as a decimal?

Some students: Ooh! (raising hands)

Lead teacher: And Damien had an idea?

Julie: Damien had an idea.

Saira (fifth grade teacher, who is sitting among students) [to teachers]: Teacher Time Out real quick. Teacher Time Out. Unm the connection, the piece around recording the fraction, the decimal number and the words, T-E-N-T-H-S... Just to clarify Julie’s question first... I know all the kids were seeing different things about what you were asking. So, to use the words T-E-N dash T-E-N-T-H-S. (Looks around at the teachers) Can I spell? (teachers giggle with her).

Saira paused the instruction to raise her concern about whether students were all hearing the spoken words in the same way, that is, whether students were hearing the “-ths” in ten-tenths (or instead hearing ten tens). While she was listening to the turn and talks, she observed that students had interpreted Julie’s question in a few different ways, a clear benefit of having many teachers on the rug with students. Saira’s quick TTO inserted the idea that writing the words ten-tenths on the board might support students’ understanding of what was being said by the educators and other students. Continuing to contribute to the playful tone of these interactions, she too made the group laugh by poking fun at her ability to spell aloud.

This interaction showed how Saira made particular aspects of practice visible: supporting students’ academic language and coordination of the verbal aspect with the symbolic aspect of number. From her place in the room, Saira listened during the students’ turn and talks and heard some students thinking that they were answering a question about ten tens, not ten-tenths. By making her concern public to the team, Saira encouraged the group to pay attention to the role of oral and aural language, helping the group to consider the usefulness of writing out the verbal representation on the board as a public record of the mathematical work. Her use of the TTO emphasized that the team’s role during the classroom visit is to listen to students’ ideas and offer instructional moves that are responsive to those ideas.

After Saira stated her concern, Julie, who was at the front of the room holding the pen, stepped back into teaching mode. She attempted to address what she thought Saira had suggested.

Julie [to students]: So, these are each how much? (pointing to representation) One tenth. And when she ran for ten days, she reached ten-tenths, which is how many kilometers? How many whole kilometers?
Students: One.

Julie: So ten what? Ten-tenths—is that what you're getting at, Saira?

Leslie (fourth grade teacher, who is sitting among students) [to Julie]: I think she wants to see it written. The words. The letters.

Julie [to students]: Ten-tenths is how much she ran in those 10 days. And ten-tenths is written like this. (Julie writes ‘ten-tenths’ on the board)

When Saira voiced her concern, her colleagues worked to understand and enact her suggestion. Because TTO interjections can be brief and somewhat telegraphic, Julie checked with Saira to see if she had taken up her suggestion adequately. Julie's move to check with Saira allowed Leslie, who was listening carefully to make sense of Saira's suggestion, to articulate that Saira wanted to see ten-tenths written on the board. True to all TTO interactions, Saira was positioned by the team as a valuable member whose insights will help the team learn about orienting students to important mathematical ideas. This TTO involved three educators, which helped reinforce the norm that the team is enacting the lesson together.

**Episode 3: Comparing 8.1 to 8.10.** The lead teacher continued the lesson by resolving the problem of which number should come after 8.9 in the count. She asked students how to read 8.9. They agreed it is read, “eight and nine tenths.” Remembering Saira’s concern, she wrote out eight and nine tenths on the board. The lead teacher then said, “So after eight and nine tenths, the next number should be?” There was still some hesitation in the students’ responses. One of the teachers, Leslie, called a TTO.

Leslie [to educators]: Can I Time Out now? To just ask the kids if they [can] make sense between this (walks up to the board and puts a box around the 8.1 at the beginning of the count) and that (puts a box around the 8.10 at the end of the count)

[Students begin excitedly to raise their hands and talk]

Leslie [to students with enthusiasm]: Turn and talk!

[The volume of talk spikes as students immediately start to share their ideas.]

Leslie noticed that students hesitated after the lead teacher asked what number should come after eight and nine tenths. The TTO allowed Leslie to improvise in the moment, offering an idea to orient students toward why it is problematic that 8.10 has been offered as one guess to what comes after 8.9. By walking to the board and using the pen to mark on the number line, Leslie reinforced that the lesson was being co-enacted. Leslie was curious if students would see that 8.1 is equivalent to 8.10, and therefore it is problematic to show up in two different locations on the number line. Through the TTO, Leslie made visible a particular line of questioning that might challenge students’ ideas about notational system and the quantities represented. Sensing students’ willingness to take up her question through many audible “Ohhhs,” the immediate increase in the volume of student talk confirmed Leslie’s decision to direct them to turn and talk.

Later during the debrief, Leslie explained to the team why she asked students to make sense of 8.1 and 8.10 showing up in the count. She wondered why students did not recognize 8.10 despite their potential familiarity with decimal notation within the context of money:

Leslie [to educators during debrief]: I wondered why it was not obvious is this idea that eight point one zero is not the same thing as nine. It cannot be the same thing.

. . . Like if it was money, eight dollars and ten cents is not the same thing as nine dollars.

By later making public the rationale for her decision, she supported the team in understanding why asking about the two numbers might contribute to the discussion and students’ understanding of decimal notation.

We continue the description of the lesson where it left off with Leslie’s turn and talk comparing 8.1 to 8.10, as the lead teacher pulled the students back together. Leslie had resumed her seat among the students.

Lead Teacher: Okay, I am gonna do something here. Just to make sure we all agree and that we actually have established something. After we get to 8 and nine tenths, the next number that I reach is my 9 kilometers. Right? [Students agreeing by nodding or saying “yes”]

. . . So we revised our thinking (crosses out 8.10 in the count). We said that we would write it as nine because we got to eight and ten-tenths. So, is this correct? (points to the nine, students nod in agreement). And is this correct? (points to 8 10/10, students nod in agreement). And then if I write 8.1, that’s where we started.
**TTOs Structure Participation**

Resources for teachers’ development are created in and through interaction, as teachers talk with one another and work together on practice (Little, 2002). In this section, we consider how TTOs helped structure teachers’ participation and interactions with one another.

**Collaborative planning, enactment, and debriefing.** Highly influential in structuring teachers’ participation and interaction was the collaborative planning, enactment, and debriefing of the lesson. Prior to the classroom visit, the team co-planned the lesson. As participants planned their work with students, they attended to a wide variety of aspects of planning for instruction, such as identifying big mathematical ideas, selecting a task, discussing means of mathematical representations, and considering how to support students’ learning of key mathematical ideas. Entering the classroom with the lesson co-planned established the sense that the team co-owned both the lesson and the enactment. Therefore, it became normal and expected that team members would jump in to help enact and adjust the lesson in the moment. The process of engaging in the co-planning, along with having a shared focus on students’ thinking, framed the work of the team to focus on what students were doing and to co-problem solve what should happen next in the lesson. Finally, there were times for formal debriefing about what they had learned about students’ current understandings and their work to support student learning. Members of the team could choose to bring up observations in the moment in order to steer the lesson in particular ways, or they could wait until the debriefing conversation to bring up certain decisions or observations. Several team members narrated the impact of the planning and debriefing, remarking that going into the visit with shared questions shaped the way they “experimented as a group” and that the debrief was “effective because [they shared] a common experience.”

**The importance of classroom visits.** Classroom visits provided open opportunities for assessing students’ current understandings in order to plan for future instruction. When asked to reflect, one teacher described classroom visits as being “a hunt” to comprehend students’ thinking and respond to those understandings in the moment, as well as later when planning for future instruction.

Leslie (during the end-of-day reflection): Today it just felt like a hunt. That we knew that there was some place along the line where [the students] fell off the rails with decimals and we were looking for that spot. Where is it that they’re like, “Oh yeah, that makes sense, that makes sense” and then, “Huh”? And it’s like OH YEAH! THERE IT IS! That’s the spot. So then all of us had a few questions about what do you think about this? And what do you think about that? And my thought was, okay you’ve got 8.1 here and 8.10 here, how can that be? And asking them to explain that distance and how can that be. Asking them to reason their way through it. And it just became so obvious, where the cluster of confusion was, that now we know what to work on.

TTOs gave the team opportunities to make sense of student reasoning and think through instructional decisions as the lesson unfolded.

**Physical arrangement during classroom visits.** With the purpose of eliciting, understanding, and responding to student thinking in mind, the team sat with and among the students on the floor during the classroom visits. Being side-by-side with students enabled team members to listen to students’ thinking and be ready to take up students’ ideas. For example, in Episode 2, because Saira was sitting among students, she assessed that some students needed to see the words ten-tenths written on the board.

Team members were also in close proximity to one another. They talked aloud as a group, freely and, as teachers put it, “fluidly.” It was also typical for team members to turn to one another, whispering about a particular idea. As one teacher described, “I was right next to Saira and we were able to process together. This gave me the opportunity to say aloud what I was thinking, get feedback [from her], and adjust before I decided to share with the whole group.”

**Reasons to call a TTO.** Participation and interactions were structured through the various ways and purposes for calling a TTO. One way included using TTO to pause the lesson and make suggestions to the group for consideration (e.g., Episode 2, writing ten-tenths on the board). The math coach described these moments as, “Like having two conversations going on at once – one [is] the kids making sense of the decimals and the other [is] the teachers having a conversation side by side of them.” Another purpose included using a TTO to press teachers to explain their decisions (e.g., Episode 4). One teacher described this purpose of TTO as allowing her to be “pulled into the angle to see where the other teachers were coming from.”


