

Doing Math Together to Build Community

Molly Rothermel Rawding and Susan Call

Last year, our school began exploring professional learning communities (PLC) as outlined by DuFour (2004, p. 6):

Even the grandest design eventually translates into hard work. The professional learning community model is a grand design—a powerful new way of working together that profoundly affects the practices of schooling. But initiating and sustaining the concept requires hard work. It requires the school staff to focus on learning rather than teaching, work collaboratively on matters related to learning, and hold itself accountable for the kind of results that fuel continual improvement.

In this article, we share our school's journey. The path that we took called for hard work, but the outcomes have been rewarding. Our administration required each

A large crowd of diverse people, seen from an overhead perspective, has gathered to form the number 25. The '2' is a simple vertical shape, and the '5' has a curved top. The people are densely packed within the outline of the number. The background is plain white, and the people's shadows are cast on the ground.

**Two math
coaches share their
experiences of meeting
and working with
professional learning teams.**

grade-level team to assemble for one hour every other week for a math-focused collaborative learning team (CLT) meeting. These meetings had no required structure, so teams did different things during their time together. Some planned detailed lessons; others shared instructional ideas and teaching strategies. About halfway through the school year, district leadership suggested that our school would benefit from following the PLC cycle in more depth and with more fidelity.

As math coaches for our school, we were tasked with supporting each grade-level team through the PLC cycle (see **fig. 1**) to develop an upcoming unit of study. This support would scaffold the teachers in their understanding of the PLC cycle and enable them to use it in subsequent CLT meetings for the rest of the school year. It would also give us an opportunity to build consistency in how teams implemented the PLC cycle. Substitute teachers in the classrooms allowed each team one day for planning the unit and a half-day for data analysis and reflection after teaching the unit. DuFour and his colleagues (2006) wrote that this type of collaboration—

represents a systematic process in which teachers work together interdependently in order to impact their classroom practice in ways that will lead to better results for their students, for their team, and for their school. (p. 2)

We were excited to support teams in making an impact on student learning. We eagerly jumped into the work of the PLC cycle and named these days our *Math Collaboration Days*.

Preparing for “Math Collaboration Days”

As math coaches, we thought that planning a purposeful, streamlined experience was crucial so that teachers’ time away from students would be meaningful and productive. Teachers voiced their apprehensions about time spent out of the classroom, the timing and pacing of the units, and whether their students’ needs would be met with this approach. As we started preparations, we kept these concerns in mind. In preparing for day one, we created a list of desired outcomes and an agenda. We selected rich, research-based learning activities that teachers could consider when planning lessons for the unit. We found examples of multiple-choice and open-ended questions that they could use to assess student understanding of the concepts in the unit (see **fig. 2**). We gathered additional materials, such as copies of our district standards and pacing guides and a basket of math jokes. Two days before the collaboration days, we prepared teachers for the experience by sharing the outcomes and agenda for the first day:

FIGURE 1

After district leaders suggested that school staff would benefit from following the PLC cycle, the authors supported each grade-level team through it in developing a unit of study, scaffolding teachers in understanding it, building consistency, and enabling use of it.

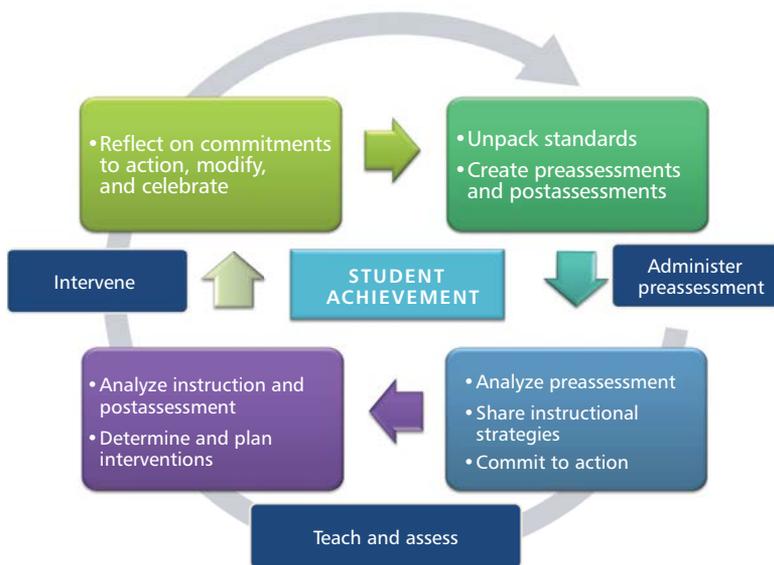


FIGURE 2

Planning a purposeful experience, the authors listed examples of multiple-choice and open-ended questions that teachers could use to assess students’ conceptual understanding.

(a) Second grade—probability

A family has three pets. At least one of the pets is a dog. Draw the pets in the house.

(b) Fifth grade—geometry

The area of the rectangle is 24 square inches. What could the perimeter be?

Outcomes

- Build a deeper mathematical understanding of the big ideas surrounding the unit.
- Explore appropriate resources.
- Plan meaningful instruction.
- Collaborate with grade-level colleagues.

Agenda

1. Frame the learning.
2. Unpack the standards.
3. Do math tasks.
4. Create learning targets.
5. Develop common assessments.
6. Plan daily lessons.

We also distributed various resources for teachers to preview, including the Van de Walle, Karp, and Bay-Williams (2012) textbook as well as other references that incorporate best practices.

Day one

Outcomes of such breadth and depth were a great deal to accomplish in this amount of time. Teachers' experiences during the math collaboration days were the beginning of this iterative process, and the teams continued to collaborate during subsequent team meetings throughout the unit.

Frame the learning

To begin each day, we framed the work by conveying the outcomes, establishing norms for the group, and reviewing the agenda. Our administrators joined us to say a few words about the importance of our work and to voice their beliefs in the power of the PLC cycle. Framing the learning in this way set a professional tone and promoted team spirit. Teachers then selected a math joke out of a basket to share with the team. Two of the teachers' favorite jokes were these: *Why did the obtuse angle go to the beach?* (Because it was over 90 degrees.) *How do you get straight A's?* (Use a ruler.) Although the work ahead was ambitious, the jokes added an element of fun and set a positive tone from the start.

Unpack the standards and create learning targets

Sharing a common understanding of what students must learn ensures clarity and consistency when teachers design learning experiences. We

started building common understanding by examining the big mathematical ideas of the unit. We used Charles's (2005) and Van de Walle, Karp, and Bay-Williams's (2012) research to help us identify those ideas. After discussing the big mathematical ideas, we reviewed our state and district standards. We rewrote the standards in child-friendly language using "I can" statements. For example, "I can organize information into a chart." This process allowed us to clarify our collective understanding as a team, and this work became the foundation for the rest of the unit. One example of gaining clarity as a team occurred when the fourth-grade teachers discussed line graphs and broken-line graphs. After the discussion, teachers had a better understanding of the distinguishing characteristics of line and broken-line graphs.

Do math tasks!

Doing mathematics with teachers was imperative to initiating a conversation about the



Math Collaboration Days were a bi-weekly opportunity to implement the PLC cycle. Substitute teachers took over classroom teaching to give teams a day for planning and a half-day afterward to debrief.



To design effective math tasks for students, teachers had to first do the math. In addition to rich discussions, collaborating in this manner was fun.



Let's chat about building community

We hope to hear that you have been tweeting with your colleagues around the country on the second Wednesday of every month.

On Wednesday, August 10, at 9:00 p.m. EDT, we will discuss this article, "Doing Math Together to Build Community," by Molly Rothermel Rawding and Susan Call (pp. 38–45). Join us at **#tcmchat**.

Unable to participate in the live chat? No worries: We will also Storify the conversation for those who cannot join us live:

Go to http://jstorify.com/TCM_at_NCTM.

mathematics—including big picture ideas of the mathematical content as well as developing how students would make sense of the math. We selected tasks that highlighted the big ideas of the standards being taught in the unit. The tasks we chose were open-ended, engaging, and *fun*! Exploring the tasks in depth led to rich discussions about mathematics and added to the previous discussions during which teachers had unpacked the standards. This was a significant turning point in the process for our teams.

Teachers identified and discussed math concepts, misconceptions, and vocabulary relevant to each task. This part of the collaboration was a pivotal experience because teachers—

- developed a deeper understanding of mathematics;
- determined potential student misconceptions;
- modified tasks to meet the needs of all students; and
- created a list of teacher moves or questions to facilitate the tasks.

Develop common assessments

We were ready to design common assessments. To gain a better understanding of what our students needed to learn, we chose to design our assessment before planning lessons. Teachers received a variety of assessment items that included multiple choice and open-ended questions. Individually, teachers answered each question, looking at it both as a student and as a teacher, identifying and reflecting potential misconceptions that students might have. As a team, we determined which questions would best assess students' understanding of the concepts. From these discussions, we created both formative and summative assessments.

Plan lessons

Once we had determined how long to focus on each of the learning targets for the unit, we were ready to start planning daily lessons. Our conversations from our earlier work on the big ideas and the math tasks set the foundation for the planning, during which teachers matched a learning target with a resource they had

previewed. They had thoughtful conversations about the most appropriate learning experiences for each learning target. They discussed which tasks would have the most impact on student learning, and they thought about how we might modify those tasks to best meet the diverse needs of our students. After planning one week of instruction (which generally took 60–90 minutes), we took a short break. As we came back together to plan week two of the unit, the teachers shared their excitement about the momentum that had developed. By the end of the day, the teachers were mentally exhausted but felt a great sense of accomplishment. Their dedication, hard work, and thoughtful discussions had paid off.

Teacher reflections

Twice during the day, teachers stopped to reflect on the work. At the midday break, teachers completed the first reflection. They selected one word that captured their thinking about the work so far and wrote a sentence or two about why they chose that word (see **table 1**). At the end of the day, teachers used a structure from *The Important Book* (Brown 1977) to reflect on their work (see **fig. 3**).

Teaching the unit

Teachers then taught the lessons that we had collaboratively planned. As the unit progressed, teachers would continue to collaborate, sharing their experiences of what worked and what changes they wanted to make. One classroom teacher shared,

Many of us have had some impromptu, powerful, and thoughtful conversations about what we are teaching. . . . I have had conversations that have helped me gain a better sense and true understanding of what it is I'm teaching (which makes for more powerful instruction).

After completing the unit, teams gathered data in preparation for day two.

Day two—Reflecting on the unit

After teachers had taught the units, we met for a half-day with each team. Our first step was to go through a *data dialogue*.

TABLE 1

At the first of two reflection breaks during the preparation day, teachers stopped to select and explain a word that caught their thinking about the work so far.

Teacher reflections in one word	
Word/phrase	One or two sentences
Exciting	We are moving ahead as a stronger, more prepared team.
Collaborate	We did a great job working through the games and determining modifications that will fit our students.
Constructive	It was helpful to go through the standards and assessments together and hear various thoughts to build and clarify my understanding.
Engaging	We were able to participate in activities that we can do with our students in the classroom. We interacted with each other to collaborate in a respectful and productive way.

FIGURE 3

At the end of the day, teachers used Brown's (1977) structure to record reflections like those below.

Important reflections

The important thing about our work today: We are working through ideas that will come up again.

It is important that we have common vision.

It is important that all continue to share our ideas.

The important thing about our work today: We worked together.

It is important that we had different perspectives.

It is important that we did math together and talked about it.

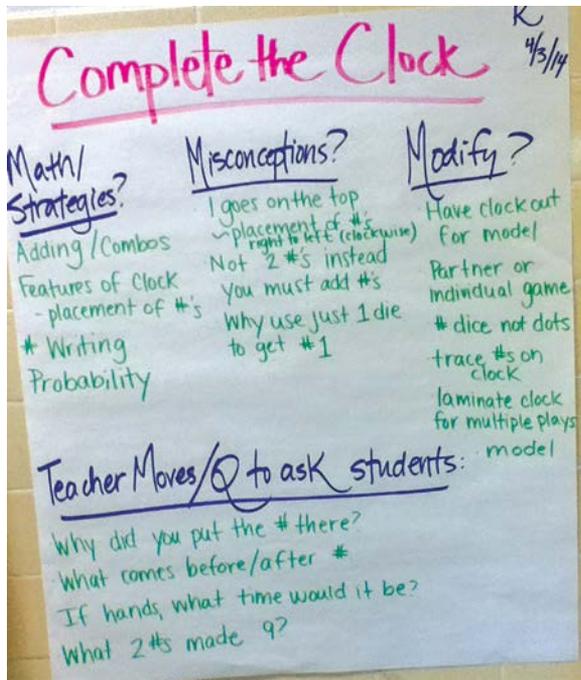
TABLE 2

The second day was a half-day at the end of which teachers wrote their thoughts about the PLC cycle.

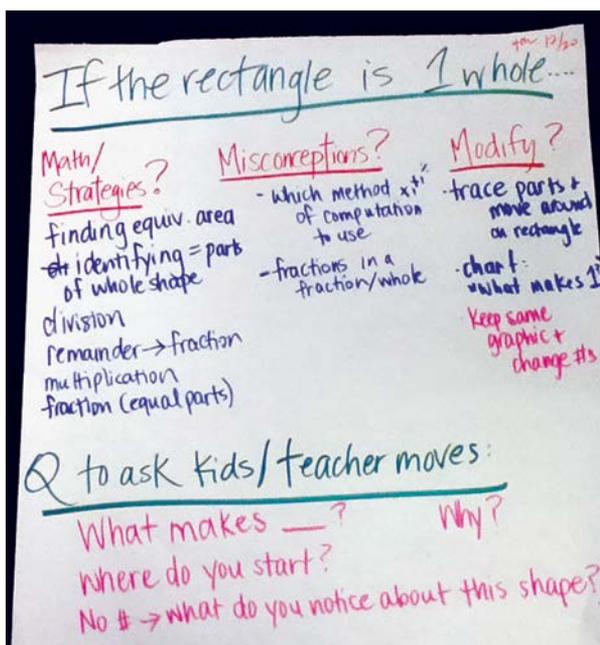
Teacher reflections on the PLC cycle		
What worked	Challenges	Questions
Organization of lesson plans and resources	Common pacing	What did other teams do that was successful?
Powerful conversations before and after lessons	Desire for more specific intervention plans	How do we keep this process meaningful?

The work of a PLC is difficult, and sustaining it takes planning and perseverance.

(a) As teachers reflected on their math and strategies, they used posters to note misconceptions, modifications, and questions.



(b) They also included teacher moves that would support students' development of concepts and meaningful connections.



Data dialogue

A *data dialogue* is a structure for systematically looking at the data (Thompson-Grove 2004). After analyzing data from the common assessments, anecdotal notes, and other sources, the teachers determined next steps for each student. To help us think about interventions based on the data, teachers worked through two more math tasks together with the needs of their students in mind.

Reflection

For the last hour, the team reflected on the PLC cycle. The teachers discussed what worked, where they were challenged, and the questions they still had (see **table 2**).

How do we continue the process?

As DuFour and his colleagues (2006) wrote, using a PLC model is hard work. Continuing and sustaining the work of the teams takes considerable planning and foresight as well as perseverance. All teams were able to complete one cycle for a unit by June of the school year. In the following school year, teams met weekly for 50–60 minutes. During those meetings, teachers spent 10–15 minutes doing a math task together, consistent with the structure initiated in our math collaboration days. As teachers reflected on the math and strategies used, they made note of the misconceptions and modifications needed as well as questions and teacher moves that would support students in developing concepts with confidence and meaningful connections (see **fig. 4**). The shifts in teacher content knowledge and pedagogy were evident in subsequent CLT meetings where teachers discussed how powerful the learning experiences were because of the collaboration that had occurred.

Now as teams plan lessons together, they use rich math tasks to focus instruction on the big ideas of mathematics. Teams focus their CLT meetings on at least one well-planned, high-leverage task rather than on a long list of assorted activities. We want teachers and students to experience mathematics in meaningful ways in which they understand big ideas and know how and why math works. As a PLC, our teams continue to build their collective knowledge of mathematical concepts that students need to learn. When teachers understand

the mathematics content at a deep level, the lessons they plan are more purposeful, focused, and engaging.

Recommendations

As we continue to learn and grow in our roles as math coaches, we support teachers and teams in their quests to enhance student learning and excitement for math. On the basis of our own reflections, we have some recommendations to guide your way as you consider embarking on a similar journey.

- Front load materials and tasks to support teachers as they build collective knowledge.
- Collaborate with someone else during the planning stages (a coach of a different subject area, an administrator, a districtwide support person). Having a fresh set of eyes on an idea can streamline work.
- Be patient with yourself and with teams. Make a realistic goal that is meaningful and will move the team forward.
- Be sure the physical environment encourages communication among the teams. How do the setting and setup promote communication? Are materials accessible? Does the milieu encourage inspiration, thinking, and creativity?
- Focus on opportunities and potential. Be solution-centered. When questions arise about something that is out of your control, make a note to follow up with that person outside the meeting time.
- Do rich math tasks with teachers! This is imperative for engaging the teachers as well as building a common understanding about what students must know and be able to do.

REFERENCES

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Following the PLC model is challenging, but teachers agreed that the payoff is worth it. The instructional units developed by our teams are purposeful, focused, and engaging.

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