Innovations in Improving Mathematics Instruction: One School's Story of Implementing Job-Embedded School-wide Professional Development

How do we build strong school-wide professional communities, especially in high-poverty schools where there is enormous pressure to better serve students and improve their educational outcomes? We know that teachers and students benefit from strong school cultures that de-privatize practice and bring principals, coaches, and teams of teachers together to build a collective vision of high quality instruction (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). The challenges in a high-poverty, consistently underperforming school seem daunting. Our story shows how a collaboration among researchers, teachers, and leaders can harness the power of teacher community and improve the rigor and quality of students' classroom experiences in mathematics.

The Lakeridge Story

In 2011 Lakeridge Elementary was identified as a bottom 5% school among all state Title 1 schools with persistently low scores on state summative assessments and was mandated to apply for a *School Improvement Grant*. The staff agreed to a transformation model and a rigorous, research-based, job-embedded professional development model. The plan to transform teaching and learning focused in large part on developing a school-wide vision of high quality mathematics instruction. Our collaboration began to realize this vision.

The school-wide professional development model we designed has three important components:

1. A principled vision of high quality or ambitious teaching with specific tools

and practices that all teachers in the school community could begin to use with their students and that promote teacher and student learning.

2. Job-embedded math labs that allow grade-level teams, the principal, and school coaches to learn to use instructional practices and make practice public.
3. Leadership that supports and presses for teacher collaboration and experimentation.

This model is informed by the work of a network of university teacher educators at UCLA, University of Michigan, and University of Washington (Lampert et al., in press). We will describe the professional development model underway at Lakeridge and share our various perspectives, telling the story of how we are collectively deepening our understanding of teaching and learning mathematics.

Developing a School-wide Vision through Principles and Practices

Our model is centered on the development of a school-wide principled view of ambitious teaching that is aligned with structured opportunities for learners to participate in meaningful disciplinary learning as articulated in the Common Core State Standards (CCSS). The vision of mathematical proficiency in the CCSS entails structuring opportunities for learners to reason about key subject matter ideas, participate in discourses of the discipline, solve authentic problems, and develop identities as competent learners. Ambitious teaching requires practices that allow teachers to build students' proficiency by engaging deeply with students' mathematical thinking, supporting meaningful participation and learning for the broad

range of students in any classroom, and disrupting longstanding assumptions about who can do mathematics (Kazemi, Lampert, & Franke, 2009).

Our work rests on shared ***principles for teaching***. For example, we believe children are sensemakers and there is logic in their ideas. Ambitious instruction requires clear instructional goals. Our work is also guided by ***principles for growing in teaching.*** For example, we believe teaching is intellectual work that requires specialized knowledge. Also, teaching is something that can be learned through repeated opportunities to practice, and there is value in making your practice public.

Our model focuses on a well developed, research-based suite of ***practices*** in mathematics. Specifically, all teachers learn a core set of "instructional activities" (Lampert, Beasley, Ghousseini, Kazemi, & Franke, 2010) and a set of discourse moves (Chapin, O'Connor, & Anderson, 2009). The activities are central to the work of teaching and can be used routinely across grade levels, they have the potential to improve student achievement, and they enable us to pay attention to student thinking and engage in ambitious teaching practices in ways that support our daily work as teachers.

As we reflect on the role of principles, two salient themes emerge: the significance of clear instructional goals and the impact of making our practice public. Ms. Simpson, intermediate teacher, describes studying instructional goals, "This past year my thinking has shifted 180 degrees from thinking about the activities dictated by the curriculum to the learning objectives. I began to evaluate activities and whether or not they get us to our instructional goals." The building mathematics coach, Ms. Lind, adds, "We start with the big ideas of the unit. Everything we do must serve the big

idea and the students or it is out." Mr. Crandall, primary teacher, says, "We think carefully about choosing our lessons, instead of having them chosen for us." The principal, Ms. Calabrese, adds, "The conversations now are about what and how to teach and it has to match our larger purpose, our goal."

The impact of making practice public is also significant. Ms. Simpson laughs, "It's nerve-wracking at first. Most of us would rather teach a room of children than a small group of peers. We were being asked to think and teach in ways we hadn't done before and we were doing it in front of each other! It works to our advantage because no one can be considered an expert; we know we are all learners." Mr. Crandall adds, "It has changed the culture of our school and how teachers view themselves. As opposed to just leading my class, it's about being an intellectual member of a community. Now it's a rare day that someone is not in my room. It has changed everything."

Coaching and Support

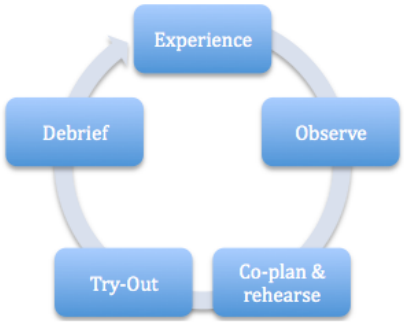
To deepen our principled vision and learn how to take up and innovate with the practices, we engage in collective professional learning through "math labs" and "participatory coaching."

Math Labs

Every month teachers are released from their classes in grade-level bands (K-1, 2-3, 4-5) to participate in a Math Lab. During each lab, we engage in a cycle of co-planning, co-teaching, and reflection. A typical lab begins with observing an instructional activity modeled by a coach or university facilitator in a classroom. Next, we co-plan and rehearse the activity with colleagues and facilitator support and visit a

classroom again to retry the activity. After that, we reflect on the experience, often watching video captured during our lessons, and finally engage in collective planning for next steps in teachers' own classrooms.

Figure 1: The Math Lab Cycle



Our goals for labs are to increase teacher capacity in both instructional practices and content knowledge; provide opportunities for teachers to try, practice, and reflect on specific instructional activities; and provide coaching and feedback. "We are trying to learn theory, change practice, adjust, all while teaching publicly with our colleagues. We do it all in one day! You can say, 'I learned it, I practiced it, I tried it, and I adjusted it.' By the next day you're trying it with your students," describes Ms. Calabrese as she sums up the power of the cycle.

Teachers place an emphasis on the co-planning and debriefing portion of the cycle. Mr. Crandall explains, "I especially appreciate when our coach teaches first. It is powerful hearing her talk about what she plans to do. Then, we watch her teach and we come back to hear her reflect on what she thought about during the lesson. That conversation changes how we teach the lesson the next day in our classrooms."

Participatory Coaching

In between labs, the coaches and university facilitators visit classrooms weekly to understand the meaning teachers are making of their lab experiences and to inform the planning of future labs. Through "participatory coaching," the instructional team supports teachers in enacting the practices in their classroom by modeling or co-teaching.

Especially helpful is in-the-moment support, specifically "teacher time outs." It is common during coaching for a teacher to pause, tell students s/he needs help, and ask others to think aloud about what should happen next. You may want help understanding a mathematical idea, how to represent a student's strategy, or where to go next in order to work toward your mathematical goal. You may want to revise something you just did and want help thinking about how to do it differently. Ms. Lewis, a math coach, notices, "This highlights the decisions teachers face - things that typically go un-discussed because we rarely have opportunities for in-the-moment discussion with colleagues." Mr. Crandall adds, "It is a risk to show your class you're not a perfect instructor. It's important to show students that taking risks pays off and we are all learners all the time." Ms. Simpson elaborates, "We are doing what we ask students to do. To know it's okay to make mistakes in front of others. This puts us all in the mind-set of asking for help."

Reflecting on coaching and support, Ms. Simpson says, "The person I want to be for my students is the person my coaches are for me. From helping me plan and see the road I'm suppose to be on, to talking me off the cliff when I'm ready to give up, they help me believe I can do what I'm doing. They also show me how to do it. They make me feel competent and smart." Mr. Crandall adds, "It is kind of sneaky because

even the work coaches do, they make me feel like I did it! I can't put my finger on all the ways coaching profoundly supports my teaching." Ms. Lind, our coach, humbly listens and replies saying,

> It is amazing to think about how far we've come in a short time. What has happened here in the last year, the way we've changed classroom practice, is truly remarkable. All of the interlinked pieces, leadership, pressure with support, math labs, the expertise of the university facilitators, making practice public which requires humility and trust… without any of these pieces, this wouldn't be happening.

She affirms there was a steep learning curve for her as well, and she thinks carefully as a coach about how to balance being a leader and a learner at the same time.

Her point is well taken. All of us, whatever our role, from teacher, student, coach, university facilitators and principal, find ourselves being leaders and learners who must be vulnerable, deeply challenged, and learning ambitiously. Ms. Calabrese, who participates in all of the labs alongside her teachers, laughs, "Everyone knows I didn't get it the first time! People see me persevere to get things. I'm empathetic to teachers and students who are also on this trajectory." Her commitment to the labs demonstrates how much she values our learning together. She chose this time of learning over other priorities and her leadership that supports and presses teachers to take up new practices cannot be underscored enough.

What we are Finding

The model appears to be working with promising results. As many of our own perspectives shared throughout this article indicate, the culture of the school has

changed. Assessments of student learning show strong growth, and classroom visits show a high level of engagement and identification with doing mathematics. End of Year One summative tests showed a 15% to 25% jump in scores in 4th and 5th grade. According to Office of the Superintendent of Public Instruction (OSPI) math benchmark tests, students at Lakeridge are making significant and steady gains as they are approaching, reaching, or exceeding the district average in all grade levels. Our own project-made assessments also show significant gains in student accuracy and strategy use across all grades.

Discussion

Our work together at Lakeridge centers on improving instruction through a school-embedded professional development model. Our model includes key components of effective professional development, such as a focus on children's mathematical thinking, protocols for the use of cognitively demanding tasks, which we call instructional activities, and the discourse needed to support learning with and from those tasks (Ball & Cohen, 1999; Stein, Engle, Smith, & Hughes, 2008). Our model is helping address significant issues in improving teaching and learning; for example, teaching has become a public practice as we cultivate professional learning at the school level and situate teachers' instructional practices within the institutional setting of the schools in which they work (Cobb, McClain, de Silva Lamberg, & Dean, 2003; Little, 1999; Kazemi, 2008). With specific practices for collective professional development and a shared principled view of ambitious teaching, we are seeing meaningful shifts in teachers' practices and students' learning. Together we are developing our identities as competent learners as we engage with students'

mathematical thinking and view students from an assets-based perspective (Delpit, 2012). We do not believe that any one of us has all the answers. We believe that we have to build more detailed visions of ambitious teaching through our work together.

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