

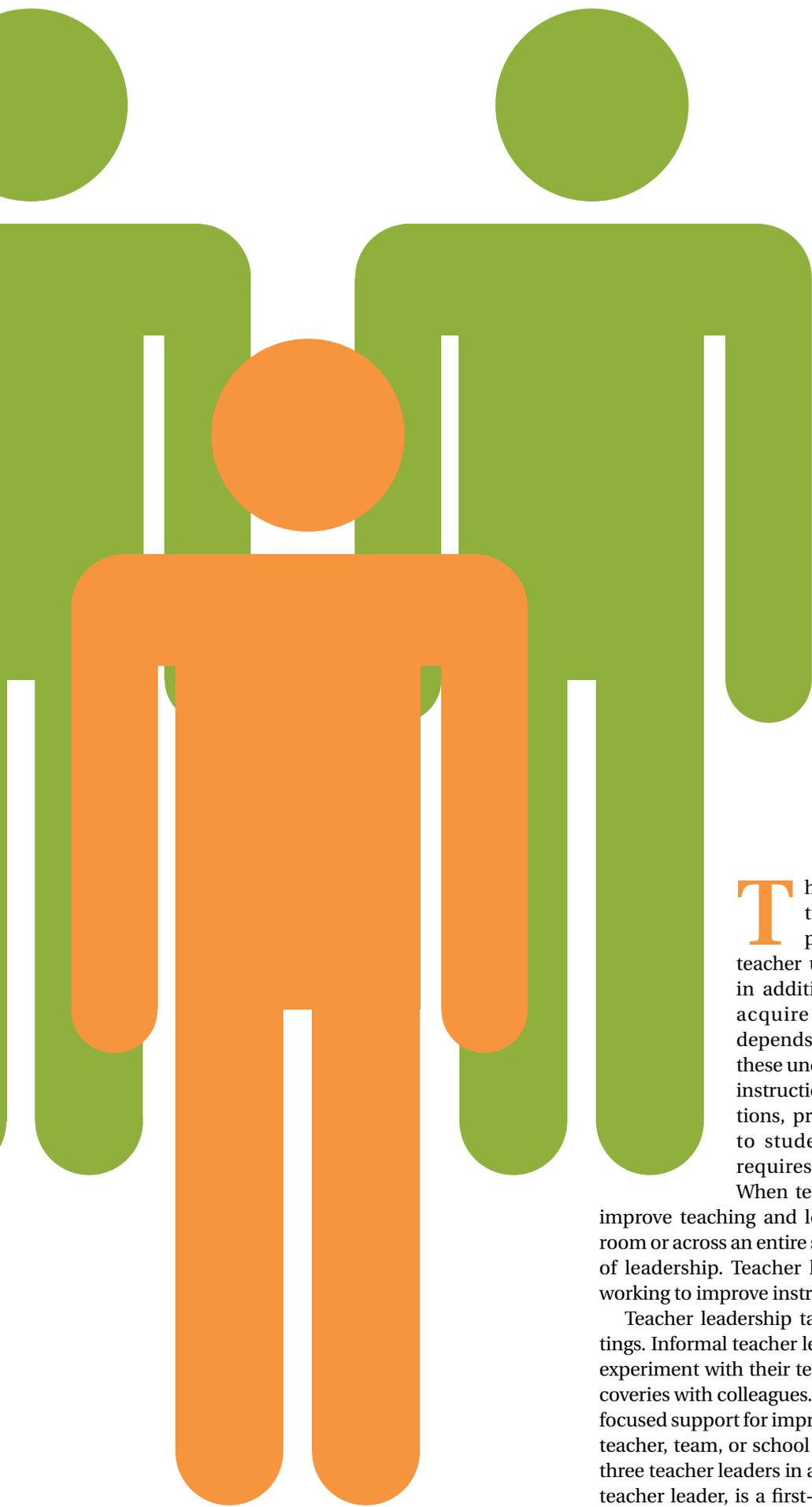


2013 Focus Issue:
Developing & Empowering
Teacher Leaders

A Tale of Three Teachers

Are you interested in taking an active role in improving mathematics education? These stories of informal, semiformal, and formal school leaders at work may suggest a path.

Improving something as complex and culturally embedded as teaching requires the efforts of all the players, including students, parents, and politicians. But teachers must be the primary driving force behind change. They are best positioned to understand the problems that students face and to generate possible solutions. In fact, almost all successful attempts to improve teaching have involved teachers working together to improve students' learning. (Stigler and Hiebert 1999, p. 135)

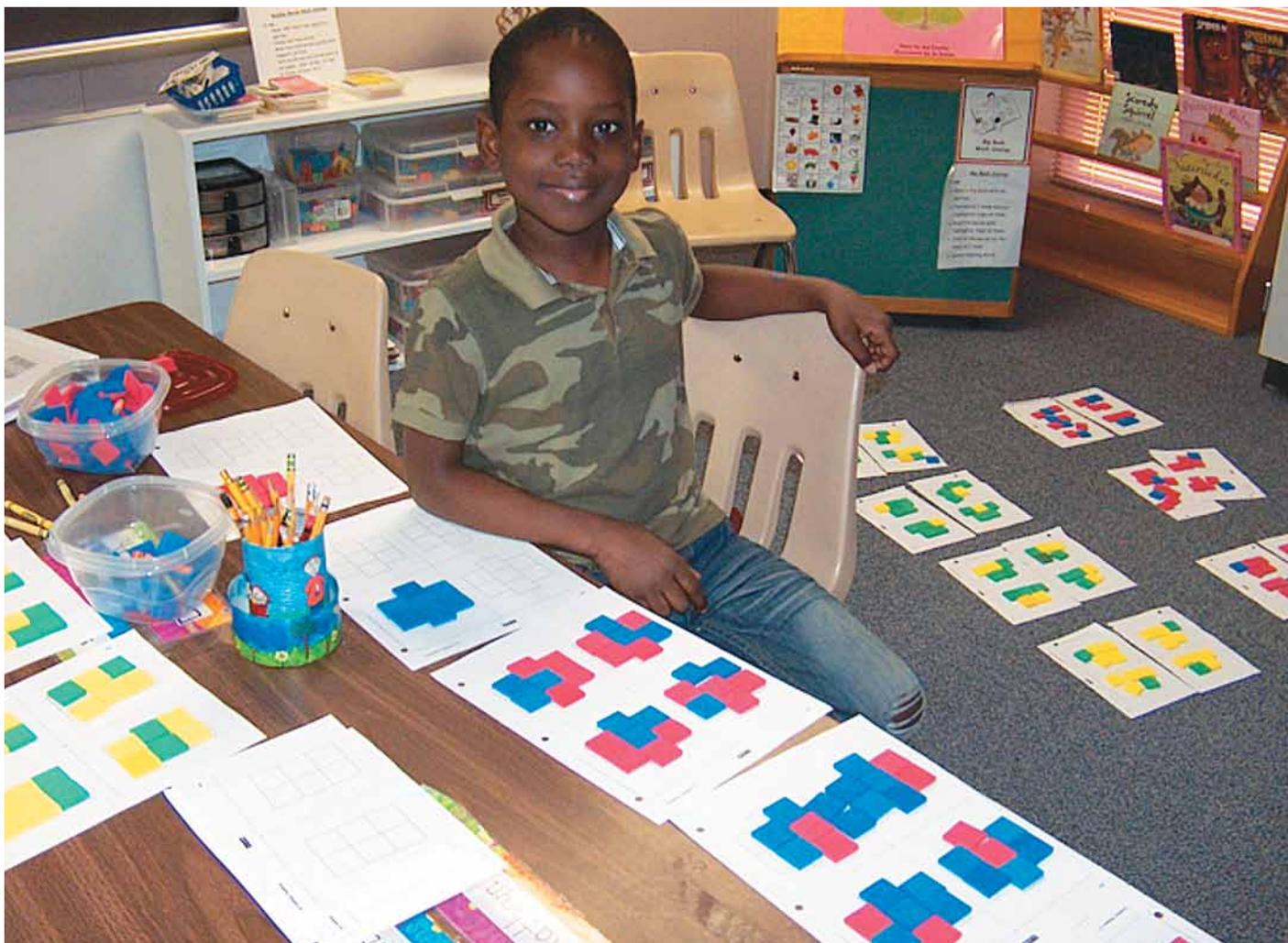


By Sue Chapman,
Allison Leonard,
Sandra Burciaga, and
Theresa Jernigan

The improvement of mathematics teaching and learning is a complicated undertaking. It relies on teacher understanding of math curriculum in addition to awareness of how children acquire mathematics concepts. It also depends on teachers' abilities to translate these understandings into learning tasks and instructional routines, as well as the questions, prompts, and feedback they provide to students. Improving math education requires active involvement by teachers.

When teachers actively engage in efforts to improve teaching and learning, whether in a single classroom or across an entire school, their efforts constitute works of leadership. Teacher leadership, therefore, is the act of working to improve instruction to increase student learning.

Teacher leadership takes place daily in a variety of settings. Informal teacher leadership occurs as teachers quietly experiment with their teaching practice and share their discoveries with colleagues. Formal teacher leadership provides focused support for improving mathematics education at the teacher, team, or school level. This article tells the stories of three teacher leaders in a single school: Theresa, an informal teacher leader, is a first-grade teacher dedicated to helping



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After consulting with a math coach, Theresa was able to break through limits to her own thinking and find a different way to support students' learning.

students build a strong foundation of number concepts and a sense of confidence about their mathematical abilities. Sandra is the team leader of her second-grade team and supports teacher-initiated professional learning across eight classrooms, including her own. Her story provides an example of semiformal teacher leadership. Allison is a formal teacher leader; she serves as math coach with fulltime responsibility for improving instruction in pre-K-grade 5 classrooms. Theresa's, Sandra's, and Allison's stories offer a snapshot of leadership by teachers in each of these arenas. They also show how the presence of these three types of teacher leadership build a learning-focused school culture and strengthen the school's capacity to continually improve math education.

Theresa's story: Teacher leadership as collaborative problem solving

"We've hit a wall in our thinking! My students have, and I have, too." Theresa slumped in a chair, gesturing toward her students' work, spread out on the table. She explained the problem to Allison, the math coach, "I want my students to be able to build and describe all the combinations of a number, but this recording sheet is limiting their thinking."

Theresa had asked Allison to stop by her room after school to talk through this situation that Theresa saw as a barrier to learning. Theresa's colleagues recognize her as a master teacher and an important source of professional knowledge. They also see her as a problem solver, a teacher constantly in search of ways

to stretch her children's thinking and maximize their learning. Theresa's first graders were working with number combinations and number relationships. Theresa's goal was to help her students internalize parts of numbers to ten. She knew that in later grades, this core understanding would lead to number sense and computational fluency.

The task that Theresa showed Allison required students to find and record different combinations of two colors of square tiles that equal a given number. Students recorded their work on a sheet with space for four combinations. According to Richardson,

When children are given opportunities to look at parts of numbers using materials such as arrangements of dots, toothpicks, or paper pattern blocks, they will notice relationships and can begin to use those relationships to solve problems they don't know. (2012, p. 57).

Theresa pointed to a student's recording sheet, "My students stop thinking after they record four combinations. I need them to stretch beyond the number relationships they have already internalized to figure out new combinations."

The recording sheet was causing students to conclude that their thinking was done when it should have just been starting. Theresa and Allison talked through the dilemma. They discussed the possibility of adding more sections to the sheet by proportionally shrinking the recording spaces but decided that young children would have difficulty recognizing a pictorial representation not identical in size to the manipulatives being used. The students needed a working space that would open up their thinking.

Talking out loud, Theresa suddenly realized she could solve the problem by cutting multiple sheets into individual recording pieces. Students could take as many of these pieces as they needed to show all the combinations they could think of. They would cover each of these recording pieces with a different combination of tiles and then record the equation in their math journals, representing each combination. Theresa decided she would take a photograph of each child's combinations. Students would

glue these pictures into their journals next to the equations they wrote for their combinations. Theresa would encourage students to challenge themselves to find all the possible combinations for the number they were studying. Theresa's shoulders relaxed as her plan for supporting her students' learning took shape.

The following week, Allison stopped by Theresa's room after school to see how things were going. Theresa was showing Michelle the math stations she was currently using with her students. Michelle had taught upper-elementary mathematics for several years but was new to first grade. She wanted to know how Theresa selected mathematics stations to use at this point in the school year and how she introduced them to students. As Theresa shared her rationale for the stations in her room, she explained how each learning task contributed to first graders' mathematical development.

Allison asked Theresa if the changes made to the number combinations station had affected her students' learning. Theresa described how the open-ended structure of the recording pieces had encouraged students to think deeply about the task. "The students are talking about relationships they're seeing within the numbers. Today I heard a child say, 'I know that four plus four is eight, so one more is nine.' They're using what they already know about numbers to explore new relationships."

Theresa talked about how the photographs of the student work were helping the children become more aware of their learning:

The photos show students where they were in their learning and where they are now. They're challenging themselves to think as hard as they can, and they're feeling confident because they can see how much they've learned. When it's time to stop stations, they want to keep working.

Michelle was enthusiastic about trying this redesigned station in her own classroom. She thanked Theresa for her time and promised to let her know how her students responded to the new station.

Theresa is a classroom scientist, always studying her students' learning and looking for ways to effectively support their growth. She is also what school improvement guru



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Sandra views her leadership role as that of a facilitator—elevating everyone in the group with shared responsibility for reaching professional goals.

Douglas Reeves calls a *superhub*, a teacher to whom others gravitate as they work to improve their instructional craft (Reeves 2008). Just as Theresa went to mathematics coach Allison to think through a learning experience for her students, other teachers regularly seek out Theresa when they have questions about teaching or math. Theresa believes professional conversations are a powerful vehicle for teacher learning:

Teachers are constantly thinking about how to help children move forward with their learning. When they get stuck, they need to think out loud with someone. When teachers start talking with colleagues about their challenges, that's when learning begins.

Problem-solving conversations like these create a network of support for teachers throughout a school and help professional knowledge spread from classroom to classroom.

Sandra's story: Teacher leadership as collective responsibility

Sandra began the team's planning day by reviewing the team's objectives, "We're here to look at the results of our place-value assessment and, based on what we find, decide on goals for student learning and professional learning plans for the next nine weeks."

Sandra asked team members to use the document camera to take turns sharing summary charts of their class assessment results. As each teacher talked about her students' learning, other team members offered insights and speculations. The group celebrated evidence of progress but also talked candidly about concerns. Sandra occasionally asked a question or paraphrased a teacher's statement to clarify and expand the group's thinking about the learning needs these assessment results revealed. As the team finished reviewing the assessment results, Sandra offered a summary of the team's discussion:

We seem to be finding a pattern across our classrooms. Some students are not using correct terminology in describing the value of digits in numbers. We see evidence that most of these students understand place-value concepts but are not using language accurately and precisely when talking about numbers. Let's keep this need in mind as we continue our planning work.

Sandra has fulltime teaching responsibility for her own second-grade class but also serves as a leader for a team that consists of eight second-grade teachers, two of whom have just completed their second year of teaching. Sandra believes the team's strong focus on instructional improvement grew from the need to provide a supportive professional learning environment for Hope and Nakia during their first year of teaching. Sandra states proudly that the team learned as much from its new teachers as they learned from the team. She says that as the team studied the math curriculum together and modeled lessons for the new teachers, all team members deepened their understanding of the mathematics they were charged with teaching. Sandra's stance of respect for her fellow teachers is one of her defining qualities. She believes that each teacher on her team possesses unique abilities and perspectives that bring strength to the team as a whole. Sandra leads her team with a servant's heart and a personal commitment to being a positive role model for others.

As the meeting continued, the team designed

several small-group lessons to help students who needed support with place-value concepts and use of place-value vocabulary. Sandra was conscious of keeping her voice in the background as much as possible so that the team owned the conversation. At times, she gently refocused the team on its agenda. Sandra played the role of citizen facilitator (Garmston 2012), contributing ideas to the discussion as a peer but also orchestrating the group process.

Sandra showed the team a short video of Leticia, one of their team members, conducting a number talk. As they watched, the teachers jotted down the questions Leticia had asked (see **fig. 1**). They looked at how these questions had shaped students' thinking and the class discussion of the computational problem. Leticia had begun her number talk by saying, "When we do number talks with addition, I worry about running out of cubes. Today we're subtracting. Why won't we run out of cubes?"

The team talked about how this question built students' operation sense and mathematical reasoning abilities. Sandra pointed out another question Leticia had asked, "What is the same about seventeen and thirty-two?"

The team made a connection to their earlier discussion of student assessment results and decided this question offered a rich opportunity for students to practice using place-value terminology in an authentic context.

Sandra then led a planning conversation about the team's professional learning for the next nine weeks. Team members decided to use a peer-coaching structure to build their skill in asking questions. Pairs of teachers would plan a number talk together and then combine their classes when conducting this number talk. One teacher would present the first problem to the class while her partner scribed the questions that students asked and their responses. The teachers would reverse roles for the second problem. Later, the teachers would analyze the transcripts of questions and responses, paying particular attention to the impact of teacher questions on students' thinking. They would be prepared to discuss their insights at the team's next planning meeting. As they finalized plans, Sandra complimented their work: "When we collaborate, it helps each of us to grow, and this has a direct effect on our students' learning."

FIGURE 1

After watching a video of one team member conducting a number talk (transcript below), the teachers decided to use a peer-coaching structure to build their skill in asking questions of their students.

Questions asked during Leticia's number talk on the problem $32 - 17$

- When we add, I worry about running out of cubes. Today we're subtracting. Why won't we run out of cubes? [*The teacher writes 37 on the board.*]
- How can you break 37?
- How do you want to explain it?
- Which digit is worth more? Tell me why.
- What's another word?
- Do you want to add another idea?
- What's the most common way? Which way do you think of first?
- What's another way?
- Is it still 37? Why?
- What's another way? [*The teacher writes $32 - 17$ on the board.*]
- What is the same about 17 and 32?
- What is the answer to this problem?
- Who wants to explain how you figured out the answer?
- Who has another strategy?
- How did you do it?
- What did you do first?
- How many tens did you have left?
- What did you do?

**Allison's story:
Growing mathematics practice
across the school community**

The first-grade team had asked Allison to join them as they planned for an upcoming lesson study. Lesson study is a professional learning design in which teachers collaborate to plan a lesson, observe the lesson execution together, discuss its impact on student learning, and then refine the lesson plan based on their insights (Lewis and Hurd 2011). The first-grade team had been through the lesson study cycle several times, and Allison noticed that the



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Allison is proud of the professional growth she sees in the school faculty.

group was comfortable with the process. As the lesson began to take shape, the team's discussion focused on evidence of student thinking that teachers would watch for at different points during their lesson observation. Allison watched and listened proudly as the team mapped out its professional learning experience.

Allison has been a math coach for four years and, across time, has witnessed the improvement of mathematics teaching and learning at her school. After the first-grade planning session, she reflected on the school's learning journey and the role she has played:

At first we were just trying to make sense of our new mathematics curriculum. We'd moved from a traditional curriculum to a standards-based program focused on student understanding of mathematical concepts. It was a struggle initially because we were working with new materials and structures. When we came together, we would talk about the resources required for the program, the manipulatives, the stations, the assessments. I've come to understand that when teachers are still thinking about resources and structures, they're not ready to think about students' learning. Just now, as the first-grade team planned for their lesson study, I realized how far we've come.

Allison went on to talk about how her role as math coach supports teachers as learners:

The process of adult learning is a lot like what we want for our kids. We have to accept teachers wherever they are in their understandings and support them, sometimes nudge them along. We wish it didn't take years for teachers to build their craft and their understanding of mathematics, but there's no other way. There's just too much to wrap our brains around, too many important pieces.

Allison spends her days working with individual teachers and teacher teams to help them refine their mathematics instructional practices. Throughout a single week, she can be found modeling lessons, observing and offering nonevaluative feedback, planning with teams, helping teachers analyze assessment results, and consulting with teachers on intervention for individual students. She provides strong support for new teachers to help them understand their math curriculum and the school's expectations for instruction. Allison plans and leads professional development sessions at the school and district level. She collaborates with math coaches from other schools and helps write math curriculum for the school district. Allison's days are never the same because she differentiates her coaching support on the basis of teacher needs and interests. She observed, "Coaching is a lot like conferring with a student. You do lots of listening. That's how you figure out what the teacher is ready to learn and the support she needs to take her next step."

Stepping into teacher leadership

Theresa, Sandra, and Allison each play different but important leadership roles within the school. Theresa shows us that teacher leadership does not require a formal role. All teachers can participate in meaningful leadership work by refining their craft and talking with colleagues about their ongoing professional learning. Sandra's story demonstrates teacher leadership within a team. When a group of teachers takes collective responsibility for the mathematics learning of all students, the resulting synergy empowers teachers to achieve results that no one teacher could accomplish individually. Allison's tale reminds us that the essence of

teacher leadership is teacher learning. Teachers, like all learners, need authentic learning experiences that allow them to construct their own understandings and then time and support to integrate these new understandings into their practice. Teacher leadership supports teacher learning, and teacher learning is key to improving student achievement in mathematics.

Together, these three teacher leaders, along with others, strengthen the school's mathematics program and create a school-wide web of support for all teachers. According to Reeves, "teaching and leadership are inseparable qualities" (2008, p. 1). Teaching is the act of facilitating learning; teacher leadership can be understood as the act of facilitating organizational learning. When teacher leaders work in concert, their schools become learning organizations.

Allison's reflection on her own teacher leadership journey suggests a path other teachers might follow as they step into leadership work:

When I was teaching kindergarten, I found several colleagues who shared my interest in improving our mathematics instruction. Our teacher leadership began with those relationships. As we talked about our teaching, our ideas ignited like sparks. We kept thinking of ways we could improve our students' math learning. We felt like we were sitting around a campfire; our conversations and collaboration caused our learning and teaching to grow bigger and brighter.

Teacher leadership offers a simple but powerful means of improving mathematics teaching and learning. When teachers realize the opportunities for leadership all around them and work together with colleagues to improve math instruction in their schools, the benefits to students multiply exponentially. According to Reason and Reason, "the more aware teachers become of their capacity to drive change, the more likely it is that deep change will occur" (2007, p. 37). If schools are to equip children with the mathematics understandings and skills they will need for future success, teachers must recognize that they

can be school leaders and intentionally place themselves in the middle of efforts to transform mathematics education.

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