Learning to Lead/Leading to Learn

Elementary and middle school teachers in a graduate class learn to focus on established principles, engaging with their colleagues, and specific tasks and challenges that math coaches face.

By Sheryl L. Stump

This is a story about teachers engaging in mathematics teacher leadership. The focus is on the teachers' learning, and the purpose is to illuminate the process. The setting is a semester-long graduate class called Teacher Leadership in Mathematics Education, and the characters are elementary and middle school teachers. Those in this group did not serve as designated leaders in their schools; they were not instructional coaches or curriculum coordinators. They were classroom teachers who had developed new insights about mathematics teaching and learning and were eager to use those insights to influence the learning of their school colleagues.

Constructivist teacher leadership

Lambert and her co-authors (2002) articulated a vision of teacher leadership that links leadership with learning. They expanded on the notion of

constructivist learning—the active process of making meaning, first at the social level and then at the individual level—to describe *constructivist leadership* as—
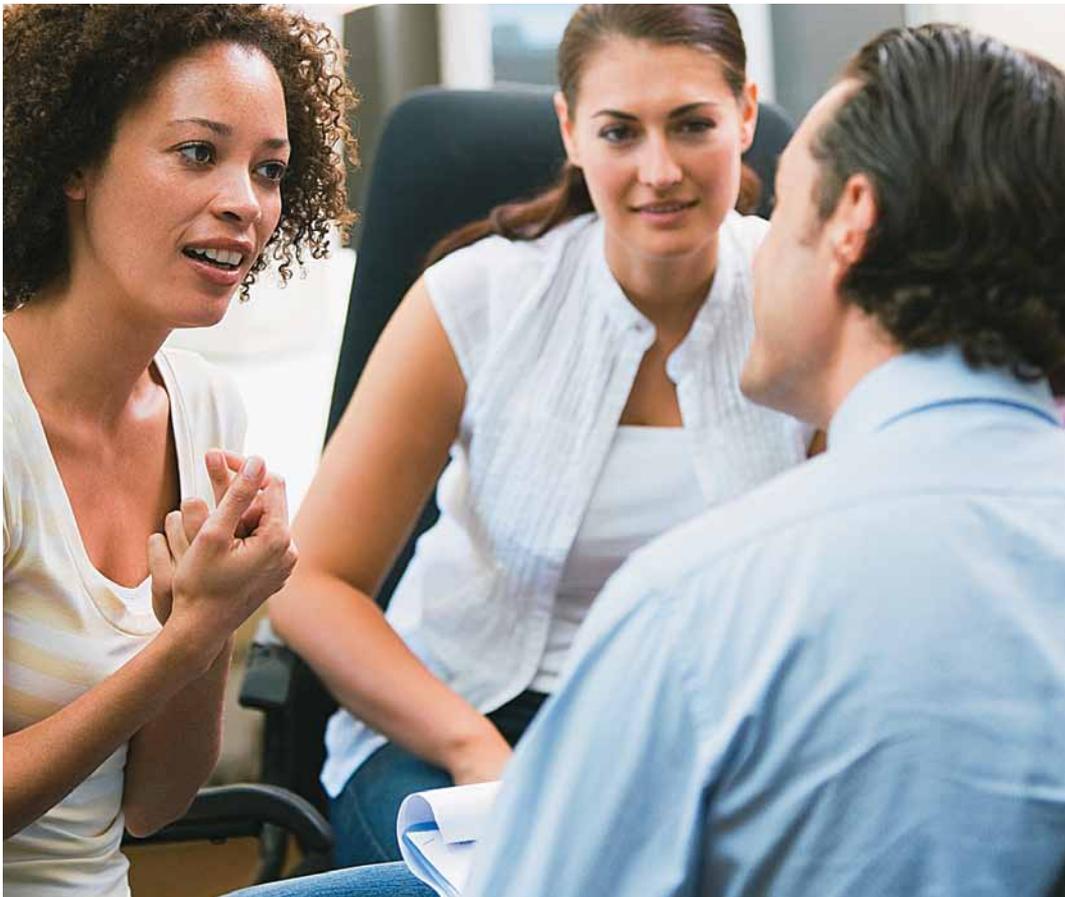
the reciprocal processes that enable participants in an educational community to construct meanings that lead toward a shared purpose of schooling. (p. 36)

Reciprocal processes are mutual learning experiences, such as listening, questioning, reflecting, and facilitating— those relational endeavors that weave a fine fabric of meaning. (p. 45)

This notion of leadership no longer designates leaders and followers; all are participants:

Leadership becomes manifest within the relationships in a community, manifest in the spaces, the fields among the participants, rather than in a set of behaviors performed by an individual leader. (p. 42)

The teachers in this graduate class were comfortable with the notion of constructivist leadership. They expressed the need for math-focused leadership in their schools, which were besieged with initiatives focused on various concerns—strategies to improve reading comprehension, designated time for standardized test preparation, assessment benchmarking, writing across the curriculum, understanding by design, response to intervention, pretesting and posttesting, curriculum mapping, learning calendars, teaching with technology, differentiated instruction, common content vocabulary, and the eight-step instructional process. However, few of those initiatives were guided by research or recommendations in mathematics education. Most of the

tial principles of leadership—equity, teaching and learning, curriculum, and assessment—and twelve research-informed indicators that describe conditions that must exist and the leadership actions that must be taken to improve student achievement. The teachers used this framework to analyze their own teaching and leadership practice. With their school principals, they also used the framework to analyze their schools and identify opportunities for mathematics teacher leadership. The teachers reported that their principals found this to be a valuable framework and appreciated the opportunity for a focused discussion.

Two books about math coaching were selected to engage teachers in a variety of issues surrounding mathematics teacher leadership. The concept of math coaching, a well-documented form of mathematics teacher leadership, was new to the teachers, and these particular books provided interesting contexts and formats for them to explore the territory. *The Math Coach Field Guide: Charting Your Course* (Felux and Snowdy 2006) described various aspects of the work of mathematics coaching and teacher leadership. The chapters, all written by different authors, inspired the teachers and launched them into reflections on the current practices in their own schools and the possibilities for their own engagement in mathematics teacher leadership. *Cultivating a Math Coaching Practice: A Guide for K–8 Math Educators* (Morse 2009) provided a set of case studies that prompted the teachers to ponder important questions and reflect on the intricacies of math coaching. As they read the cases and engaged in the activities and discussions, they found themselves developing new insights into mathematics, teaching and learning, and working with colleagues.

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> A research-based framework helped these teachers break through the noise of myriad initiatives and focus on the crucial aspects of math education in the context of leadership.

teachers had already taken one or more content, pedagogy, or research classes for their masters program in mathematics education, and they were interested in bringing some mathematics-specific ideas into the conversations in their schools. The notion of mathematics teacher leadership was intriguing to them. As one teacher explained, "I really like the idea of mathematics improvements coming from teachers banding together to improve their craft."

Exploring the territory

Teachers in this graduate class were investigating mathematics teacher leadership through reading, discussing, and practicing in their schools. Three texts guided their explorations. The *PRIME Leadership Framework: Principles and Indicators for Mathematics Education Leaders* (National Council of Supervisors of Mathematics [NCSM] 2008) provided a structure for focusing on critical aspects of mathematics education in the context of leadership. The framework (see **table 1**) is based on four essen-

Teachers in this graduate course used the framework from the National Council of Supervisors of Mathematics to analyze their own teaching and leadership status and identify opportunities for mathematics teacher leadership in their schools.

The PRIME Leadership Framework

Principle	Indicator 1	Indicator 2	Indicator 3
Equity leadership	Every teacher addresses gaps in mathematics achievement expectations for all student populations.	Every teacher provides each student access to relevant and meaningful mathematics experiences.	Every teacher works interdependently in a collaborative learning community to erase inequities in student learning.
Teaching and learning leadership	Every teacher pursues the successful learning of mathematics for every student.	Every teacher implements research-informed best practices and uses effective instructional planning and teaching strategies.	Every teacher participates in continuous and meaningful mathematics professional development and learning to improve his or her practice.
Curriculum leadership	Every teacher implements the local curriculum and uses instructional resources that are coherent and reflect state standards and national curriculum recommendations.	Every teacher implements a curriculum that is focused on relevant and meaningful mathematics.	Every teacher implements the intended curriculum with needed intervention and makes certain it is attained by every student.
Assessment leadership	Every teacher uses student assessments that are congruent and aligned by grade level or course content.	Every teacher uses formative assessment processes to inform teacher practice and student learning.	Every teacher uses summative assessment data to evaluate mathematics grade-level, course, and program effectiveness.

Engaging in constructivist leadership

Although the teachers in this graduate class were not math coaches or designated leaders in their schools, they did embrace opportunities to engage in constructivist leadership. The course assignments were thus designed to provide them with opportunities to engage in leadership activities with their principals and school colleagues. In addition to the school analysis conducted with the principal, each teacher designed and implemented a professional development workshop for their school colleagues. Each workshop addressed a need identified in the school analysis, was guided by mathematics education research or NCTM recommendations, and focused on one or more indicators in the *PRIME Leadership Framework*. Descriptions of three workshops and what the teachers learned from the experience follow.

A passion for mathematics

Pamela was a fourth-grade elementary school teacher with a newly discovered passion for learning and teaching math. After using the PRIME Leadership Framework to complete the school analysis, she and her principal decided it would be a good idea for the entire school to go through a similar exercise. Pamela worked with the school's math committee to conduct

Putting what they learned in graduate school into practice, three teachers became comfortable leading faculty workshops for their colleagues.

rooms. Once they are successful, then others might be more interested in learning about best practices in teaching math.

Teaching through problem solving

As a fifth- and sixth-grade special education teacher, Dawn was convinced that teaching mathematics through problem solving was an effective way to help all students learn mathematics with understanding. She wanted to encourage the other fifth- and sixth-grade teachers to consider this method of teaching, so she invited the author of this article to conduct a workshop at her school. Dawn followed up that workshop with one of her own, designed to help the teachers create instructional units for teaching mathematics through problem solving in their classrooms. Dawn gathered a collection of resources to address specific topics identified by each grade level, and the teachers examined and discussed the materials. Dawn reflected on her experience:

> It was very exhilarating, frustrating, and hard work. I have always loved sharing my knowledge with other people. I think we are in this business for the kids, so if we learn something that can make everyone a better teacher for their students, then we should share it.

Teaching through inquiry

A seventh- and eighth-grade math teacher who had always loved the subject, Lindsey had just recently developed an appreciation for learning and teaching mathematics through inquiry. To raise her colleagues' awareness of teaching mathematics through problem solving, she established workshops and demonstrated the benefits of having students give verbal

grade-level team discussions that resulted in the identification of topics for professional development. She then designed two different workshop sessions, one for all kindergarten through fourth-grade teachers and another for second-grade teachers. In the first session, teachers engaged in a task-sorting activity. In the second session, teachers examined probability activities and discussed questioning techniques. Pamela's goal for both sessions was to help her colleagues learn to identify worthwhile mathematical tasks to promote true problem solving. Afterward, Pamela reported:

> I learned how important it is to connect with your colleagues and to build relationships. I felt that the second session went much better when I was working with a small group of teachers. I had worked with these four teachers for 5–6 years, and we had a good relationship already established…. I need to work with those teachers who are open and excited about using these ideas in their class-

explanations and justifications of their work. She led the workshops in three different clusters—kindergarten–second grade, third–fifth grade, and sixth–eighth grade. In each workshop, the teachers engaged in problem solving, examined student work, and watched a video that showed Lindsey asking her students probing questions. After the workshops, Lindsey said,

> This was a great learning experience for me. It has given me courage to step up and talk with the teachers about what is going on in the classrooms. It has given me the motivation to work as a team to improve the mathematical thinking in our school.

All three of these teachers—Pamela, Dawn, and Lindsey—faced the issue of *trust* in working with their school colleagues. "Becoming a confident, capable, and caring constructivist leader is a life-long learning process," according to Lambert and her colleagues (2002), "that involves taking responsibility for one's own learning within the context of a community of learners and site-based colleagues" (p. 208). Moreover, "Trust is a result of shared experience over time" (p. 212). The teachers in this graduate class were introducing themselves to the notion of leadership, so they were in the early stages of learning about trust.

Additional leadership activities

To further their explorations, class members completed additional leadership activities in their schools, such as those described in *The Math Coach Field Guide* (Felux and Snowdy 2006). Knowing their own school cultures and the level of trust and support from their principals and other school colleagues, the teachers chose activities that would maximize their own learning and facilitate their colleagues' learning.

Bulletin boards

Several teachers created bulletin boards in prominent locations at school. Samantha, a sixth-grade teacher, collaborated with the art teacher to find problems that students could solve using pictures, and she displayed her students' solutions on the bulletin board in the hallway. Erin, a third-grade teacher, engaged students in a data-collection activity, and displayed the results on the bulletin board in

the hallway. She also invited other teachers to participate in the activity. Terri, a fourth- and fifth-grade teacher, displayed problems called How Would You Solve It? on a bulletin board in the main hallway and invited observers to solve the problems and compare their strategies with those of fourth-grade students. Cary, a seventh-grade science teacher, worked with the eighth-grade special education mathematics teacher to design an interactive bulletin board that was posted outside his classroom.

Helping other teachers

Some of the teachers chose to practice coaching skills with their colleagues. Dawn helped a "reluctant colleague" by conducting a demonstration lesson in her own classroom to show that students with learning disabilities can learn mathematics through problem solving. Lindsey helped an "interested colleague," a fourth-grade teacher, design a measurement lesson to develop understanding and encourage "math talk" in her classroom. Jenni, a kindergarten–grade 6 mathematics interventionist, helped a third-grade teacher "rethink her practice" by providing resources about using models and then conducting a demonstration lesson in her colleague's classroom. Kevin, a seventh- and eighth-grade mathematics teacher, provided some reading materials and led an after-school discussion about problem solving with the fifth-grade, sixth-grade, and math resource teachers.

Trajectories of development

The *PRIME Leadership Framework* (NCSM 2008) describes three stages of leadership development. In stage 1, leadership of self, "the leader is respected for his or her own teaching and learning skills." In stage 2, leadership of others, "the leader is respected for his or her interpersonal skills and commitment for leading change among teams of teachers and colleagues." In stage 3, leadership in the extended community, "the leader is respected for his or her influence and engagement with an expanded community of educational stakeholders" (p. 6).

In general, the teachers in this class were in transition from stage 1 to stage 2. On one of the last nights of class, each teacher made a poster to describe the development of his or her ideas about mathematics teacher leadership (see **fig. 1**). They focused on various aspects of their

Near the end of the graduate course, each class member made a poster to describe the development of his or her ideas about mathematics teacher leadership. Below are self-assessed trajectories of three teachers' development.

(a) Pamela, a fourth-grade elementary school teacher, wants to continue taking graduate classes to build on her own mathematical content knowledge. She believes that building relationships and supporting teachers in their efforts to become better math educators will help her gain credibility.

Beginning	Midway	Today
• Unsure about how my colleagues would accept my leadership role	• More confident in my goals for mathematics	• Assured that my colleagues want help in mathematics
• Established personal relationships	• Working more closely with other grade-level teachers; getting to know others better from a professional point of view	• Different relationships with colleagues because they perceive me as a mathematics leader
• Gaining knowledge in mathematics content	• Wrote a grant for my grade-level teachers for mathematics manipulatives	• Thinking about mathematics relationally
• Very focused on getting myself familiar with Common Core State Standards		• Seeking new grants for wider ranges of teachers to find relevant materials
		• More outward focus on helping others adjust to Common Core State Standards and Mathematical Practices

(b) Dawn, a fifth- and sixth-grade special education teacher, still considers herself a "math teacher in training." She wants to make co-teaching a reality in her school next year. Ultimately, she would like to become a math coach.

Beginning	Midway	Today
• I was concerned whether the mathematics teachers would even listen to me since my main role is as a special education teacher.	• Since I was taking classes that coincided with the changes we needed to make with our mathematics curriculum, it gave me a window to share what I have learned.	• Since I am putting into practice a lot of the things I have learned, I feel more confident with sharing ideas and leading discussions in our math meetings.
• Not confident with mathematics content. I do not consider myself an expert.		• Teachers want me to do some co-teaching next year.

(c) Lindsey, a seventh- and eighth-grade math teacher, plans to talk with her principal about finding more ways to engage in mathematics teacher leadership in her school. She considers such leadership to be "icing on the cake."

Beginning	Midway	Today
• A need to work as a unit versus individuals—bringing everyone together	• I started talking to other teachers more about their ideas on topics—show my interest in working together.	• Suggestion—Have planned times to meet as subjects instead of grade level
• Need to increase problem solving—lowest scores on state tests	• A lot of group practice before [the state test]—but did it continue?	• Weekly problem for students in newsletter?
• Keep goals in mind. Our group of teachers easily gets off track.	• Agendas emailed out at the beginning of the day	• Display goals to stay focused in the meeting; when off task, remind teachers of posted goals.

leadership of self and leadership of others, their knowledge of mathematics, their understanding of standards and curriculum, their desires to engage students in problem solving, their abilities to foster collaboration with colleagues, and their specific plans for continued leadership.

These teachers are interested in continuing their development in mathematics teacher leadership. Pamela is focused on becoming a credible mathematics teacher leader. She believes that building relationships and supporting teachers in their efforts to become better mathematics educators will help her gain credibility. Dawn still considers herself to be a "math teacher in training," but, ultimately, she would like to become a math coach. Lindsay plans to talk with her principal about finding more ways to engage in mathematics teacher leadership in her school: "Not only can I increase my knowledge of mathematics," she ponders, "I can also become a leader in my school and find effective ways to spread this to my colleagues in a professional way."

A context-dependent social endeavor

Constructivist theory recognizes that learning is primarily a social endeavor and is context-dependent; it grows differently in different settings and with different people (Lambert et al. 2002). The teachers in this class worked with one another and with colleagues in their schools, and they learned about mathematics teacher leadership. They learned to use the PRIME Leadership Framework to focus their leadership on established principles; they learned about the specific tasks and challenges faced by math coaches; and they learned about themselves engaging with their colleagues in constructivist leadership. Learning to lead and leading to learn, they brought insights to their colleagues. Together they wove a "fine fabric of meaning" focused on mathematics.

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After the graduate class, participants remained interested in continuing to develop mathematics teacher leadership skills.

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Common Core Connections

SMP 1
SMP 2
SMP 3