

RESEARCH BRIEF

Changing Practice Through Effective Professional Development *By Julia McClintock Peck*

In 1998, a team of researchers examined the state of professional development for K–12 teachers in the United States and painted a discouraging picture:

- Significant numbers of teachers had few or no professional development opportunities
- The opportunities that existed came in the form of workshops, courses, and institutes that didn't necessarily offer appropriate information or support over time to apply what was learned in classrooms
- Professional development focused on individuals rather than organizational capacity

Five years later, the researchers took another look at the subject and found little had changed: Much of the current professional development is led by an “expert” outside the school district, presented to a few teachers who attend voluntarily, in a setting removed from student learning. Susan Loucks-Horsley and her colleagues concluded, “The fact that these conditions persist and in fact still dominate practice is not just cause for concern. It is cause for alarm” (2003, p. xviii).

Because most of today's math teachers learned traditional mathematics curriculum in the traditional way, many aren't steeped in the effective instructional practices recommended by groups such as the National Council of Teachers of Mathematics (NCTM). Changing practice—both what and how teachers teach—is extremely difficult. As Sutton and Krueger point out, “Many efforts have fallen short because programs did not draw on the existing knowledge, beliefs, values, purposes, and workplace constraints of teachers” (2002, p. 9).

KEY AREAS TO ADDRESS

Research into professional development (Garet, Porter, Desimone, Birman, & Yoon, 2001; Loucks-Horsley, Hewson, Love, & Stiles, 1998; WestEd, 2000) emphasizes teacher learning in three areas: the content of mathematics; pedagogy or the knowledge needed for teaching and understanding how students learn mathematics; and experience with effective strategies for understanding mathematics.

Content—Teachers need to know and understand the mathematics they'll be teaching at a deep enough level to explain, identify, and apply their understanding in a variety of formats. One research study that controlled for student characteristics found that “average mathematics achievement was higher in schools in which teachers had participated in extensive professional development focusing on teaching specific mathematics content compared to the achievement in schools where teachers had not” (Garet et al., 2001, p. 8).

Historically, teachers could teach mathematics if they knew the rules and procedures. In a classroom where students are making their thinking visible through discourse and writing, a teacher's understanding must be deep and conceptually connected or she will miss opportunities to anticipate misconceptions, to help students make connections, and to select tasks appropriate for her students. When teachers have more limited knowledge of mathematics, they depend on the sequencing of the textbook and may portray mathematics as a set of rules and facts to be memorized.

Pedagogy—Educators must understand how students learn mathematics. Teachers need to be able to take abstract ideas in mathematics and unpack them in a way that will make the basic underlying mathematical concepts visible to the students. “Assessing understanding rather than simply attending to correct answers is a particular challenge for teachers as they shift toward teaching for understanding” (Grant & Kline, 2004, p. 197). Professional development should help teachers expand their comfort and skills in gathering evidence of student thinking and then using this information to adjust instruction.

Effective strategies—It is difficult for teachers who have never engaged in actively learning mathematics to believe that all students can become successful mathematicians. When teachers have learned something only in the form of words or formulas, they may not be able to recognize the variety of ways students might approach a problem. When teachers engage in the same types of practices found effective for student learning, they develop confidence in their ability to foster learning in each student. Teachers need to study strategies that are effective in promoting student learning, making the pedagogy and sequencing of effective lessons visible. This study would include topics such as: What are the characteristics of a good problem-solving lesson? What does the teacher do to lead the lesson? What might students do? What problems or misunderstandings might students encounter during their investigations? How does the teacher bring out the essential mathematics as students share solution strategies?

IMPORTANT PLANNING ISSUES

Planners of professional development must consider a number of critical issues: equity for all students; administrative support for teachers; opportunities for teacher collaboration and collegiality; adequate time for teacher learning; and sustainability of professional growth.

“Excellence in mathematics education requires equity—high expectations and strong support for all students” (NCTM, 2000, p. 11). If we have high expectations for all students, we must provide the professional development needed to have high-quality instruction and learning in every classroom. In order to address equity for all students, school staff must examine data to detect inconsistencies in student learning as well as to uncover educators’ beliefs that may affect student opportunity to learn.

As Steven Leinwand states, “Administrators are key for setting a tone for continuous review and improvement, for maintaining continually higher expectations, and for providing teachers with the financial, material, and professional development support they need to meet the school or district’s objectives” (2000, p. 92). Studies of successful school improvement efforts list two critical factors for promoting successful teacher learning: strong administrative support of professional development for all staff, and support and encouragement for teacher leaders. When teachers are extending themselves as they learn, they need encouragement and professional support from the building principal. Administrators need to be involved in the professional development and the analysis of data with teachers from their building. For district-level improvement, district administrative support for building principals and teachers is also critical.

In order to engage in the kind of professional development that will make improvement in teaching and learning possible, teachers need administrator support, time to work with colleagues, and access to resources such as research and outside expertise. For teacher learning and, therefore, student learning to become a priority, the structure of schools and the policies affecting them must address these needs (Sutton & Krueger, 2002, p. 31).

The National Council of Teachers of Mathematics encourages professional development planners to shift away from providing things for teachers to “do” in their classrooms. Instead, NCTM suggests providing support for reflective approaches to the practices of teaching. Teachers will likely find that learning alone is less powerful than engaging in dialogue with other teachers.

As teachers become involved and comfortable with collegial relationships and with their own learning, their opportunities for learning can be expanded to include collaborative research within their classrooms. Teachers need opportunities to see examples of what “better teaching” looks like in practice and to observe student learning.



Photo by Mount Burns

Collegial interaction can bring about professional growth for individual mathematics teachers while raising the achievement levels of their students. Extensive reform requires this kind of team effort, and teams are more likely to be successful if team members are truly colleagues (Taylor, 2004, p. 219).

Providing adequate time for collaborative teacher learning is critical. A time commitment needs to be made for both total contact hours and duration for an extended period of time. “The fact that both time span and contact hours have independent effects on our measures of core features suggests that both dimensions of duration are important” (Garet et al., 2001, p. 14). The National Staff Development Council recommends that teachers dedicate 25 percent of each school day to

work together and collaboratively plan lessons and share information (Sparks & Richardson, 1997).

It is also important that professional development be sustained over time with states and districts making “ongoing professional development part of teachers’ daily work through joint planning, research, curriculum and assessment groups, and peer coaching” (National Commission on Teaching and America’s Future, 1996). After all, changing practice is not something that happens all at once or overnight. Linda Darling-Hammond reminds us that “reform is never completed, because everyone continually changes, and everyone continually learns, experiencing fresh insights from practice, from research, and from the synergy of teachers, administrators, students, parents, and others inquiring together” (1997, p. 337). ■

This Research Brief is adapted from Improving Adolescent Mathematics: Findings From Research, available this month from the Northwest Regional Educational Laboratory. For more information on the publication, see www.nwrel.org/scpd/ote/math/.

RESOURCES

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Algebra *Continued from page 9*

as more than a course that is offered at middle and high school. It is a way of thinking and reasoning about relationships that can begin as early as preschool and grow in complexity and sophistication through high school.”

Vernette Kittel, a pre-first grade teacher at Riverview who attended the NWREL math institute two years ago, knows firsthand that youngsters often are more capable than we think. “At the end of the school year, I wrote up equations and hung them around the classroom,” she recalls. “Then, one day I took them all down and put big stickers over one of the numbers [in each problem]. The kids knew right away what the hidden number was; they had absolutely no trouble with that. I said to them, ‘You know what? You’re doing algebra!’”

One of the main things that Kittel stresses in her classroom is the importance of the equal sign. A number of researchers emphasize the need for children to understand that the equal sign represents a relationship rather than simply an answer. Studies conducted by University of Wisconsin found that when sixth-grade students are given the problem $8 + 4 = ? + 5$, 84 percent give the answer as “12.” Developing relational thinking helps students improve their computational skills and lays the groundwork for more advanced work.

By introducing algebraic reasoning early, the goal of “algebra for all” is more easily attained. As NCTM states, “By focusing on algebra across the grades, we will ensure that students develop the skills and ways of thinking and reasoning needed for success in high school and beyond.” In the process, teachers like those in Lebanon, Oregon, are discovering there are rewards not only for their students, but for themselves as well. Nancy Hunt reflects, “I used to hate teaching math because it was all out of a book that didn’t explain it very well. I never did much with algebraic reasoning because I thought this age couldn’t do it. But even little guys, if you give them counters, can figure it out. Now I love teaching math!”

“Children are really interested in math,” adds Ernst. “Math is a problem-solving kind of thing and we have to push it that way. Last year, my [student] Sam, who was seven, would walk by his brother who’s in eighth grade and say, ‘Hey, you’re doing algebra. Need any help?’ They have that kind of enthusiasm ... and think it’s really fun. Some days I can hardly contain myself!” ■

Note: NWREL’s K–2 Mathematics Institutes, focusing on number sense and algebraic reasoning in the primary grades, will be available to schools in 2006. The workshop is 30 hours and can be delivered in one week, six hours per day, or scheduled during several weeks. For more information, contact Claire Gates at NWREL (gatesc@nwrel.org), 800-547-6339, ext. 173. In addition, NWREL will offer the Institute in Portland during summer 2006. For more information, contact Vanessa Grayson (graysonv@nwrel.org) to be placed on a mailing list.