Chapter 9

Teacher Support

Now that your district has selected a new curriculum, your teachers face the challenge of learning to make the materials work well in their classrooms. When you select a standards-based curriculum, chances are that it looks and feels quite different from the mathematics programs your teachers have used in the past. In addition, it contains new mathematical ideas and pedagogical approaches that teachers must master. They will need help learning to use these new curricula effectively and in a way that is consistent with the intentions of the developers.

[Most] teachers will need a tremendous amount of initial, as well as ongoing, assistance to implement any standards-based curriculum. This is a critical *issue to address. There needs to be a strong, up-front assurance that professional development will be available. (M.B., professional development consultant)*

In this chapter we discuss some general principles for designing effective staff support and some strategies that districts have used. Briefly, the principles are as follows:

- Think of teacher support as a long-term prospect—in terms of months and years, rather than days.
- Expect teachers' needs for support to change as implementation progresses.
- Budget for professional development and other forms of teacher support—they cost money.
- Be strategic—develop a coherent plan for professional development that does the following:
  - ~ responds to your teachers' needs
  - ~ leverages your costs
  - ~ addresses issues of scaling up to full implementation within your district

Teacher Support is a Long-Term Prospect

Learning to implement standards-based curricula effectively takes time, and you should expect that teachers will need more support in the first few years of implementation than you are typically used to providing for new curriculum adoptions. Most teachers need to make significant changes in their classroom practice in order to fully implement a new standards-based curriculum. The curricula are demanding to teach, offering challenges to teachers on many levels. The structure and organization of units and lessons are different in standards-based curricula than in programs they have used before; the

Textbook companies will help you the year you adopt, but it's really a matter of working the implementation support into your long-range plan of how to improve mathematics teaching over time. (E.B., mathematics curriculum supervisor)

mathematical ideas are developed in different kinds of contexts and they thread throughout the year (or even throughout the entire multi-year curriculum) differently than they do in typical textbooks; some of the mathematical content itself may be new to teachers; and the pedagogical approaches, with their emphasis on doing mathematics—observing, conjecturing, testing, problem solving and discussing mathematical ideas—are often unfamiliar.

With all these challenges, teachers won't become confident and skilled users of standards-based curricula with only one or two half-day workshops. It will take time and support for teachers to meet the different layers of challenge that these curricula present, which is to be expected. Districts choose standards-based curricula *because* the materials involve different approaches to mathematics learning and teaching, so it stands to reason that teachers will need some time and assistance in learning how to use the new approaches effectively. Nothing will contribute more to the successful implementation of your curriculum than ongoing support of the teachers who are responsible for transforming the written materials into actual occasions for learning in the classroom.

Changing Support Needs

Teachers need different kinds of support at different points in the implementation process. As teachers become better acquainted with the new curriculum and its goals for students' mathematics learning, they will encounter different sets of challenges. You can think of implementation needs as falling into roughly three time periods:

- pre-implementation
- early implementation
- ongoing implementation

Pre-Implementation: Raising Awareness

Many districts find it useful to begin professional development before teachers are asked to use the new curriculum, particularly if general awareness about the ideas and rationale behind mathematics education reform among teachers is low. (If you have worked with the "Concerns-Based Adoption Model" [CBAM], which articulates different stages of concern during implementation of an innovation, you will recognize this as Stage 0: Basic Awareness of the Innovation.)[8] You can use the time prior to actual implementation to orient teachers to the goals and methods of standards-based programs. Offer teachers introductory

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[8] Recent discussions of this model can be found in Driscoll, M., & Bryant, D. (1998). *Learning About Assessment, Learning Through Assessment.* Washington, DC: National Academies Press; Loucks-Horsley, S., Hewson, P.W. , Love, N., & Stiles, K.E. (1998). *Designing Professional Development for Teachers of Science and Mathematics.* Thousand Oaks, CA: Corwin Press; and Loucks-Horsley, S., & Stiegelbauer, S. "Using Knowledge of Change to Guide Staff Development" in Lieberman, A. & Miller, L., Eds. (1991). *Staff Development for Education in the 90's.* New York: Teachers College Press (pp. 15-36).

information and provide opportunities for mathematical exploration that will give them personal experiences in which to ground discussions about teaching and learning mathematics. Also encourage them to visit classrooms where teachers are using the new curriculum. During this time, many districts also offer professional development focusing on mathematical content knowledge and pedagogical practices. This kind of ongoing professional development can build a strong foundation for a successful implementation.

Early Implementation: "Just in Time" Professional Development

When it is time to unwrap the teacher's edition, find storage space for the new collections of manipulatives, and figure out how to introduce the first lesson of the year, teachers suddenly find that they are faced with a host of practical, detailed questions that couldn't easily be anticipated by a theoretical understanding of the curriculum. It can take a year (or even two or three) for teachers to feel as if they have mastered the mechanics of a standards-based program.

Because these curricula explore mathematical ideas through a variety of activities and materials, lessons have many moving parts—manipulatives, calculators and/or computers, different kinds of working groups, journals, and worksheets. It is challenging to organize and coordinate all of these parts, and teachers who are new to standards-based curricula often have very real and pressing questions, for example, what materials will I need to pull together for this activity? what preparation do I need to do? what black-line masters will I need to get photocopied? how many computer stations do I need for this lesson, and what do students work on when it's not their turn at the computer? Some teachers also need time to become accustomed to the instructional model embedded within these curricula, for example, starting with a contextually based problem or managing the "Launch–Explore–Summarize" organization of mathematical investigations.[9]

Pacing is another issue that teachers universally encounter in the first year or two of implementation. Many teachers find that standards-based curricula are very rich and that there is much more material than a class can actually complete in a single year. It may be difficult for teachers to anticipate the amount of time it will take to complete units, since so much of the pacing of lessons depends on student-generated activity, rather than teacher-generated lecture and demonstration. Teachers are faced with the need to make decisions about where to focus class time and where they can skip material without sacrificing important student learning. Many teachers have found it very useful to work through lessons themselves before class in order to clarify the mathematical focus of the

[9] This organization is presented in the middle grades curriculum *Connected Mathematics*, published by Cuisenaire • Dale Seymour. In the "launch" phase the teacher establishes a context for the problem the class is to investigate. Students work to solve the problem during the "explore" phase, and the "summarize" phase serves as the occasion for students to discuss their work, deepen their understanding, and make connections to other mathematical ideas. Other curricula use variants of the same process.

unit and anticipate some of the issues and ideas their students may bring to the lessons. Actually working through the activity also helps teachers recognize new ideas in the mathematics they have been teaching, or articulate previously unexplored connections among mathematical ideas.

Even with this kind of preparation, pacing decisions are still difficult to make the first or second time through the curriculum, as teachers cannot yet draw on their prior experience with the ways lessons unfold in the classroom. They will need guidance to help them identify those lessons that are central for developing important mathematics and those that are more ancillary or supplementary, and to understand how mathematical ideas play out throughout the year. This is particularly a challenge for curricula that "spiral," revisiting ideas over the course of the year rather than providing all of the instruction geared toward a particular idea in a single unit. Without experience in how a curriculum develops spiraling ideas over time, teachers have difficulty knowing when they can let go of something for the time being because students will meet up with it again later in the year or at another grade level. Once teachers have worked their way through the curriculum a few times, pacing issues generally become more manageable.

At the same time that teachers are working to become acquainted with the curriculum, they often are called on to explain (and sometimes defend) it to their students' parents. Teachers who are already familiar with standards-based curricula and invested in the general approach may not find it particularly difficult to represent the new curriculum to parents, but teachers who are just learning about the curriculum themselves may have some trouble. You can support teachers in this task by offering concrete suggestions for productive ways to work with parents, and preparing others in the district (e.g., principals, mathematics supervisors, and mathematics department heads) to assume some of this responsibility.

Meeting "Just in Time" Implementation Needs

There is an immediacy to these kinds of implementation concerns. Feeling comfortable and in control of the mechanics of any particular lesson can make the difference between having the class flow smoothly and having it feel like a train wreck. Having a clear sense of pacing helps teachers make decisions about the amount of time to spend on individual lessons. Teachers who are wrestling with these kinds of logistics need practical, "just in time" support to help them manage the curriculum and direct more of their attention to the mathematical agenda. You can help provide this kind of support in a number of ways:

- Negotiate professional development with the curriculum's publisher as part of the district's purchase package. Many publishers do conduct introductory workshops to orient teachers to the program. (Curriculum developers may provide similar kinds of support, as well as more in-depth training, through the satellites of the NSF-funded curriculum implementation centers; see Appendices 1 and 2 for contact information.)

- Help teachers develop images of standards-based instruction by arranging for them to consult with experienced users in other schools and/or districts and, if possible, visit their classrooms. You may also be able to get videotapes of lessons from the curriculum publisher or the appropriate satellite implementation center.

There need to be support groups for teachers, where they can share their experiences and really talk about what it's like to use the materials—what's working and what's not. Structures need to be in place; some stuff can happen districtwide, but it's really important for things to be together at the school level. (K. A., regional LSC director)

- Make sure that teachers have access to consultations with teacher coaches, mentors, mathematics supervisors, or other trained district personnel when they have questions or problems with implementation.

The school has to make a commitment to give teachers some kind of release time so the teachers can deal with bringing this new stuff into their lives, because it is a big change. (M.N., high school teacher leader)

- Hold regular grade-level meetings about teachers' implementation experiences. These meetings provide a venue for teachers to work together on implementation issues, provide support for each other, and learn as a team.

- Schedule common preparation times so teachers can meet regularly to share experiences, plan and debrief lessons, and generally support each other's efforts. Other than actually coteaching, no other formal form of support is as ongoing and as tied to the daily details of the curriculum as regularly preparing lessons together.

We've tried to develop a document that describes the big ideas in each of the units, indicating when students should have mastery of particular ideas. We've collected data from teachers' classrooms, using these materials to supplement what we got from the units, i.e., examples of student work. We'll be using it with parents and new teachers. (J.F., K–12 mathematics coordinator)

- Provide teachers with a scope and sequence guide that is keyed specifically to the new curriculum. This guide will help teachers identify lessons that address skills and concepts of particular importance to the district and make decisions about pacing.

- Develop guidelines and/or materials to help teachers talk with parents about the new curriculum.

Ongoing Implementation: Deepening Mathematical Understanding and Developing Classroom Practice

Once teachers have become familiar with their new curriculum and are less preoccupied with the details of setting up and carrying out the individual lessons, they can turn their attention more fully to consideration of the pedagogical and mathematical innovations that are part of standards-based curricula. For many teachers, this means exploring new ways of thinking about mathematics as a body of knowledge, what it means to know or understand mathematics, and how best to promote mathematical learning. Teachers begin to move away from concerns about the mechanics of lessons, and become more attentive to questions about their students' learning.

Focusing on Student Learning

Below are examples of questions that characterize teachers' shifting attention from implementing the logistics and mechanics of a standards-based curriculum to facilitating students' mathematical thinking.

SAMPLE QUESTIONS ABOUT LOGISTICS	SAMPLE QUESTIONS ABOUT STUDENT LEARNING
• How can I allot enough class time for students to finish their group work and also have a class discussion? • What kind of homework can I assign when students are at such different places in their explorations? • When should my students be working in groups and when should they work on their own? • Where should I keep manipulatives so students can have access to them without disrupting their classmates' work?	• How do I know whether a discussion is moving in a mathematically productive direction? • What kinds of questions can I ask students that won't be leading but will nonetheless guide them to further their mathematical understanding? • What important mathematical ideas do I want students to take from this unit, and how does this specific lesson advance their understanding of those ideas? • What did Sylvia and Hector mean when they said that 1/2 could sometimes be bigger than 1/3 and sometimes smaller?

During this time, teachers need professional development that will help them deepen their understanding of the mathematics in the curriculum and develop more effective means of facilitating student learning. To some extent, the new curricula themselves will stimulate teachers to consider these issues. But, while the programs can help raise issues and challenges for teachers, they cannot by themselves help teachers resolve them. For this, more extensive professional development is needed.

*In the first year we were dealing with classroom implementation: "How do I get started with the curriculum, how do I organize, how do I deal with correcting all the homework?" In the second year teachers were ready for more content development. The materials are rich with mathematics content information. It's there if the teachers are able to read it and take it in [without being overwhelmed by the logistics of the program]. They need to have the chance to take a summer institute on content, **after** the first year. (M.T., K–8 mathematics supervisor)*

Mathematics

Some of the mathematical content of standards-based programs, as well as the contexts in which this content is presented, may be new and unfamiliar to teachers. With lessons framed as challenges, for example, to design efficient floor plans, develop ciphers and codes, or plan for a long journey, the mathematical concepts that drive lessons may not always be apparent. Teachers may need help drawing connections between the activities and the mathematics that motivates them. They may also need help learning to increase their emphasis on engaging students in mathematical processes—reasoning, problem solving, communicating, and making mathematical connections. Because much of the instruction with

standards-based curricula occurs through interaction in the classroom instead of lectures and individual seatwork, teachers need to be more aware of whether the ideas that students are developing in their explorations and discussions are important and actually worth pursuing. Using these new curricula, teachers are called on to think more about how their students' ideas are building toward greater mathematical understanding.

I'm starting to think that adopting the most forward-thinking curriculum is foolhardy without the appropriate teacher support. Teacher readiness for materials is key. It needs to happen early on, and teachers need . . . support over time, on both the content and the pedagogy. I'm finding that there are a lot of teachers who don't know [all of] the mathematics behind the activities. (K.A., regional LSC director)

In the past teachers have not generally been called on to develop these kinds of judgments about mathematics, and it will take time for them to learn to do so. Standards-based materials require teachers to have a firm grasp on the important mathematical ideas that underlie the curriculum and an understanding of how children develop these ideas. They also require teachers to understand the connections between these ideas and the individual activities and to recognize the possibilities for student learning in materials that do not look like traditional lessons. For some teachers, this means deepening their own understanding of the mathematics they teach.

Pedagogy

When you enter a mathematics classroom at any grade level that is using standards-based materials, the activity in the room may seem quite foreign compared to your own mathematics classroom experiences. If you were to visit a class involved in a small group activity, you would find students freely moving about the room, talking with each other, and maybe even arguing heatedly. The teacher would be moving among these groups, checking in with students about what they were finding and asking questions to direct their work toward the major mathematical ideas of the lesson. If your visit coincided with a class discussion, students might be responding to questions from the teacher, sharing a problem solution at the overhead projector or blackboard, explaining the reasoning behind their ideas, or asking each other questions. And if you were to visit when students were working individually, you might nonetheless see them going to classmates with questions or sharing observations and ideas.

Because so much of the mathematics work in standards-based classrooms happens in the context of interactions, teachers must learn to draw mathematical learning out of the flow of ideas going on around them. They must learn to recognize important mathematical ideas as they come up and know how to take advantage of "teachable moments." They struggle with when to offer students guidance and when to leave them to their own process of exploration and discovery. They need to learn how to uncover students' ideas, drawing them out toward a more developed understanding. These ways of working are learned through experience, thoughtful reflection, discussion with colleagues, and professional development.

Facilitating Classroom Learning

The following vignette depicts a typical scene in a standards-based classroom.

Mrs. Martinez and Mr. Golden, who have teamed up to teach eighth grade this year, have divided their students into groups of four. The teachers have challenged them to show why the text says that division by zero is "undefined." The teachers want their students to know "why you can't divide by zero." Once the students figure out why division by zero is undefined, they are to prepare something that they could use to justify their explanation to the rest of the class.

Mrs. Martinez suggests that the calculator may be a useful tool for this problem. "Making up some kind of story problem for the situation that involves division might be helpful for others," adds Mr. Golden. The two teachers have arranged their large classroom so that calculators, graph paper, Unifix cubes and base 10 blocks, felt-tip markers and blank overhead transparencies, rulers, and other materials are out where students can freely use them. This facilitates the use of alternative tools. Students are encouraged and expected to make decisions about which tool to use. Several students are . . . preparing overheads to display their conclusions about division by zero. Others are excitedly punching buttons [on their calculators].

"The answer keeps getting larger and larger!" exclaim a pair of girls as they watch the results obtained by successively dividing 4 by smaller and smaller divisors with the calculator. "Why is that important?" asks Mrs. Martinez as she watches over one girl's shoulder. "Well, because each of the numbers we are dividing by is getting closer and closer to zero but isn't zero." "Maybe you could make a graph to show what you are finding," suggests Mrs. Martinez.

Mr. Golden finds two students slouching sullenly in their chairs behind the room divider. "We don't understand what to do," grumbles one. Sitting down next to them, Mr. Golden begins, "Let's see if I can help. You are trying to figure out what the special problem is in trying to divide by zero. Maybe you can use some things you already know about division. How do you know that $8 \div 2$ is 4? How could you prove that if someone challenged your answer?" The students look at him disbelievingly. He waits. Then one says, "Well, I'd just say that 4 times 2 is 8 so 8 divided by 2 has to be 4." "Can that help you at all with this problem?" asks Mr. Golden. He stands up. The two students look at one another and then, sitting up a bit, begin talking. "Well, that doesn't work if you take $8 \div 0$," Mr. Golden hears as he walks away. [10]

It takes time and support for teachers to learn to conduct classes in this way. Some of the changes are relatively easy (for example, asking students to explain the thinking behind their problem solutions), but learning to use the pedagogical approaches in the service of rigorous mathematical learning takes time for reflection, refinement, and practice.

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[10] Excerpted from *Professional Standards for Teaching Mathematics*. (1991). Reston, VA: National Council of Teachers of Mathematics (pp. 53–54).

Implementing the pedagogical innovations of standards-based curricula does not mean simply adopting new forms of teaching in and of themselves. Standards-based instruction employs these forms of teaching in the service of promoting students' learning of important mathematical content. The purpose of asking students to share their thinking, for example, is not simply to have students participate in class discussion but to bring mathematical ideas to the attention of the class in order to explore and develop them further. However, simply sharing their thinking doesn't ensure that students will learn more mathematics. The teacher must *do* something with these ideas in order to promote further mathematical understanding—for example, pose a new problem, raise questions that cause students to extend their thinking, or have students with different ideas work together so they each have a chance to think about the subject in new ways.

Teachers also need personal and emotional support during implementation, although this is rarely acknowledged as an important part of the process. Standards-based curricula make a variety of new demands on teachers which may leave even the most experienced veterans feeling somewhat uncertain—even uneasy—about their mathematics teaching. It is difficult for people who take pride in their work and have a strong sense of responsibility as educators to feel suddenly less confident in their ability to implement the new materials. Some have suggested that the job of preparing to teach new content while developing new instructional techniques is much like trying to re-engineer an airplane while it's in the air. The end result may be vastly improved, but there are some harrowing moments along the way. It is important to be sensitive to these issues when providing support to teachers and address them as directly as you can.

Meeting Ongoing Implementation Needs

Teachers who are working to deepen and extend their classroom practice are engaged in serious and substantial professional development. Your support of their efforts is an investment in the quality of your community's teaching and learning. You can support their ongoing implementation needs in a number of ways. Some strategies that other districts have used are described below.

- Develop workshops, seminars, and summer institutes focusing on instructional issues that are particularly germane to your faculty. Examples of issues that have been relevant to districts include exploring new mathematical content from the curriculum, developing assessment tools, and analyzing student work.
- Provide teachers with information about opportunities for ongoing professional development. Contact local university partners and educational organizations for their course offerings; get referrals for seminars, workshops, and institutes from the NCTM and the NSF-funded implementation centers; and use the World Wide Web to find professional development courses (see "Professional Development Resources" at the end of this section for some specific websites).

We began the process with [implementation help from the] publishers, and at the same time I was training "math cadre" people. Once school started, math cadre people would take over and the staff development would be done by our teachers. The goal was for a third grade teacher using the program to in-service other third grade teachers, so she could say, "Look, I'm using these materials and they really do work." (V.M., supervisor of mathematics, science, and technology)

*The best professional development is what happens informally in the department—and what you need for that is **time**. The kind of learning that goes on as colleagues talk with each other day after day is huge. It's hard not to get it when you're talking about it every day. (G.T., middle school mathematics teacher)*

- Continue holding grade-level meetings at which the focus is on substantive issues of mathematics learning and teaching. Hold cross-grade meetings on a regular basis, as well, so that teachers can develop a broader perspective on the curriculum as a whole and the development of mathematical ideas throughout the grade span.
- Provide mentors to consult with teachers about their practice. Mentors can help teachers with implementation issues in a number of ways, for example, observing lessons and debriefing with the teacher afterward, coaching, demonstrating lessons, co-teaching, and providing assistance in planning lessons.
- Encourage teachers and principals to develop a culture of inquiry in their schools in order to promote a work environment that encourages reflection and thoughtful discussion among colleagues. While there's no recipe for developing this kind of atmosphere, there are some qualities that can help, such as administrators' interest in participating in substantive conversations about mathematics and mathematics teaching; respect among the faculty for teachers' efforts to change their practice; the ability to listen to colleagues without evaluating them; and a willingness to try out new ideas.
- Help teachers develop skills and strategies for serving as spokespeople. Parents often call on their children's teachers to represent the new curriculum. All members of the school community should be prepared to educate parents about the changes happening in mathematics education within the district.
- Provide training for principals and mathematics department heads about the philosophy and goals of mathematics education reform and the particular instructional demands of the curriculum you have just adopted. In addition to serving as instructional leaders for the teaching staff, these administrators must be able to represent the new programs to parents and be prepared to listen to parents' concerns.
- Provide written support material to teachers. Some resources and sources for further information are included below.

Professional Development Resources

Selected Print and Video Materials

Professional Development Materials

- **Bridges to Classroom Mathematics** (publisher: COMAP) is designed for elementary school teachers. It includes a generic professional development component that is appropriate for use with teachers implementing any standards-based curriculum, and components specific to *Everyday Mathematics* and *Investigations in Number, Data and Space*. Find more information at the COMAP website <http://www.comap.com/elem_bridges_to_classroom_mathematics.htm> or call (800) 772-6627.

- **Developing Mathematical Ideas** (publisher: Cuisenaire • Dale Seymour) is available as a series of modules focusing on students' development of particular mathematical ideas central to the elementary grades curriculum. It is appropriate for teachers working with any standards-based curriculum. Contact Cuisenaire • Dale Seymour at (800) 872-1100.

- **STREAM** (publisher: COMAP) is a collection of video and print materials designed to provide an introduction to important themes of mathematics education at the secondary level. These materials are intended for use with teachers, parents, and administrators. Find more information at <http://www.comap.com/hs_secondary_training_reform_materials.htm> or call (800) 772-6627.

- The **Annenberg/CPB (Corporation for Public Broadcasting) Learner Online Math and Science Collection** contains print guides, videos, and software showing concrete examples of good teaching and active learning in a variety of settings. It also includes professional development resources for teachers. More information is available at <http://www.learner.org/collections/mathsci/>.

- **The TIMSS (Third International Mathematics and Science Study) Resource Kit**, available through the National Council of Teachers of Mathematics (NCTM), contains four modules designed to foster examination of curriculum, teaching, student achievement, and pursuing excellence in education. The kit also includes understandable reports of TIMSS research findings; videotapes of classroom teaching; guides for using the research information in discussions; presentation overheads with talking points for speakers; checklists, leaflets, and flyers. For more information, call (800) 235-7566 or visit the NCTM website at <http://www.nctm.org/catalog/new-resources/668.html>.

Resources for Designing and Developing Professional Development Programs

Many currently available print resources and videotapes can be used to provide examples of standards-based instruction and stimulate discussion in professional development settings. In addition to the resources listed below, contact the publisher of your curriculum and the appropriate satellite implementation center about the availability of materials specific to the curriculum you have adopted.

- **Ideas at Work: Mathematics Professional Development** is a pamphlet published by the Eisenhower National Clearinghouse for Mathematics and Science Education. It presents a framework for creating professional development programs and summarizes different strategies for professional development. Contact the Clearinghouse at (800) 621-5785 or on the web at <http://www.enc.org>.

- **Designing Professional Development for Teachers of Science and Mathematics** by Susan Loucks-Horsley, Peter W. Hewson, Nancy Love, and Katherine E. Stiles (Thousand Oaks, CA: Corwin Press, 1998) offers an in-depth examination of the principles of effective professional development and a discussion of the issues that emerge in applying those principles in practice. This book would be an excellent resource for those interested in an expanded treatment of the ideas suggested in *Ideas at Work*.

Case Materials

Several casebooks address the issues involved in learning to use standards-based mathematics materials, including:

- *Fractions, Decimals, Ratios and Percents: Hard to Teach and Hard to Learn?* by Carne Barnett. (Portsmouth, N.H.: Heinemann, 1994)

- *Windows on Teaching: Cases of Secondary Mathematics Classrooms* by the Harvard Mathematics Case Development Project. For information contact the Harvard Project on Schooling and Children at 126 Mount Auburn Street, Cambridge, MA 02138, or call (617) 496-6883.

- *Reconstructing Mathematics Education: Stories of Teachers Meeting the Challenge of Reform* by Deborah Schifter & Catherine Twomey Fosnot. (New York: Teachers College Press, 1993)

- *What's Happening in Math Class? Volume 1: Envisioning New Practices through Teacher Narratives,* edited by Deborah Schifter. (New York: Teachers College Press, 1996)

- *What's Happening in Math Class? Volume 2: Reconstructing Professional Identities,* edited by Deborah Schifter. (New York: Teachers College Press, 1996)

Professional Development Contacts

- Publishers offer some introductory professional development. Contact the publisher of the curriculum you have adopted to find out about its workshops.

- NSF implementation centers have professional development offerings. Contact information for the implementation centers is provided in Appendices 1 and 2.

- A number of organizations have information on their websites regarding professional development in mathematics. Some also have up-to-date databases that list professional development programs. Here are some examples:

~ National Science Foundation, <http://www.nsf.gov>. The Teacher Enhancement Program in NSF's Division of Elementary, Secondary, and Informal Science Education funds Local Systemic Change projects and Educational Leadership projects. See <http://www.ehr.nsf.gov/EHR/ESIE/programs.htm>.

~ U.S. Department of Education <http://www.ed.gov>. The Eisenhower National Clearinghouse (ENC) is a resource for K-12 mathematics and science educators which is funded through a contract with the U.S. Department of Education. ENC provides a searchable database for information on education-related issues. See <http://www.enc.org>. ENC also provides professional development links that highlight strategies and successful programs across the country at <http://www.enc.org/reform/ideas/133273/index.htm>.

~ TERC <http://www.terc.edu> is a nonprofit, educational research organization that focuses on mathematics and science teaching and learning. At <http://www.terc.edu/getinvolved.html>, TERC lists workshops, field test results and research studies about mathematics education.

~ National Staff Development Council (NSDC) <http://www.nsdc.org>. The NSDC is a nonprofit organization providing services and publications about planning and implementing staff development. It offers an array of workshops and a training academy for staff developers.

~ National Council of Teachers of Mathematics (NCTM) <http://www.nctm.org>. NCTM posts online announcements and links for upcoming professional development opportunities. Workshops, conferences, and grants are among the informational categories. See <http://www.nctm.org/classifieds/announcements/index.html>.

~ Math Forum <http://www.forum.swarthmore.edu>. The Math Forum is an online community of math educators, researchers, and students that provides web-based discussions, interactive question services, and links to mathematics education sites. The Math Forum professional development link at <http://forum.swarthmore.edu/mathed/professional.dev.html> provides a list of internet resources for teacher education and development.

~ Project 2061, of the American Association for the Advancement of Science, offers several types of workshops which can be customized for the particular needs of a district or individual school. Learn more about these professional development programs at <http://project2061.aaas.org/pdp/wkshop.html>.

Budgeting for Professional Development

As we work and talk with district leaders who have been implementing standards-based mathematics programs, one message always comes through loud and clear: Teachers need support to learn how to implement standards-based curricula effectively, and this support costs money. There's really no other way to ensure a successful implementation. There are layers of complexity to the instructional approaches these curricula employ, and teachers cannot be expected to uncover and master them all without assistance. Without professional development for

teachers, the success of your implementation will be at risk, so make sure that you plan for these costs in your budget (see Chapter 7, "Cost Considerations").

You can be creative about how to piggyback moneys to pay for this professional development. One district, for example, obtained a matching funds grant from its NSF-supported State Systemic Initiative (SSI) to buy teachers a free period to use as a common preparation time. Some districts have been successful in arranging for volunteers from local businesses and industries to serve as substitute teachers one day a month so teachers can attend professional development seminars.

Summary

Be strategic about your plans for teacher support. Your professional development will be a lot more effective if, at the outset, you anticipate your major needs and develop focused plans for allocating resources to address them. (This was one of the major reasons you conducted the needs and resources assessment detailed in Chapter 4.) There are two main issues to think about when planning your professional development: (1) providing ongoing teacher support, and (2) scaling up your implementation.

Remember that the implementation process for teachers who are new to standards-based mathematics materials is a rather extended one, and that teachers' needs change over time. Be prepared to offer teachers "just in time" support at the outset of the adoption and to shift to more substantive mathematical and pedagogical professional development as implementation progresses. Also, your professional development will have a greater impact on teachers' practice if you focus on a small number of critical challenges, rather than taking more of a smorgasbord approach.

In some districts (and at some grade levels) scaling up means that every teacher in the district is using the new curriculum materials; in others, a full-scale implementation does not necessarily mean that you will find the new curriculum on every desk in every classroom. Whatever full-scale implementation means for your own district, you will need to have a plan for responding to the professional development needs of an entire district of teachers who are at different points in the implementation process (see also Chapter 11, "Implementation Rollout").