



What to Look for in Your Math Classrooms

Barbara Scott Nelson and Annette Sassi

Knowing math facts isn't good enough.
Do your students understand the
concepts behind those facts?

IN BRIEF

Principals need to get away from traditional beliefs that equate math success solely with rote knowledge of math facts and the ability to calculate. Today, math instruction also is being directed to student understanding of essential concepts. Principals must learn what to look for when they visit math classrooms to make sure it is being taught effectively.

The combination of new instructional methods and new accountability pressures puts many principals in a quandary when it comes to evaluating the adequacy of mathematics instruction in their schools. How can you tell if teachers are using new methods effectively? And how can you tell if they are striking good balance between teaching mathematical facts and calculation procedures, and also developing in students a good conceptual understanding of mathematics?

For about 10 years, we and our colleagues have been studying how elementary school principals think about and work to improve mathematics instruction. We have worked closely with nearly 100 elementary principals from urban, rural, and suburban districts, and both large and small schools. We presented our major findings in a recent book, *The Effective Principal: Instructional Leadership for High-Quality Learning*.

While we worked with these principals on many aspects of their instructional leadership, the process of classroom observation and teacher supervision seemed especially important to them. By visiting classrooms and talking with teachers, they come into direct contact with instruction, judge its adequacy, and decide what help a teacher may need. But understanding what is happening in today's math classes and making judgments about its adequacy

may be especially challenging for veteran principals, since the kind of instruction occurring there may be very different from what they experienced as students or how they taught mathematics when they were teachers.

An Emotional Jolt

Many principals assume that if students know basic mathematical facts and can perform basic calculations, they understand mathematics. Often, this is not the case. Students who appear mathematically competent may, in fact, have very fragile conceptual understanding.

One of the principals in our study first observed the disconnect between facility in calculating and mathematical understanding after seeing a video in one of our classes. He later tested what he had seen in his school by observing a third-grade class and talking with the students. “Lo and behold, I found a lot of our students in that class had not established a basis of understanding, but had established a series of rules. ‘Why do you do this?’ I asked a student. ‘Because that’s what I was told,’ he said.”

Many principals have experienced this emotional jolt because they have always assumed that if students can do the problems, they understand the mathematics. So it can be quite a shock to realize that some they once considered to be good mathematics students might not do very well on high-stakes tests that focus on mathematical understanding.

Looking for Strategies

Many principals have become convinced that students’ conceptual understanding is important. They realize that students need opportunities to think about and articulate important mathematical ideas, and they look for classroom practices and structures that encourage this to happen. These may include such instructional strategies as:

- Using a variety of manipulatives to explore, represent, and communicate mathematical ideas;

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- Using some portion of the class time to have students work on mathematical tasks in small groups;
- Having students discuss their work in small-group and whole-class configurations;
- Having the teacher circulate among student groups, listening to their discussions with an eye to identifying mathematical issues that the entire class might profitably discuss;
- Having the teacher ask open-ended questions that do not require “yes” or “no” answers, but invite students to explain their mathematical thinking.

Looking for instructional strategies like these is a step in the right direction for principals seeking to understand what is happening when they observe in mathematics classrooms. However, implementation of such strategies alone will not guarantee that a math class is providing students with the opportunity to think carefully and rigorously about the central mathematical ideas of the lesson. Small-group work can miss the mark, working with manipulatives can fail to bring students into contact with the mathematical concepts these instructional tools are intended to illuminate (Ball 1992), and enumeration of problem-solving strategies without discussion of their accuracy or effectiveness can deprive students of the opportunity for rigorous mathematical thinking. Principals need to go beyond looking for particular instructional strategies in evaluating mathematical instruction.

Focusing on Mathematical Thinking

What is considerably more challenging for principals to do during classroom observations is to use their own mathematical knowledge to make

an assessment of what the students are understanding correctly (and what they do not yet understand) and how the teacher’s instructional moves—discussion questions, brief dialogues with particular students, assignment of follow-up tasks, and so on—respond to the students’ mathematical ideas and give them the opportunity to inspect the validity of those ideas, or to modify them if necessary.

Some principals have been able to develop this skill through professional development or by working closely with skilled teachers in their schools. These principals did not necessarily have strong mathematics backgrounds, but over time they have developed an ear for listening to students’ mathematical thinking.

Focusing on students’ mathematical understanding, and on teachers’ ability to understand that thinking and interact with it, is a different classroom observation focus for many principals. As one of them acknowledged, “I’m not at a place where I can [do this] expertly without questioning myself. So it’s a work in progress...”

Learning to Listen

To understand what is happening in today’s math class and make informed judgments about the adequacy of the instruction, principals need to listen to students’ mathematical thinking and make judgments about the teacher’s capacity to listen and to make instructional moves that can help students’ thinking process. There are a number of ways to do this, including the following:

- Observe good math teachers at work in your school from a stance of learning, not evaluation, and ask them afterward what their students were thinking about, and why the teachers responded the way they did.

- Sit in on professional development sessions for teachers in mathematics instruction—especially those that use classroom artifacts, such as videotapes or student work—that are designed to help teachers learn to understand students’ mathematical thinking.



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**“...principals need to...
make judgments about
the teacher’s capacity
to listen and to make
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There is much for principals to learn about how and under what conditions new instructional methods work in mathematics classrooms, how to support teachers as they develop new instructional skills, and how to integrate a commitment to high-quality mathematics instruction with the demands of high-stakes testing. But the foundation for all of these is listening carefully and knowledgeably to students’ mathematical thinking. ■

WEB RESOURCES

The Center for Development of Teaching, a division of the Education Development Center, describes professional development for administrators in understanding the nature of mathematics and how it is taught and learned.
www2.edc.org/CDT/cdt/cdt_admin.html

The Developing Mathematical Ideas Project of the Center for Development of Teaching is a professional development program designed to help teachers think through the major ideas of K–7 mathematics and examine how children develop those ideas.
www2.edc.org/CDT/dmi/dmicur.html

The Learning Mathematics for Teaching Project investigates the mathematical knowledge needed for teaching, and how that knowledge develops through experience and professional development.
<http://sitemaker.umich.edu/lmt>

Reference

Ball, D. L. “Magical Hopes: Manipulatives and the Reform of Math Education.” *American Educator* (Summer 1992): 14–18, 46–7.

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