FOREWORD

"Research says …"

In education, this phrase is often followed by claims about what works in teaching and learning. I regularly find myself responding with clarifying questions:

"What do you mean by *research*? How was the study designed?"

"How was *success* defined? Success for whom, under what conditions?"

"What do you mean by *effective*? How was effectiveness *measured* in this research study you're citing?"

Sometimes, the answers are underwhelming. For example, I'm rarely convinced we should change teaching practices based on studies that used a single measure of success, such as annual standardized test scores, and that were conducted without researchers setting foot in the subject classrooms to see what was actually going on. Other times, I'm enthralled and informed by research, if that research involved thoughtful and serious study of teaching, learning, and student thinking.

Peter Liljedahl's work is that second kind of research, the research I can't get enough of. In my reading of Liljedahl's work, *research* means exploring important, testable questions with more than four hundred teachers and their thousands of students over 15 years. *Success* means getting more of these students thinking in math class, for longer amounts of time. *Effective* describes teaching decisions and practices that create conditions for student thinking. And results are *measured* by watching what students do: How many seconds does it take students to get to work? How long do they persevere? How engaged are they? How often do they pull out their phones for distraction? Who is participating? How much do students talk? How much does mathematical knowledge move from one group to another?

Liljedahl is a studier of students. By valuing, observing, and interviewing them, he has gathered incredibly useful information

about one of the slipperiest questions in education: *What works?* For example, does it make a difference if teachers assign students a task by projecting it, printing it, writing down a textbook page number, or explaining it verbally? (Turns out, yes!) While teachers introduce this assignment, does it matter if students sit or stand? (It does.) How much of an impact does the timing of the launch within the lesson have? (A lot.) While students work on the task, should they use notebooks, chart paper, or erasable surfaces? In groups or individually? If they're in a group, should everyone have a marker, or just one student? What's the optimal group size? How should these groups be formed? How frequently should they change? These are just a few of the hundreds of questions Liljedahl and his colleagues considered and tested through tens of thousands of hours of classroom experimentation to figure out what works and what matters. When they discovered a technique that yielded a significant benefit during a two-week trial—as measured by increased student engagement and thinking—they collaborated with teachers to refine the technique over several weeks, and then tested the results with many additional teachers in a wide range of settings over longer stretches of time. Only lasting techniques that produced the most student thinking and were transferable across teachers and schools have made it into this book.

The practical, readable resource you're holding in your hands is an enormous gift and guide to math teachers. Liljedahl has identified the most effective changes we can make to get our students thinking and keep them thinking longer. He has organized these shifts into an intuitive framework so we can start as soon as we are ready and tackle one piece at a time. Liljedahl uses common sense, refreshingly honest student voices, and everyday language to describe ideas and behaviors: when he talks about "now-you-try-one" tasks or "I-write-you-write" notes, we know just what he means. Every moment is grounded in classroom reality and the path ahead feels so doable because of the way he has laid it out for us. I found myself nodding regularly as I read, and I am grateful that he has organized and described his findings with such clarity that we can implement these shifts incrementally, in the most effective sequence.

Incremental doesn't mean gradual, however. Even though the specific shifts are practical and manageable, they will feel disruptive—that's actually the main idea. Liljedahl argues convincingly that we need to interrupt the entrenched patterns of school. Students arrive at our classroom doorsteps each year, week, and day expecting the same familiar script: They take their seats and we stand at the front of the room. We show them what to do on the board and they copy it down

in their notes. They then mimic us through worked examples, again on homework problems, and finally on a test scored by percentage. Over the course of *Building Thinking Classrooms in Mathematics*, we learn from Liljedahl's contrarian logic to question and replace each of these familiar patterns with different, more effective, field-tested techniques. Instead of sitting during a discussion, students stand. Instead of taking mindless notes to please us, they take notes that would be helpful to their future forgetful selves. Instead of mimicking our methods alone, they think about new problems together, and so on. We make these changes not for the sake of change, nor for ideological reasons, but because these practices lead to increased student thinking in hundreds of diverse classrooms. Taken together, these practices signal to students that this class is different: In this class, they'll be expected to think.

Why does it matter? Because most of our students do an awful lot of "studenting," but not much thinking. Students from communities that have historically been excluded from mathematics are often denied access to thinking at all. For the health of our students and our societies, we need to challenge institutional norms and build thinking classrooms in which we value students' thinking and time rather than use legacy practices that encourage students to slack, stall, mimic, and fake their way through the system. In Chapter 9, Liljedahl wrote that the "goal of building thinking classrooms is not to find engaging tasks for students to think about. The goal of thinking classrooms is to build engaged students that are willing to think about any task."

Given the enormity of the problems we all face, I am especially eager for teachers to implement the ideas and techniques in *Building Thinking Classrooms*. Could there be anything more important and pressing than teaching students how to think?

—Tracy Johnston Zager
Author of *Becoming the Math Teacher You Wish You'd Had: Ideas and Strategies from Vibrant Classrooms*