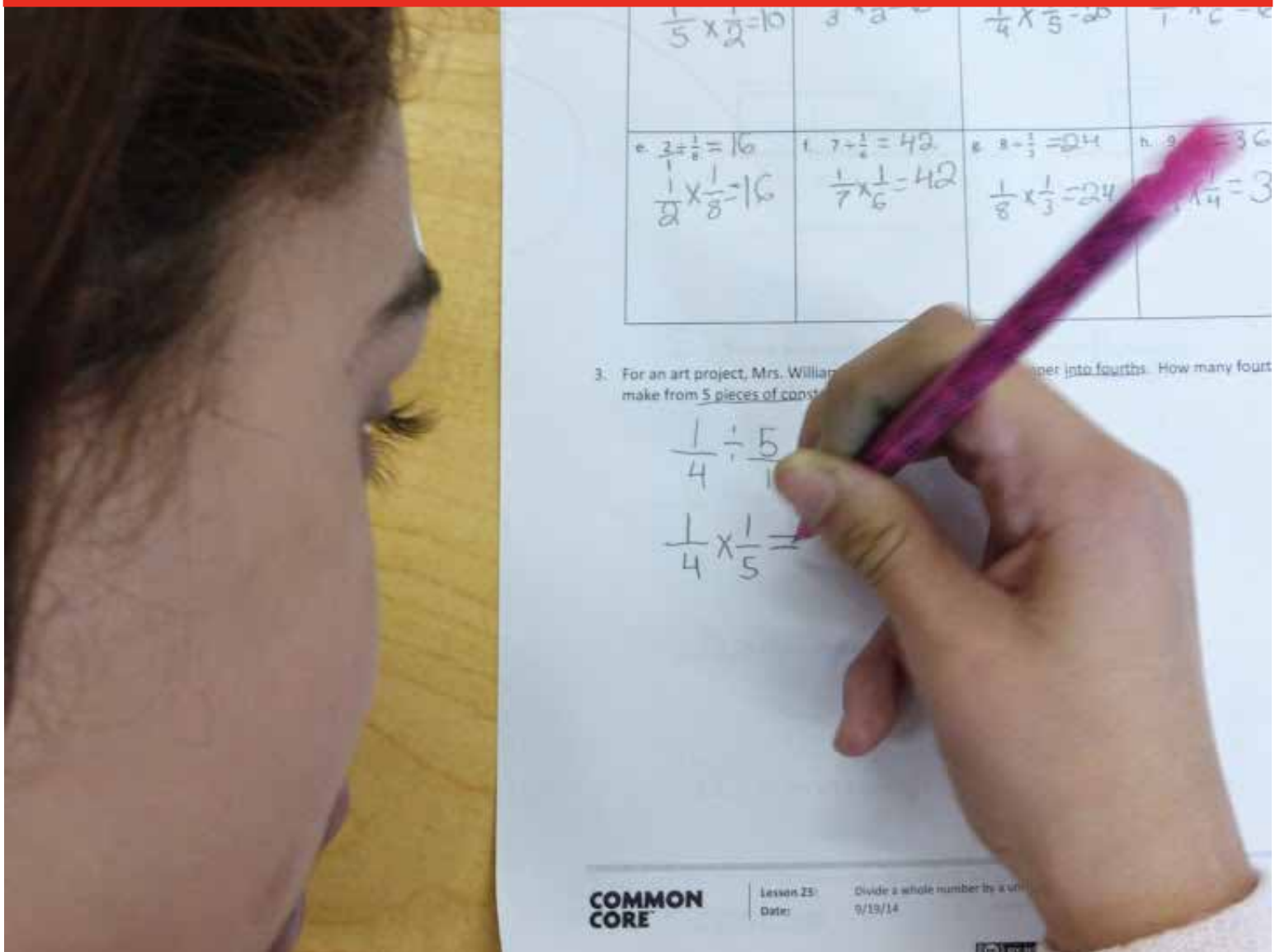


Conquering Teachers' Math Anxiety:

How two schools are tackling the Common Core

BY LYDIE RASCHKA AND CLARA HEMPHILL



It's not surprising that many elementary school teachers struggle with the Common Core State Standards for math. Many early childhood teachers are actually frightened of math. They may doubt their own ability and have chosen a profession where they think it won't matter.

In fact, one study says elementary education majors, who are overwhelmingly female, have the highest levels of what is called "math anxiety" of any college majors. They do their best to avoid math, and unwittingly pass their anxiety on to their pupils, particularly to girls.¹

Overcoming this fear is one of the most vexing problems in early math education, one exacerbated by the fact that the Common Core has raised expectations concerning what children should know. This policy brief looks at how two schools—one on Staten Island and one on the Lower East Side—have dealt with the problem. Both schools have strong female leaders and mostly female staff who have found ways to confront their own math phobia, become excited about math and communicate that excitement to students. Rather than focus on quick gains in test scores, they strive for steady improvement of their own and their pupils' understanding of math. While the standards and their implementation remain a matter of fierce debate, both critics and supporters of Common Core can agree that's a good thing.

The city should emulate these schools by offering intensive staff development to elementa-

ry school teachers to ease their math anxiety. Teachers need time during the school day to relearn the math they learned as children, framed to enhance understanding of underlying concepts, not just the mechanics of lining numbers up in rows and "carrying" or "borrowing." Some schools do this well, but many teachers feel they are on their own to figure out what is required of them.

It's important to note that teachers don't need to know high-level math like calculus to teach elementary math well. But they do need to know arithmetic really well and feel comfortable with it. An insightful book comparing Chinese and American teachers found that Chinese teachers only have 10 or 11 years of schooling—that is, they haven't gone to college—but they know basic arithmetic inside and out. For example, they can explain *why* you invert and multiply when you divide fractions, and can give you a real life problem that requires you to divide fractions.²

Changing the Equation: What the Common Core has meant in elementary-level math

Purposely or inadvertently, the Common Core State Standards effected a truce in the "math wars" that raged in the 1990s over how arithmetic should be taught. (Exchanges about "fuzzy math" even made it into the 2000 Presidential debates between George W. Bush and Al Gore.) Under the Common Core, teachers are supposed to strike a balance between progressive methods—that focus on conceptual understanding of math—and traditional approaches—that emphasize quick recall of math facts and plenty of practice in computation. Research shows that to

1. Sian L. Beilock et al. "Female Teachers' Math Anxiety Affects Girls' Math Achievement," PNAS Early Edition, 2009, www.pnas.org/cgi/doi/10.1073/pnas.0910967107.

2. Liping Ma. *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States*. Mahwah, N.J.: Lawrence Erlbaum Associates Publishers, 1999.

succeed in math children need both computational fluency and the conceptual understanding that allows them to solve problems.³

In New York State, the Common Core sped up the pace of instruction by about a year. For example, under the old New York State Standards, children didn't learn their multiplication tables until 4th grade. Now, children are expected to learn them in the 2nd and 3rd grades. The new standards also call for using lots of word problems and multistep problems.

The staff of Insideschools, a project of the Center for New York City Affairs at The New School, visited 60 elementary schools between 2013 and 2015 to observe how teachers were implementing the Common Core for math. At the very best schools, Insideschools discovered, teachers were already mostly doing what the Common Core required, and they just had to tweak their work a little bit. But at many of the schools, teachers had scant training and seemed to be floundering. Particularly in the 2013–14 school year, as the standards were being rolled out, teachers were resentful that the state imposed the new Common Core tests before they had a chance to learn about them—particularly since teachers were being evaluated on the basis of their pupils' test scores.

It didn't help matters that the new textbooks designed to go along with the Common Core didn't arrive until well after the school year began in fall 2013. And the standards were imposed on all the grades at the same time, rather than being introduced starting with kindergarten. So both children and teachers in the upper grades had a difficult time catching up. Moreover, parents were confused, and didn't know how to help their children with their homework.



Teachers at PS 63 work in pairs to help each other improve and prepare for math lessons.

However, PS 26 on Staten Island and PS 63 on the Lower East Side invested significant time retraining their staff—and got results.

At PS 26, It's About "Growth Mindsets"

PS 26 is nestled in a tiny community near the former Fresh Kills landfill that's like an island on an island. The school, which has seen a steady rise of new immigrants from China, Mexico and Russia, made big strides in improving reading instruction soon after Laura Kump, a literacy coach, became principal in 2011. Now, teachers are working on improving instruction in math.

They adopted Math in Focus, the U.S. version of Singapore math—the teaching method based on the national curriculum of that island nation. This is considered one of the most demanding math programs available in the United States today, and one that requires a significant investment of time for teachers to learn how to use it.

3. "Foundations for Success," Final Report of the National Mathematics Advisory Panel, 2008: 26. <http://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf>.

Kump and her instructional coach attended Math in Focus workshops in order to teach this new method to the staff and give them support. "We try to make sense of it ourselves first," the principal said. On an ongoing basis, the administration examines math assessments to discover where teachers appear to be weak, such as in teaching complex word problems. During tailor-made workshops, teachers work in pairs and groups and help each other; the better mathematicians help lead the workshops.

As the staff learn to improve their own math skills, the children are also taught to self-assess. During a lesson, for example, as they work on problems at their tables, they clip clothespins on index cards divided into three colors to indicate how much help they need: green (I get it), yellow (I need a little help) and red (I need lots of help.) The teacher groups them accordingly.

To help ease teachers' anxiety about learning new math methods, Kump had her staff also read and study Carol Dweck's work on "growth mindsets."⁴

Dweck, a professor of psychology at Stanford University, suggests that some people have a "fixed mindset," that is, they believe intelligence is something you are born with and your talents are fixed. Others have "growth mindsets," that is, they believe you get smarter by working hard. The teachers at PS 26 came to believe that math was something they could learn—and stopped saying things like "I'm no good at math."

PS 26 parents hear about mindsets, too, as teachers make them aware that negative talk about math can undermine what their kids are

trying to do. In the 2014–15 school year, teachers overcame their initial wariness at being filmed doing math, and created short instructional videos, which they post online for parents who can't attend math workshops in person.

PS 63 Cuts Teachers' Textbook Umbilical Cord

At PS 63, many students come from families living at the poverty level; it is nevertheless a school where the sense of excitement about math is palpable in the classrooms. Children learn to work independently, so at one table you might see one child using counting blocks, another drawing pictures, and another using numbers to solve a word problem. Convinced that teachers rely too heavily on textbooks, especially when they are unsure of their subject matter, Principal Darlene Cameron and Assistant Principal Jodi Friedman decided to teach teachers math from the ground up so they would understand it better.

The teachers at PS 63 read and discussed a series of books called *Young Mathematicians at Work*⁵ over two summers. Teachers meet weekly for workshops and to plan lessons. Friedman also meets as needed with teachers after school to help them plan or practice their classwork. Together, these activities "create a space to learn," according to 2nd-grade teacher Suzanne Farkas. "We let people say what makes them anxious and we let them make mistakes."

The pre-k teachers at PS 63 are beginning to bring more math into their classrooms in the form of games, pattern blocks, books and charts.

4. Carol Dweck. *Mindset: The New Psychology of Success*, Ballantine Books, 2007.

5. Catherine Twomey et al. *Young Mathematicians at Work* series, Heinemann, 2010.

A pre-k teacher with 20 years' experience made a chart to teach kids the names of shapes—and so she could remember the names herself. "I always forget what a hexagon is," she said demonstrating how comfortable she is in PS 63's environment admitting what she doesn't know.

Language is important to math instruction at PS 63; 1st-graders use words like "conjectures," "algorithms" and "open number lines." Each student works with a buddy, and one girl said this was one of her favorite things about math—not surprising, given that girls generally like to collaborate on math problems. Another way kids are made to feel comfortable about math is that they are free to choose their own strategies for solving problems, while they are also urged to use the most efficient strategies over time. Children take turns discussing how they arrived at an answer during a daily class "congress." Just as teachers at PS 26 taught parents by using teaching videos, the kids at PS 63 teach each other in the congress. Teaching others cements their own learning.



PS 63 students use cubes, drawings and numbers to solve a word problem.

Each class spends 20 minutes a day on "repeated do's"—routines, drills, chants, songs and games to help kids get speedier with math facts. And 3rd-graders research skip-counting patterns (counting by two's, or five's, for example) at a "100 board," arraying numbers from 1 to 100 in rows of 10.

Teaching without fixed textbooks has kept teachers alert to children's needs; one teacher said she revises her lessons all the time, trying to make them clearer for students, and she even makes her own instructional materials if she needs to. Professional development has a hands-on component and is filled with real problems to solve, like how to best teach kids expanded notation. "We get excited in professional development," said a teacher who admits she used to be afraid of math. "It's changing my perspective about math."

Teachers at both PS 26 and PS 63 know that their strategies around math are not a quick fix. Test scores at PS 26 are above the citywide average, but they haven't improved significantly in the year in which teachers have been re-learning math themselves. At PS 63, which has been working longer on improving instruction, test scores made a leap four years after the intense teacher training began. The proportion of children who were proficient on the Common Core math tests doubled from 2013 to 2014—one of the largest gains in the city. Still, barely one-third of children tested passed the Common Core math test, slightly below the citywide average.

Nonetheless, Insideschools staffers came away from both schools convinced that they were poised to make great strides, and that both had the ingredients to become great places to teach and learn.

Raising Standards, Lowering Anxiety

The Common Core Standards are a contentious subject, but there's widespread agreement that their introduction in New York's schools has been a fraught episode for teachers, parents and students. Mix such angst with pre-existing teacher math anxiety and you've got an emotional cocktail packing a pretty powerful and unpleasant wallop. If the schools are going to raise standards in elementary-level math instruction, they've also got to lower the tension level for classroom teachers; kids aren't likely to buy into doing tougher math with teachers who are inwardly hyperventilating about the subject themselves. The best learning usually occurs when students and teachers share a sense of discovery. At least two elementary schools in our city have discovered how to create that kind of classroom chemistry, in large part by helping teachers become learners themselves. If we're going to help young kids meet new and higher math standards at every stage of their education, it's one well worth emulating in other schools, too.



Playing and learning with shapes prepares PS 26's youngest students for higher-level math.

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