Carol Ann Tomlinson

The Kind of STEM Teachers We Need

In a preschool class a few years back, I watched 3-year-old twin boys puzzle over a pulley with a plastic bucket on it. They were absorbed by the contraption for the full 10 minutes that I watched them. One boy would tug on the pulley cord, and the bucket would rise. Both boys would look up for several seconds, then the other one would tug on his side of the pulley cord and the bucket would descend. Another pause, this time to look down. Silence. They were not simply jerking a cord for the sake of pulling it. They were inquirers on the verge of figuring out something deeply important to them at the moment.

After a time, their teacher knelt on the floor beside them and asked, with her full attention on their faces, “What are you thinking?” One boy replied, “The bucket goes up and down on purpose.” The second said, “It happens every time.” For several minutes, the teacher posed questions and follow-up questions and added conjectures of her own. Together, they tested the capacity of the pulley to lift objects in the bucket. One of the boys mused, “This pulley makes me strong and tall.” I wanted to stay in the room a lot longer than my schedule said I could.

More recently, I watched an elementary math teacher load her students in an inquiry about prime numbers. Her questions were carefully calibrated to guide and provoke reasoning. Ultimately, students began to ask one another questions rather than only answer the teacher’s questions. At one point, a girl was puzzled by a peer’s explanation and said to him, “Could you help me understand your thinking? If I use your logic, every number will be a prime number.” With confidence, the boy began to illustrate his thinking by writing on the board as he spoke. Soon, there were pauses in his explanations, then a restart, then a sputter.

Then he faced his inquisitor and said with poise, “I believe I need to disagree with myself at this point.”

I watched an English teacher and her middle school students look at photographs the kids had taken in the schoolyard the day before. They had hunted for images to photograph that spoke to them in some way. “How did the textures of the object affect you?” she asked at one point. At another time, she said, “I think I see contrasting feelings in your explanation. Did you sense that as well?” Later, a student remarked, “I like the contradictions in my image, or maybe they are just contrasts. I like the idea of looking at one thing and coming away with mixed feelings.”

These teachers, in my book, were all STEM teachers, although only one of them was teaching a class in math, science, engineering, or technology.

The Teachers I’d Put My Money On

I’m great with the idea of STEM for all students. I get the need for a society to have a sustained crop of scientists, mathematicians, engineers, and experts in technology who move forward the frontiers of its national and international prospects. I’m skeptical, however, that course taking in STEM areas will, by itself, yield what we need in terms of thinkers and innovators for tomorrow.

Instead, I’d put my money on a broad cohort of teachers in every subject who dedicate themselves to the full engagement of young minds in whatever they teach. Give me teachers who relentlessly cause kids to wonder—who ask why? and how did that happen? and what if? as though those questions were the lifeblood of learning.

Give me teachers who insist that students observe and do so systematically; teachers who say, “You must question what you see and what

Continued on page 92
The Kind of STEM Teachers We Need
Continued from p. 91

you hear”; teachers who make it imperative that students find the patterns in everything—and explain what those patterns reveal.

Give me teachers who say to their students, “Don’t just provide facts. Build a case. Evaluate claims by holding them up against solid evidence. Seek more evidence. Question the assumptions of others—and question your own assumptions.”

Give me teachers who push their students to dig deeper, look at the other side of things, learn to tolerate mental messiness and ambiguity, and value truth more than right answers. And give me teachers whose classrooms and lives commingle logical thinking, divergent thinking, and critical thinking—educators who teach students to be aware of their own thinking and how it can serve them poorly or well.

Once the United States has classrooms, buildings, grade levels, and departments stocked with such teachers, we’ll have STEM for all students. We’ll have producers, consumers, and connoisseurs of pivotal ideas. We’ll have thoughtful readers and viewers of television, and we’ll have solid citizens. Good stuff!

I’ve always liked John Muir’s assertion that “when we try to pick out anything by itself, we find it hitched to everything else in the universe.” We’ll get the crop of STEM graduates we need not so much when we mandate courses in certain disciplines as when we support teachers in all subjects to help their students develop the attitudes and habits of mind at the core of seeing—and seeking to understand—what’s all around us in the world. And I’d bet those same habits will lead students to be wise stewards of that world.


Carol Ann Tomlinson (cat3y@virginia.edu) is William Clay Parrish Jr. Professor and Chair of Educational Leadership, Foundation, and Policy at the Curry School of Education, University of Virginia in Charlottesville. She is the author of The Differentiated Classroom: Responding to the Needs of All Learners, 2nd Edition (ASCD, 2014) and, with Tonya R. Moon, Assessment and Student Success in a Differentiated Classroom (ASCD, 2013).

Dress Code!
Continued from p. 90

Sure enough, after I shared the draft memo with some younger teachers, a few items changed. “Does what kind of sandals I wear really make a difference?” a teacher asked. Not really, I decided. Another teacher wanted to make sure the guidelines were appropriate for teachers who spent much of the day engaged in physical activities with kids or sitting with them on the floor. The resulting memo that I sent was stronger because it included these additional perspectives.

5. Explain why and explain again. Whenever we place a restriction on behavior, we need to give the rationale. “Because I said so” doesn’t cut it today (and I’m not sure that it really ever did). I explained that we need a dress code because we always want to present a professional appearance—even if it’s casual. We don’t want to dress in a way that causes others to question our judgment. After sending the memo, I raised the issue at a faculty meeting and asked if there were any questions or comments. I got lots of affirmative nods and a few “makes sense” comments.

Now you can see why this issue took more time and energy than I anticipated. What could have been a big deal remained a little thing. And I hope that the teacher’s comment that ended the memo also elicited a smile.

Author’s note: Readers who would like a copy of the dress code guidelines should send me an e-mail at trhoerr@newcityschool.org.

Thomas R. Hoerr (trhoerr@newcityschool.org) is head of school at the New City School, 5209 Waterman Ave., St. Louis, MO 63108. He is the author of The Art of School Leadership (ASCD, 2005) and Fostering Grit: How Do I Prepare My Students for the Real World? (ASCD, 2013).