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Stem without Roots:
Selling STEM Education through Fears of "Others"

On warm nights in the late 1950s, my family would sometimes gather in the dark expanse of front yards in Kansas City, to cook hotdogs and hamburgers. It was time for marshmallows when the coals turned to a scattering of orange nicks of light in the bottom of the kettle-shaped grill and lightning bugs blinked in the distance.

The adults on Adirondack chairs, the kids on the grass, we would gaze into the sky until our necks hurt, in hopes of spotting other tiny points of light, drifting across black skies. We talked softly, if at all, at the new wonder of "moving stars," at the same time giving little voice to the deep fears that pooled beneath the surface.

Russia had launched *Sputnik 1* on October 4, 1957, and Americans were stunned into fear—even deeper and more irrational than the paranoia already spawned by the growth of nuclear weaponry and the McCarthy witch hunts for Communists. The following month, the USSR launched *Sputnik 2*, carrying a dog named "Laika." My brother and I would go to sleep each night while listening to a small, plastic radio tuned to local station WHB's call-in programme, "Nightbeat." Many midnight callers feared that, somehow, the "space dog" had been trained to pull levers with his teeth and

manipulate buttons—that he was spying on us. All of America was held in fear. Nearly a half-century later, NASA historian, Roger D. Launius, states that, "The only appropriate characterization that begins to capture the mood on 5 October [the day after *Sputnik 1's* launch] involves the use of the word hysteria."[1] Launius also quotes a poem written during this time by G. M. Williams, the governor of Michigan:

> Oh little Sputnik, flying high
> With made-in Moscow beep,
> You tell the world it's a Commie spy
> And Uncle Sam's asleep.

That same fall, rock and roll star, Little Richard, was touring Australia and witnessed *Sputnik 1* fall to earth. He interpreted this event as a sign from God to quit the music business and join the ministry.[2] These were strange times, indeed.

Were these runaway fears of "Commies" and "foreigners" warranted? Not so much. *Sputnik 1* weighed under two hundred pounds, a good-sized basketball, and it fell to earth after three months of orbit. It was, as Launius further states, an "illusion of a technological gap," because, "what was not said, but clearly thought by many Americans in both the scientific and political communities… was that the Soviet Union had staged a tremendous propaganda coup…." America responded in kind, fanning its own fires of propaganda that we were losing to the Soviets and pumped massive funding into educational programs in science, technology, engineering, and mathematics—or "STEM" as it's now called, to communicate the "basic" nature and necessity of these disciplines for survival, especially for "economic survival." Now, fifty-years later, America seems to be on that same path, in an orchestrated fanning of those same fears of foreigners, so that

we may achieve "economic development" and "global competition"—or, maybe more aptly, corporate (and hence cultural) dominance.

President Bush recently called for STEM education, especially math and science, to be a national priority. The U.S. House Science Committee quickly followed suit by introducing three bills "to strengthen U.S. economic competitiveness" by large infusions of dollars into math and science education programs and research.[3] In further orchestration, many state governors are pursuing similar initiatives. While increasing the numbers of math and science teachers and improving their teaching are worthy goals, I wonder about the wisdom of re-playing the late 1950s, albeit in terms slightly altered.

As fields of study and research, math and science do not exist in a vacuum. Math can easily overlap into science, and science can spill into philosophy and ethics. Both math and science can interact with art, music, and every other discipline. Tesla and Einstein attributed much of their success to thinking in images. DaVinci's notebooks show verbal thinking clicking along in tandem with visual thinking. Jazz musician Willie Ruff based his composition, *The Harmony of the World*, on Johannes Kepler's data from *Harmonices Mundi*—a marriage of music, science, history, culture, and more.

Many creative breakthroughs, regardless of categories and pigeonholes, have been greatly aided by this rich interplay of seemingly different disciplines. Such interactions can create combustion, out of which new or reconfigured ideas emerge. Creative thinkers in physics, for example, may reflect in very different ways about the same topic. When we do not realise this, we may be confusing the product (physics) with the process (thinking). They are rarely the same.

Disciplines do not exist in a vacuum because they are connected through language. As well, they often function more within language, than within their own symbol systems. This is why schools require students to read and write in each of their classes. Mathematicians and scientists often engage in language, as they debate the merits of "The New Math" or argue the ethics of stem-cell research, abortion, or evolution. Such language delves into ethics, literature, history, religion, and culture. Some teachers use music to teach reading, painting to teach writing, sports to teach physics, and physics to teach business. Such practices are known as "great teaching." And great teaching is a complex tapestry, woven with language. The most effective way to grasp complex concepts and data is to untangle them through written and spoken discourse. The child who articulates why and how she employed formula X instead of formula Y usually understands the problem better than the child who is less fluent in language.

If we accept, even half-heartedly, that math and science do not exist in a vacuum, then state and federal funds should support "the other disciplines" equally. My university currently employs eight full-time math education faculty members and one art education faculty member. We have four science education positions and one position in music education. This imbalance is not due to heavier enrolments in math and science, but rather to the abundance of grant funding opportunities in these areas. Please do not misunderstand—these are all superb faculty members who run excellent programs, and I remain grateful for *any* investments in education. However, it's also true that a recent survey reveals that 57% of parents believe that their children were taking sufficient math and science courses.[4] Why, then, run faster toward math and science dominance? Yes, other industrial nations "outscore" us on tests (I won't mention problems with

achievement tests and comparing apples and oranges). While competition is Mr. Bush's official rationale for again investing heavily in math and science education, the rallying cry of many governors is "economic development." However, beneath these virtuous goals, resides an old-fashioned "fear of foreigners."

Most Americans will favour the goal of "economic development." But it should give us pause. First, there are better reasons for students to engage in science, technology, engineering, and math, than ratcheting up the gross national product—better reasons that are seldom noted, such as the self-perpetuating pleasures of discovering and exercising a life of the mind—of questioning and hypothesizing, of demystifying the universe, of conserving the natural environment, of shedding light on ignorance.

Second, haven't we already, more than once, poured huge resources into math and science, beginning with our fear of Russians and Sputnik in the late fifties? According to the National Science Foundation, just between 1994 and 2000, America's spending on research and development increased from $169 billion, to $264 billion.[5] The President's recent initiative, the proposed House bills, and many governors' current plans will ensure that such increases continue. What's more, the rationale for this funding hardly differs from the Red Scare of the late fifties—a fear of "foreigners." Us vs. them.

The old Cold War fears of a "common enemy" resonate within today's calls for enhancing STEM education. Let's start with Congress and the three bills mentioned earlier. In the press release, one bill's sponsor, Senator John Schwarz (R-MI), stated that, "Countries like China and India are graduating millions more math, science, and engineering students than the United States. We cannot afford to sit idly by or we face a realistic chance of a decline in our standard of living." (Never mind that China graduates

more students in these areas due to their larger population.) This time around, it's not Russia to fear. It's China, India, and "countries like [them]."

At the state level, Texas Governor Rick Perry stated that, "if… China and India continue to graduate higher numbers of students equipped with these skills, the next generation of Texans will face a future of limited opportunities…."[6] Delhi vs. Dallas. Hong Kong vs. Houston. New York Governor George Pataki warned that, "In tomorrow's economy, our students' competition for jobs, investment and opportunity will not come from places like South Carolina or Indiana; it will come from places like South Korea and India…."[7]

Missouri Governor Matthew Blunt stated that America is "becoming more dependent on foreign talent to work in the areas of math and science."[8] Governor Blunt further noted that, by the year 2010, "more than 90 per cent of all scientists and engineers in the world will be living in Asia if current trends continue."[9] While being careful to avoid naming "Asians," Blunt, like the other governors, nonetheless evokes fears of "foreigners."

Are we, again, and however unwittingly, using those old fears of common enemies (Communists, Chinese, Arabs, *et al*.) to inject more money into math and science, so that, again, global economic development is more nurtured than students?—so that fears of "foreigners" are more cultivated than perceptions of global interdependence? Are there authentic roots beneath these stems? Educators, especially, are responsible for asking these questions and pursuing answers. And this means looking at ourselves and other countries, such as China and India—and even gazing up at the night sky—without fear.

Notes

[1] http://history.nasa.gov/sputnik/sputorig.html.
[2] "Rock N' Roll Timeline" (www.digitaldreamdoor.com).
[3] "Science Committee Members Introduce Bills to Improve Education and Research for Competitiveness," Press Release, 11 May 2006, Science Committee Press Office, Joe Pouliot.
[4] "Math initiative does not equal local concerns," *Columbia Daily Tribune*, 16 February 2006, 11-A.
[5] "Rosy Forecast for R&D Spending" (12 January 2001), State Science and Technology Institute, 2002 (*SSTI Weekly Digest*, http://www.ssti.org/Digest).
[6] Thomas Korosec, "Texas Governor Perry unveils initiative to boost math, science funded by Gates and Dell," *Houston Chronicle*, Dallas Bureau, 2005 (http://www.chron.com/disp/story.mpl/).
[7] "Governor Pataki Delivers 12th and Final State of the State Address," Press Release, 4 January 2006 (http://www.ny.gov/governor/press/06).
[8] "Blunt discusses math, science," *Columbia Daily Tribune*, 23 January 2006, 5-A.
[9] "U.S. Innovation and Competitiveness," U.S. House Committee on Science and Technology, Press Release, 24 January 2006 (http://gop.science.house.gov).