"Tidal Change" in Science Education?

By Lucie Guo

The new Obama administration promises to usher in a new era of science. On March 9, 2009, President Obama took a bold, well-publicized step that has been long awaited by the scientific community: signing the Stem Cell Executive Order and Scientific Integrity Presidential Memorandum and thereby overturning previous restrictions on federal money for embryonic stem cell research. The memo also directed the head of the White House Office of Science and Technology Policy to develop a strategy for restoring scientific integrity to government decision-making with the intention of creating public policy based on "the soundest science" (1). The Obama administration has made ambitious promises to increase investments in the sciences research and development, to encourage interdisciplinary research and education, to develop affordable green energy and battle global warming, and much more. Indeed, as we face rapid climate change, a heavy global health burden, and a collapsing space program, much is at stake. Science and technology must be effectively harvested to combat our myriad of 21st century challenges.

Beyond issues like climate change and AIDS in Africa, which are discussed often on our college campus, our nation faces a tough, silent crisis in science, technology, engineering and mathematics (STEM) education. In September 2008, as I skimmed the document "Investing in America's Future: Obama and Biden's Plan for Science and Innovation" from barackobama.com, I was pleasantly surprised to read that making a national commitment to science education was the third bullet point, behind restoring integrity to science policy and increasing federal investment in research (1). The document promises to recruit "America's best minds" to teach K-12 math and science by creating 40,000 scholarships of up to $25,000 each for bright scholars who can commit four years to teaching in STEM fields. Of course, as the staggering economy undermines ambitious funding plans in many domains, it is not easy to predict if or when such a policy will be effected.

But at least the administration recognizes the urgency of the issue. High school students in the US rank near the bottom in math and science compared to students in other developed nations and the number of U.S. citizens receiving PhD's in engineering or the physical sciences has dropped by 22% within ten years (2).

Furthermore, there exists an appreciable gender gap especially in computer science, math, and physics. Girls currently make up only a third of AP physics students and only 15% of AP computer science students (3). Three years ago, I attended a speech at the U.S. Department of Education given by then-Secretary of Education Margaret Spellings at the First National Summit on the Advancement of Girls in Math and Science where she gathered more than 100 education experts and prominent female scientists (such as Sally Ride) to develop a collective strategy to close the gender gap in STEM education. The summit attendees recognized the gender gap as a "national failure to implement" since the problem may be a "marketing failure": science often is not presented in an engaging way in the classroom. Spellings spoke that elementary schools must expose girls to science to show that it is a creative and collaborative process. The solution, they believed, lies in recognizing untapped potential in the pre-K through 12th-grade pipeline, and the conference speakers spoke that a "tidal change" in STEM education is about the take place.

Although there was much hoopla surrounding the event, no substantial government action items emerged from the discussions. This was disappointing, but was it all that surprising? Even the landmark education policy of the Bush era, No Child Left Behind (NCLB), achieved only questionable success. NCLB aimed to improve test cores and accountability in education, but the focus on standardized testing led educators to "teach to the test" rather than to develop creative curricula. Additionally, increased punitive measures on "failing" schools only aggravated the stigma against low-performing students. An opinion piece in *USA Today* two years ago deemed NCLB "too destructive to salvage": Kohn wrote that "this law is not about narrowing the achievement gap; its main effect has been to sentence poor children to an endless regimen of test-preparation drills." (4).

How will STEM education change in this new administration? On February 17, 2009, Obama signed the American Recovery and Reinvestment Act into law, which provides $44 billion for states and school as quick aid to avoid teacher layoffs and program cuts. At the National Science Teachers Association Conference on March 20, 2009, Secretary of Education Arne Duncan promised to "launch a new era of science education in America"—but how will his approach differ from that of the "tidal change" promised by Margaret Spellings only three years ago? Obama has called to expand performance pay, to encourage responsibility from parents, and to increase access to college. Duncan believes in rewarding teaching excellence through merit pay, which may improve accountability. In his address, Duncan also specifically alluded to higher pay for science and math teachers, making the teaching profession more compelling for those considering other, more lucrative opportunities.

Will Arne Duncan shift away from the draconian policies of No Child Left Behind? Kohn wrote that NCLB "must be replaced with a policy that honors local autonomy, employs better assessments, addresses the root causes of inequity and supports a rich curriculum" (4). While people like Kohn push for a complete departure from NCLB, Duncan is a pragmatist who believes in the necessity of an "honest assessment" of teacher quality and student performance (5). Teachers would be held accountable for what they do, and Duncan is set on determining what's working and what's not. He wants a set of national standards to which each state must comply. Our new education policy may likely involve revamping NCLB instead of establishing one anew, but the new administration has developed funds such as Race to the Top which will provided $5 billion—an unprecedented amount—to districts or programs that plan to aggressively reform education.

Duncan's address at the National Science Teachers Association Conference praises the ambitiousness of Obama's plans for education, but he closes with an air of humility. "The challenge of getting more young people into science is not something we can successfully implement in Washington," he said. Instead, this is a job that primarily falls on the shoulders of teachers and parents.

Clearly, this "tidal change" in STEM education must be a bottom-up endeavor. Excessive guidelines on test performance could only exacerbate the achievement gap, as we have seen in the case of No Child Left Behind. Instead, we must place more emphasis on local autonomy and development of rich curricula, as Kohn suggested. In addition, encouraging meaningful, encouraging teacher-student relationships are essential for sparking and retaining interest in science. For most of us at least, math and science skills do not come easily and kids cannot simply stop believing in their abilities upon encountering more challenging, and potentially frustratingly-discouraging material. After all, a recent study showed that self-confidence instilled by parents and teachers is crucial for young girls learning math and science—even more important than their initial interest in the subject (6).

Furthermore, we must not underestimate the power of the private sector. While no action items from the Department of Education came out of Margaret Spelling's summit, the representatives from Girl Scouts who were present at the summit later launched a series of initiatives: from all-girls robotics camps to tech-y computer games (girlsgotech.org), the organization has made sure to include science exposure into their overall agenda of building leadership, conviction, and self-worth for young women.

A "tidal change" in STEM education may indeed happen during our generation. But just as each of us must strive to reduce our individual carbon footprint to combat global warming, improving STEM education is an endeavor that requires collective action. H

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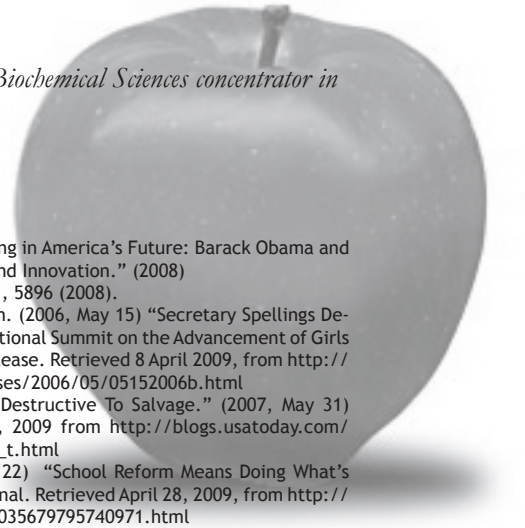

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