PostEverything

We don't need more STEM majors. We need more STEM majors with liberal arts training.

The ability to draw from other disciplines produces better scientists.

By Loretta Jackson-Hayes February 18

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In business and at every level of government, we hear how important it is to graduate more students majoring in science, technology, engineering and math, as our nation's competitiveness depends on it. The Obama administration has set a goal of increasing STEM graduates by one million by 2022, and the "desperate need" for more STEM students makes regular headlines. The emphasis on bolstering STEM participation comes in tandem with bleak news about the liberal arts — bad job prospects, programs being cut, too many humanities majors.

As a chemist, I agree that remaining competitive in the sciences is a critical issue. But as an instructor, I also think that if American STEM grads are going lead the world in

innovation, then their science education cannot be divorced from the liberal arts.

Our culture has drawn an artificial line between art and science, one that did not exist for innovators like Leonardo da Vinci and Steve Jobs. Leonardo's curiosity and passion for painting, writing, engineering and biology helped him triumph in both art and science; his study of anatomy and dissections of corpses enabled his incredible drawings of the human figure. When introducing the iPad 2, Jobs, who dropped out of college but continued to audit calligraphy classes, declared: "It's in Apple's DNA that technology alone is not enough — it's technology married with liberal arts, married with the humanities, that yields us the result that makes our heart sing." (Indeed, one of Apple's scientists, Steve Perlman, was inspired to invent the QuickTime multimedia program by an episode of "Star Trek.")

Carly Fiorina, former CEO of Hewlett-Packard, credits her degree in philosophy and medieval history in helping her be the first woman to lead a high-tech Fortune 20 corporation. "If you go into a setting and everybody thinks alike, it's easy," she has said. "But you will probably get the wrong answer."

I became a chemistry professor by working side-by-side at the bench with a number of mentors, and the scholar/mentor relationships I've enjoyed were a critical aspect of my science education. And it is the centerpiece of a college experience within the liberal arts environment. For me, it was the key that unlocked true learning, and for my students, it has made them better scientists and better equipped to communicate their work to the public.

Like apprentices to a painter, my students sit with me and plan experiments. We gather and review data and determine the next questions to address. After two to three years of

direct mentoring, students develop the ability to interpret results on their own, describe how findings advance knowledge, generate ideas for subsequent experiments and plan these experiments themselves. Seniors train new students in the lab, helping them learn gene recombination techniques that depend on accurate calculations and precise delivery of reagents. Put simply, a microliter-scale mistake can spell disaster for an experiment that took days to complete. And while my students work on these sensitive projects, they often offer creative and innovative approaches. To reduce calculation errors, one of my students wrote a user-friendly computer program to automatically measure replicate volumes. He did this by drawing on programming skills he learned in a computer science course he took for fun. Young people stuck exclusively in chemistry lecture halls will not evolve the same way.

A scientist trained in the liberal arts has another huge advantage: writing ability. The study of writing and analyses of texts equip science students to communicate their findings as professionals in the field. My students accompany me to conferences, where they do the talking. They write portions of articles for publications and are true co-authors by virtue of their contributions to both the experiments and the writing. Scientists are often unable to communicate effectively because, as Cornell University president David J. Skorton points out, "many of us never received the education in the humanities or social sciences that would allow us to explain to nonscientists what we do and why it is important."

To innovate is to introduce change. While STEM workers can certainly drive innovation through science alone, imagine how much more innovative students and employees could be if the pool of knowledge from which they draw is wider and deeper. That occurs as the result of a liberal arts education.

Many in government and business publicly question the value of such an education. Yet employers in every sector continue to scoop up my students because of their ability to apply cross-disciplinary thinking to an incredibly complex world. They like my chemistry grads because not only can they find their way around a laboratory, but they're also nimble thinkers who know to consider chemistry's impact on society and the environment. Some medical schools have also caught on to this. The University of Pennsylvania School of Medicine has been admitting an increasing number of applicants with backgrounds in the humanities for the past 20 years. "It doesn't make you a better doctor to know how fast a mass falls from a tree," Gail Morris, head of the school's admissions, told Newsweek. "We need whole people."

By all means, let's grow our STEM graduates as aggressively as possible. But let's make sure they also have that all-important grounding in the liberal arts. We can have both.