

The gender gap
Encouraging girls
in STEM

In the classroom
The need for
qualified teachers

Supply and demand
Meeting tomorrow's
needs

**MEDIA
PLANET**

December 2011

STEM EDUCATION

3
FACTS

YOU SHOULD KNOW
ABOUT EDUCATION
IN AMERICA

BLASTING OFF!

How to engage the next generation in
science, technology, engineering and math

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CHALLENGES

The **U.S. ranks 17th internationally** for science education—America is behind and so are our children. The only way to change the course we are on is to invest in STEM.

Changing the course of our future

Two million American students attend high schools that do not offer calculus. More than 40 percent of 8th grade mathematics teachers do not have an undergraduate major or minor in math, and time spent on science in our elementary schools has been declining steadily since 1994. It should be no surprise, then, that the United States ranks behind 16 other developed nations in science and 24 in math. We do a disservice to children, families and the nation as a whole by allowing our students to fall behind in science, technology, engineering and math (STEM).

In today's global economy, there is no question that Americans need a deep understanding of STEM no matter what career path they



Linda P. Rosen
Ph.D., CEO of
Change the
Equation

choose. From architecture and environmental engineering to fashion design and marketing, STEM is changing the way we work.

STEM is also a major engine of innovation and job growth. In 2007, 5.5 million people were employed in U.S. science and engineering jobs. That's a 30-fold increase since 1950, when 182,000 people were employed in those fields.

Technological innovation also creates jobs well beyond the traditional STEM fields. This expansionary effect creates opportunities for factory workers, advertisers, truck

drivers and salespersons among others who benefit from new inventions, industries and markets. Higher productivity means higher wages and lower prices. And, most important, the projected growth in STEM-related employment is nearly double that of other careers. In 2011, the Facebook "apps" industry alone created 182,000 new jobs—many times the number of people Facebook employs directly.

Spirit of innovation

American businesses have long been at the forefront of innovation and reinvention, and we need to carry that spirit into partnerships with states, schools and out-of-school programs. Together we need to combine this innovative spirit with a strong focus on how students learn, what inspires them to learn and how we can best

support our educators through better preparation and professional development.

Change the Equation (CTEq) is working to affect this kind of change. Our network of more than 100 CEOs has called on the nation's governors to raise the bar and ensure that all students have a rich STEM education.

From advocacy and philanthropy to inspiring young minds with unique STEM learning opportunities, these leaders are making certain that American students and businesses are competitive with the best in the world. Success in educating our children benefits every citizen and makes our nation stronger.

LINDA P. ROSEN

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WE RECOMMEND



Dr. Mae C. Jemison

President of The
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Bayer's Making
Science Make Sense

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INSPIRATION

Leading by example: From Texas to the White House

How does a twenty-three-year-old science major from humble beginnings in rural Texas come to introduce the First Lady, Michelle Obama, at a White House event rolling out a new program of the National Science Foundation (NSF)?

Now a student in the dual degree program of The University of Texas School of Public Health and the Texas Tech University Paul L. Foster School of Medicine, Michelle earned her Bachelor of Science in biomedical biology and was the first student in the College of



Joan Herbers
President,
Association for
Women in
Science

Science to graduate with three minors: in chemistry, Spanish and psychology. As president of the El Paso chapter of the Association of Women in Science (AWIS), she leads a mentoring program that connects ninth grade girls with mentors who are science, technology, engineering, or math (STEM) students and working professionals.

Although Michelle Del Rio has already faced many challenges in her young life, early last month she proved ready to forge new frontiers. Through her involvement with AWIS, Michelle was invited to tell her story at the White House.

Can do attitude

As the oldest daughter, Michelle was expected to take care of her younger siblings and parents. So, while working two jobs and watching her younger siblings so her parents could work, Michelle completed college. She says it was her desire to learn, explore, and make a difference that moti-

vated her. She says, "If I can do it, anyone can do it. Yes I have challenges, but I do not believe that I have any limits."

Organizations like AWIS and NSF have programs which clear the barriers young women like Michelle confront when they pursue careers in STEM. And while many of us think of science as fixed rules and formulas, women in STEM like Michelle are applying the rules in a new way—and succeeding.

JOAN HERBERS

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FACT

1

HIGH SCHOOL
GIRLS REPRESENT ONLY 17
PERCENT OF
COMPUTER
SCIENCE AP
TEST TAKERS

↓ GIRLS & STEM

■ Teach girls that curiosity is a good thing! Every time they learn something new, their brain forms new connections and they become smarter.

■ Praise girls for their effort rather than their intelligence. Love of hard work, love of a good challenge and the ability to learn from mistakes are at the heart of all scientific contributions.

■ Girls tend to skew lower on spatial skills than boys, so encourage girls to play with construction toys (found in the "boys" aisle) to help them become more confident engineers, architects and builders.

Source: Why So Few? Women in Science, Technology, Engineering, and Mathematics (AAUW 2010).

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MYTH: Women don't like science.

FACT: Women DO like science and they can succeed in science, technology, engineering and math (STEM).

AWIS

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INSIGHT

STEM TEACHERS:
NEEDED NOW MORE THAN EVER

FACT

2

66 PERCENT
OF PHYSICS
TEACHERS ARE
UNDER
QUALIFIED

■ **Question:** How can we ensure the next generation is prepared for the competitive workforce?

■ **Answer:** Invest in STEM teachers.

In recent years, national initiatives have put the United States' urgent need for math, science, and technology teachers in the spotlight. As our economy depends more and more on competitiveness in STEM fields, preparing a next generation workforce is crucial.

And yet a 2009 report by the National Commission on Teaching



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National Fellowship
Foundation

and America's Future showed that, over the next decade, as many as half of the nation's veteran teachers will retire. What's more, in addition to this exodus of experienced teachers, we also know from a number of studies that, nationwide, one-third of new teachers—as many as one-half in high-need districts—leave the profession in the first five years. These pressures are especially

severe in the STEM fields, since so many college graduates in these fields choose positions in business and industry with higher pay and perceived prestige. For all of these reasons, many states have long had math and science on their “teacher shortage” lists.

In high demand

So it's no wonder that an aerospace engineer who recently changed careers to teach noted, “Even with all the news of massive layoffs and thousands of teachers out of work, I had no trouble finding a job. I was offered a few I hadn't even

applied for.”

Recent college grads and career changers with deep backgrounds in math and science can make a powerful difference now in young people's lives—especially in high-need rural and urban secondary schools, which have always had a harder time recruiting top STEM teachers.

Some programs are offering incentives to consider STEM teaching. Such programs are also providing deeper in-class or “clinical” preparation, comparable to the way that physicians learn their field by working in hospitals.

There's never been a more impor-

tant time for strong STEM majors and STEM professionals to consider teaching—and with new models of preparing for classroom success, there's never been a better time to make the leap.

Constance Bond has published and consulted widely on urban teachers and schools. She has taught secondary school in California, overseen West Coast operations for Teach for America, and directed the New Teacher Residency Program at Mercy College.

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INSIGHT

Dr. Mae C. Jemison

Physician, chemical engineer, first African American female astronaut, founder of The Earth We Share™ science camps and Bayer's longtime Making Science Make Sense® spokesperson

THINK CRITICALLY

Succeeding in STEM

By changing the way we approach science education, and ridding ourselves of false notions of who can be successful in science, we can generate more students passionate about pursuing these career opportunities.

The majority of scientists say they developed their passion for science by age 11. That means that the educational experience children have in grade school profoundly impacts our nation's ability to graduate a pre-

pared STEM work force. Yet no more than 28 percent of elementary school teachers judge themselves to be well qualified to teach the sciences.

Children are innately curious, confident, and enthusiastic. Unfortunately, common teaching methods squander this prodigious natural construct for learning—giving students facts to memorize and regurgitate—while their ability to “think critically” is eroded.

Formal education becomes, to an extent, a disabling rather than an enabling experience.

Funding the best education possible for all our children today is the most important step the US can take to promote economic success in the years to come. After all, kids can't have a “do over” of their childhood years.

DR. MAE JEMISON

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↓ INSPIRATION

Assembling medical breakthroughs

■ A daughter's engineering interest thrills most parents. However, the University of Pennsylvania's Dr. Karlin Bark kept some of her motivation a secret.

“They didn't know until I was in college that I used to take apart their appliances and put them back together,” Bark said.

Today, childhood transgressions easily dismissed, Bark breaks new ground in haptics—technology dealing with feedback of touch. And while previous work broadened use with amputees, as a recipient of a 2011 L'Oréal USA Fellowships For Women In Science, Bark presses

for broader implications among stroke patients.

Feeling fortunate for the support she's been given and her own childhood encouragement, Bark insists on giving back through mentoring.

“A lot of girls just don't know that you can study math and science and engineering and have a career in a wide variety of areas,” Bark said. “Math and science isn't just about tinkering or stereotypical roles with computers or car companies.”

Parents, guard your toasters.

WENDY TAYLOR

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Each year, the L'Oréal USA Fellowships For Women In Science

are awarded to the women scientists whose advancements are reinventing what's possible in the world of science, engineering and math. Our Fellowships allow these amazing women to continue their research on a post-doctorate level. And from there...the possibilities are endless.

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NEWS

↓ 21ST CENTURY STEM EDUCATION

Our economic success depends on our ability to increase our students' skills in alignment with our innovation economy.

With STEM jobs predicted to outpace growth in other sectors, we need to ensure our students have the STEM knowledge and skills—the ability to think critically, innovate, and solve real-world problems—to take advantage of these opportunities. This is critical in Washington, which has a growing mismatch between the jobs in our STEM-rich state and the skills people have.

While teachers play a vital role, it is a community-wide responsibility in which business-education partnerships are a crucial

component. Just as employers need students to pursue STEM fields, students need employers to help make STEM careers a reality. Business can inspire a new generation in STEM: from partnering with teachers to integrate real-world learning, to working with kids through mentorships and internships, and holding policymakers accountable for aligning education with job growth.

The challenge ahead of us is lighting the spark of potential in all young people. Support your local schools and get engaged to ensure our kids get the 21st century STEM education they need and deserve.

**DEAN ALLEN, BOARD CHAIR,
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Supply and demand

Today, Monster and other job search sites estimate that 3.7 million STEM-related jobs are currently available. Clearly, the need for jobs in the fields of STEM is increasing, yet the pool of available STEM-ready workers is not meeting employer demands.

We must find and train candidates as employers share their workforce needs. It takes a pipeline of success, meaning that students study STEM education and that we maintain and retain their interest in the field.

Many women and minorities in particular are leaving the STEM pipeline. The Bayer study released



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Search

earlier this month confirms, “American women entering college are the best prepared academically to hit the books and successfully graduate with a STEM degree (82 percent),” but girls and women need to be encouraged to stay in STEM careers.

STEM jobs will be nearly double the growth of all jobs. The Commerce Department shows that STEM careers are projected to grow

by 17 percent from 2008 to 2018, compared to 9.8 percent growth for non-STEM occupations.

STEM workers command higher wages, earning 26 percent more than their non-STEM counterparts. According to Bureau of Labor Statistics, the twenty fastest growing job categories will require specific STEM skills.

There are shortages in the skilled trade areas that require basic knowledge of math and science. One-third of STEM jobs do not require a college degree, and many can be filled by STEM-literate high school and community college graduates.

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INSIGHT



Stephan Turnipseed
President, LEGO
Education North
America



Joyce Malyn-Smith, Ed.D
Managing Project Director,
EDC



Question 1:
Why has STEM education received more attention in recent years?

STEM education puts within the grasp of all kids the ability to understand and apply science and math in meaningful and productive ways. The success kids have through these hands-on learning experiences is tangible and sticks with them for life. That's difficult to ignore.

As today's STEM workers move toward retirement, we must replace them with employees who can maintain America's leadership and security in a global economy. With stronger STEM skills, youth will be able to apply computational tools that allow discovery, creativity and innovation—the essentials of a growing society and economy.

FACT

3

Question 2:
How can parents become more involved in engaging their kids in STEM education?

Coach a competitive robotics team. Advocate for hands-on STEM projects at your kids' schools. Most importantly, provide a home that encourages kids to problem solve creatively, think with their hands, and develop that passion and curiosity for the world around them.

ALTHOUGH STEM FIELDS CONTINUE TO INCREASE, THE US RATIO OF R&D TO GDP PEAKED IN 1964 AT 2.87 PERCENT

By encouraging their children to observe, explore, and question, parents nurture inquiring minds, which in turn can drive scientific discovery. Parents who cultivate interest, set high expectations for achievement in STEM courses, and help children believe in themselves, can lay a strong foundation for a generation of STEM-savvy youth.



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