

# UP WITH THE SYSTEM

**CORPORATE EXECUTIVES ARE BANDING TOGETHER TO ADDRESS A HUGE VOID IN HIGH-TECH WORKERS, AND TO ENCOURAGE YOUNG AMERICANS TO PURSUE MATH AND SCIENCE STUDIES**

S1

**W**ith approximately 12.8 million unemployed Americans struggling to find a job, it's hard to imagine a sector that actually has twice as many available jobs as it has unemployed jobseekers to fill them. However, that's exactly the case when it comes to job openings for workers with science, technology, engineering and mathematics (STEM) expertise, according to Change the Equation (CTEq), a nonpartisan, nonprofit coalition of 100 corporations that seeks to transform STEM learning in Pre-K–12 in the U.S.

"Change the Equation is trying to help corporate America invest more strategically, advocate more effectively at the state level and inspire the youth to realize the excitement of STEM," says Linda Rosen, CTEq CEO. "These companies care not only about their future workforce, but about creating an informed citizenry poised to innovate and strengthen the U.S. economy."

Business leaders have a prime stake in the quality of our nation's STEM workforce and the economic health of the nation. CTEq's member companies annually devote well more than \$500 million—and millions of volunteer hours—to improving STEM learning in the U.S. By aligning these efforts around principles of quality, and arming business leaders with data to inform more forceful advocacy for change, CTEq believes it can improve the life prospects of millions of U.S. students.

In response to a demand from its coalition of members, CTEq recently unveiled STEMworks, a database of effective STEM programs reviewed by a third-party evaluator. STEMworks is a resource to help funders find effective programs that meet their geographic and programmatic funding priorities, and is searchable by location, type of program, target population, STEM discipline and grade level, among other criteria. It also makes clear to program developers what funding agencies are seeking. "The third-party review process is a win-win for everyone. Those that gain approval will get the attention of funders, and

IN PARTNERSHIP WITH

{CHANGE THE  
EQUATION}

# STEM EDUCATION

## IN THESE FACES, WE CAN SEE THE FUTURE.

From developing unique educational initiatives to creating a state-level STEM modeling program, Raytheon continues to help students pursue careers in science, technology, engineering and math. Through innovation, education and inspiration, we're ensuring a bright future for the next generation of innovators.



INNOVATION IN ALL DOMAINS

[www.raytheon.com](http://www.raytheon.com)

Follow us on:



# Raytheon

*Customer Success Is Our Mission*

those that don't get an honest assessment so they can improve and try again," says Rosen. CTEq's initial goal is to identify 100 excellent STEM programs through this process by the end of the year, but there is no limit to the number the database can ultimately support.

### ROOTS OF THE STEM DILEMMA

It's a widespread belief that addressing the STEM-qualified worker shortage is a shared responsibility among the educational system, the federal government and the companies that hire these workers. "We are truly at an inflection point and there is no simple solution. Clearly, we need to begin to solve the problem by understanding why the youth of our country are performing so poorly in the basics of math and science," says Keith J. Peden, Senior Vice President, Human Resources and Security, Raytheon Company. "We all have a role to play in setting things straight. We see the issue as far-reaching, with the potential for very serious consequences for our nation's economic prosperity, as well as our national security. We are encouraged to see so many organizations from both the private and public sectors working together to solve the problem."

International testing data show U.S. students lag behind their global peers in math and science, and other studies show only 17 percent of U.S. 12th-grade students are proficient in math and interested in STEM. "It doesn't seem to make sense," says Peden. "With STEM job growth outpacing non-STEM job growth by more than 300 percent, according to the Department of Commerce, you would imagine that students would flock to STEM studies. It seems we were all a little late in ringing the alarm bell."

One primary reason the STEM crisis is upon us is an undeniable perception among students that STEM isn't sexy. Rosen says teenagers typically think of STEM careers as being "brainiac neurosurgeons, software engineers and rocket scientists." However, the reality is that STEM skills touch almost every line of work, including those in the creative arts and the white-hot realm of video games and gaming system development.



"Choreographers use sophisticated notation software to design routines; jewelry designers fire up on-demand 3D printing applications to fabricate prototypes; and musicians use powerful audio filtering, processing and editing technology to create the right sound. STEM education is the underpinning of many jobs that we wouldn't traditionally call a STEM job," Rosen says.

That's why CTEq is creating iON Future, a game-based learning environment designed to expose teens and tweens to the variety of STEM-based professions, and to dispel the notion that only science and math geniuses need apply. "Education is not the main business of the majority of these large corporations. So what is it that's motivating them to be interested in K-12 STEM learning?" Rosen asks rhetorically. "It's obvious to them that more jobs need STEM knowledge. More citizens need STEM knowledge. The bottom line is that people need a lot more STEM knowledge to take advantage of opportunities in the world."

Gabi Zedlmayer, Vice President, Sustainability and Social Innovation at Hewlett-Packard (HP), says, "HP has been investing significantly in STEM education over many years, through the innovative use of our technology and through the expertise and

passion of our employees. We do this because STEM 'literacy' is as important to the public at large as it is to the high-tech workforce." Zedlmayer says that society is facing environmental and health challenges that require more technical prowess: "We not only need more qualified STEM professionals, but also STEM-educated politicians and informed citizens who will be making critical decisions that affect the planet and our lives."

### COLLABORATING ACROSS BOUNDARIES

Part of the message President Obama and CTEq have stressed is collaboration among companies to deepen the current shallow pool of STEM-qualified talent. Zedlmayer, who is based in Switzerland, says collaboration needs to go beyond U.S. borders, as the shortage of STEM talent is an international problem.

"In the end, we need proactive international collaboration to close this gap in STEM. It is absolutely critical," says Zedlmayer. "There are innovative solutions from around the world that we can all learn from. One way we act on this at HP is through our Catalyst Initiative that brings educators from around the world together to explore how technology can help create new and powerful STEM and STEM-related learning experiences for students—and then share these innovations with educators around the world."

Zedlmayer says students are graduating into a flat, competitive world, and need to experience disciplines such as science, math and engineering design as problem-solving projects that require international collaboration. The students who are able to collaborate across cultures, time zones and languages will most likely be better prepared to be

**"WE NOT ONLY  
NEED MORE STEM  
PROFESSIONALS, BUT  
ALSO STEM-EDUCATED  
POLITICIANS AND  
INFORMED CITIZENS  
WHO WILL BE MAKING  
CRITICAL DECISIONS  
THAT AFFECT LIVES."**



IF YOU'RE GOING  
to do something  
MAKE it MATTER.

Why do you do what you do? Why do you put in the work? Why do you make the effort? You do what you do because it matters. Because it's important. Little things. Big things. Little things that add up to big things. At HP, the things that matter to you, matter to us. We don't just believe in the power of technology. We believe in the power of people when technology works for them. To help you create. To make the digital tangible. To harness the power of information. To advance the way we live and work. To do the things that matter. If you're going to do something, make it matter.

[hp.com/make it matter](http://hp.com/make it matter)



Make it matter.



**"BIG SYSTEMIC CHANGES ARE REQUIRED TO TRANSFORM THE LEARNING EXPERIENCE, AND IT TAKES A LONG TIME TO MAKE THEM. LET'S MAKE SURE STUDENTS DON'T HAVE TO WAIT ANOTHER 10 YEARS FOR THOSE CHANGES."**

successful in the future. A prolonged lag in STEM literacy will limit the world's collective ability to address true global crises such as climate change, hunger and health epidemics.

"As a company of engineers and scientists whose primary products are the building blocks of innovation, our competitiveness depends on having a world-class technical workforce and an equally capable customer base," says Melendy Lovett, Senior Vice President and President of Education Technology for Texas Instruments (TI).

Lovett says STEM knowledge drives the innovation that is critical to TI's growth, and refers to STEM as the foundation of "an ecosystem for innovation" that allows companies and—by association—the U.S. to be leaders in the global market.

"Without a unified effort to improve STEM education, there will be a shortage of talent in the workforce for U.S. companies that depend on innovation to grow. By advancing proven programs and ensuring that new programs are developed and assessed against sound design principles, we can be sure that business support is creating value, not serving as a distraction to a

school system's efforts to improve STEM education," says Lovett.

**BREAKING DOWN BARRIERS WITH STEM**

Eleven years ago, 30 women employees from Texas Instruments, including Lovett, made personal contributions to establish a donor-advised fund at the Dallas Women's Foundation. The fund, known as High Tech, High Heels (HTHH), was established because the women of TI were concerned about the low number of women graduating with technology-related degrees.

HTHH is an effective strategy to close the gender gap in the STEM fields, with three programs that provide equity training and STEM career workshops for educators, and advanced-placement physics camps for high school girls. Since its advent, HTHH in Dallas has increased the number of girls taking the AP physics test by 2.5 times, and increased the number who pass the exam by six times.

In 2011, the Texas Instruments Foundation gave a significant grant to the National Alliance for Partnerships in Equity Education to manage and expand the

impact of HTHH to other districts. "I find it very rewarding to see this program encourage young, minority girls to participate in the physics camps and then see the choices they can have after high school that will provide a path for many out of poverty," says Lovett.

Lovett says STEM education is a core value to TI that needs to be addressed well into the future, but that there must be proof of tangible progress. "We have to look at the return on investment and benchmark each specific program. There is no silver bullet," says Lovett. "We will evaluate each program and measure impact."

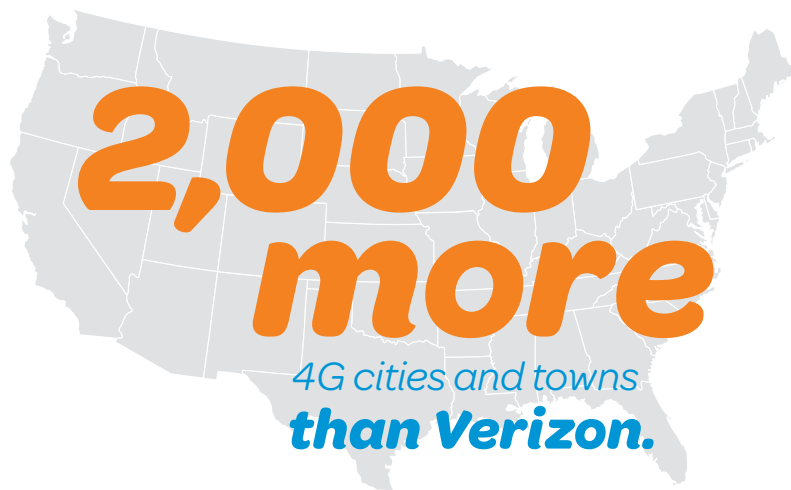
At AT&T, which hired about 25,000 employees last year (a significant portion of whom have STEM jobs), executives have identified STEM education as one of numerous educational programs designed to reach students who may not otherwise graduate high school. "Five years ago, our CEO challenged us to focus on the single most important educational issue. That's when we heightened our emphasis on education and the looming crisis of high school dropouts. So, to us, it's not just about STEM, but reaching students that are affected in general," says Beth Shiroishi, AT&T Vice President of Sustainability and Philanthropy. "We've seen the talent pipeline become narrower, and we've seen our need as a company to train employees increase steadily over time. We value diversity and we've seen dropouts—in particular among ethnic groups—that, looking forward, will lead to a true crisis in the ability to create a diverse workforce in 10 to 20 years."

**MOVING THE NEEDLE WITHIN THE EDUCATIONAL SYSTEM**

One of the critical issues facing students and corporations alike is how quickly technology advances and how slowly educational systems are able to change curriculum. "As a country, we have not created an educational system that adapts to the needs of our society. It's hard to change, in general, but when you have school systems as huge as ours in the U.S., it becomes extremely difficult. I don't think anyone would argue that, from a test perspective, we're continuing to fall behind," Shiroishi says. "But I'm hugely optimistic about this



**AT&T.**  
*The nation's*  
**largest**  
**4G network.**



Rethink Possible® 

1.866.MOBILITY | [ATT.COM/NETWORK](http://ATT.COM/NETWORK) | VISIT A STORE

4G speeds not available everywhere. Comparison based on U.S. cities and towns with 4G coverage. ©2012 AT&T Intellectual Property. Service provided by AT&T Mobility. All rights reserved. AT&T and the AT&T logo are trademarks of AT&T Intellectual Property. All other marks contained herein are the property of their respective owners.





S7

country's spirit of fighting and innovation. If you step way back, our educational system as a whole was designed to do a particular job and it did that job well for many years. Now, however, it's time to change."

Shiroishi says instilling STEM into everyday learning is a lifelong continuum, and dispels the myth that "it's too late" to get high school students interested in STEM. "What students are not seeing is the connection between what they're learning and what they'll do out there in the working world. You have to show a student the connection and inspire them, but you have to back that up with a path supported by the parent, teacher, counselor and training platform. At AT&T, we believe it takes both investment and involvement. Our employee volunteers and in-kind contributions significantly extend our impact."

One point remains clear across the board: It's going to take more than throwing money at the STEM problem to solve it. "Our existing education systems can sometimes struggle to quickly adopt new technologies that exist and that are emerging," says HP's Zedlmayer. "Curriculum adoption cycles are generally measured in years; high tech innovations are generally measured in weeks or months." For this reason, HP supports the Horizon Project research conducted by the New Media Consortium and its international network of education technology experts. The resulting Horizon Reports ([www.nmc.org/horizon](http://www.nmc.org/horizon)) help educators look beyond the "horizon" to

strategically examine new technologies that can enhance learning and teaching.

Another challenge educators and corporations are facing when it comes to exposing students to STEM is that the approach has to be different for grade school children versus high school teens. "For younger children," says Peden, "we want them to see that when they plug in a guitar, ride a skateboard or play a video game, they're having fun with math and science. By exposing them to these day-to-day activities, we can show them how STEM shapes their world. For older students, they're ready to apply classroom learning to real-world situations, so we need to give them hands-on opportunities that will spark their imagination and promote innovative thinking."

To this end, Raytheon sponsors the Team America Rocketry Challenge, which allows middle and high school students to design, build and launch their own rockets. "The competition promotes the teamwork, problem solving and creative

thinking that are required in STEM careers, and the students can apply these skills in a competitive environment that is creative, fun and exciting, and sets them on a path for future application and development," Peden says. "Throughout the education life cycle, it is crucial to expose students to the future career opportunities that excellence in STEM can deliver. Internships, leadership programs, mentoring networks and engineers in the classroom are all critical pieces of the puzzle."

In 2005, Raytheon launched its Math-MovesU program to connect with students from elementary school through college, and to support those educators. "Supporting the education process is something we take very seriously," says Peden, "and supporting our teachers should be at the core of any STEM initiative. We simply must support and invest in our teachers. When it comes to moving the needle on STEM, they are the true game changers."

## FIXING THE CRISIS

Improving STEM education is a long-term investment. In the meantime, small changes are taking place. "When we visit schools to take part in STEM programs, and see the excitement in the eyes of the students, it makes me feel proud and excited," Zedlmayer says. "That's when you clearly understand that you can make a difference. There are big systemic changes required to transform the learning experience, and it takes a long time to make those changes. Let's make sure students don't have to wait another 10 years for us to make those changes. Technology is an enabler and can change the way we live, learn and work."

While the task of achieving widespread STEM literacy is daunting, organizations like CTEq and its corporate members believe that they are on the right path. "At a high level, success would result in an America where all students graduate with skills the country needs, but in the short term, we look hard at the metrics. We ask ourselves, 'Is this program delivering more workers in the STEM space than it normally would?'" says Shiroishi. "But we understand that payback is long-term—we might reach someone in ninth grade and not know it for years." — *Jason Carpenter*

**"STUDENTS DON'T SEE THE CONNECTION BETWEEN WHAT THEY'RE LEARNING AND WHAT THEY'LL DO OUT THERE IN THE WORKING WORLD. WE HAVE TO SHOW THEM THE CONNECTION."**

# TEXAS INSTRUMENTS IS ENGINEERING CHANGE IN STEM

**A**s a global technology company and supporter of K-12 and higher education in its communities for more than 80 years, Texas Instruments (TI) knows that STEM education drives innovation and the future of our company and our country.

"It's so important to collaborate and support proven programs that get results and that can be replicated nationwide," says Melendy Lovett, TI Senior Vice President and President of Education Technology. "We team up with strategic partners to advocate for sound educational policies and, through organizations like Change the Equation, to help fill the STEM talent pipeline."

By focusing on teacher effectiveness, awareness and student achievement, TI and the TI Foundation have seen firsthand the impact successful STEM programs can have on students:

- UTeach, a program to recruit, prepare and retain qualified STEM teachers, is in place at 34 universities. Since 2009, the TI Foundation has supported programs at three of these universities

that will produce approximately 800 math and science teachers by 2018. Over the course of their careers, those teachers will serve nearly a quarter of a million students.

- The Advanced Placement Incentive Program has resulted in a 1,344 percent increase in Dallas students taking AP™ math, science and English exams since the program began in 1997. Since the TI Foundation's partnership with Dallas schools began in 2000, over 18,500 North Texas students have passed AP exams for college credit.

- MathForward provides technology and resources to help narrow the achievement gap for Hispanic, African-American and economically disadvantaged students in middle-grades math. TI began the program in 2005 in Richardson, Texas, where it significantly narrowed the achievement gap in the 7th and 8th grades; it now covers 18 states, 76 districts and more than 300 schools.

To read more, please visit [www.ti.com/citizenship](http://www.ti.com/citizenship) ●



## WE'VE GOT A Better Formula for Success

And it's starting to add up to a brighter future.

There's a surprising area of opportunity sitting vacant in America — jobs that require advanced knowledge in science, technology, engineering and math (STEM). To stay competitive in a rapidly advancing world we need to change the face of STEM learning.

Change the Equation is working to improve interest in and quality of STEM learning. Our almost 100 corporate members are joining forces to make a bigger impact than they ever could alone.

Together, we are helping equip all American students with the STEM skills they need to thrive in a competitive world.

Find out how your company  
can get involved:

[changetheequation.org](http://changetheequation.org)

