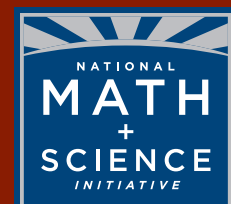




FACING THE FUTURE

## National Math and Science Initiative

*Providing the ideas, inspiration,  
and resources for programs that  
teach U.S. students to master  
the global language of math  
and science*



MULTIPLYING SUCCESS



*“This new generation will have the opportunity to solve many global issues: healthcare, energy security and the global food crisis to name just a few. Given this, the missing ingredient is a better knowledge of math and science and its power to provide solutions to these problems. Technology can and will change the world. For this younger generation to be the force for good they want to be, they need to understand that the new literacy of the 21st century includes math and science.”*

*— Tom Luce, CEO,  
National Math and Science Initiative*

NMSI equips  
students  
to succeed  
in math and  
science.



## National Math and Science Initiative

The mission of NMSI is to advance math and science education in the United States. We do this by expanding programs with proven results to a national scale in order to reach the 50 million students in America's public school system.

### What

To reverse America's troubling decline in math and science education, NMSI is in the process of replicating across the country two established programs commended by the National Academies' landmark report, *Rising Above the Gathering Storm*.

- + Advanced Placement\* Training and Incentive program, which greatly increases the number of students succeeding in more rigorous coursework and graduating from college.
- + UTeach, which encourages math and science majors to enter the teaching profession by offering compact degree plans, early teaching experiences, and financial assistance for undergraduates.

### Why

Math and science are the foundational literacy for everyone in today's global economy. NMSI was launched in March 2007 by top leaders in American business, education, and science in response to the call for action by the National Academies in *Rising Above the Gathering Storm*, which found that low performance in math and science is hurting the United States' global competitiveness.

### How

In its first year, NMSI awarded its first round of funding — six \$13.2 million awards for AP Training and Incentive programs in high schools around the U.S. and 13 awards of \$2.4 million to launch the UTeach program in additional universities.

- + The six non-profits currently receiving AP Training and Incentive grants are in Alabama, Arkansas, Connecticut, Kentucky, Massachusetts, and Virginia.
- + The 13 UTeach grantees are the University of California at Berkeley, the University of California at Irvine, the University of Colorado at Boulder, the University of Florida at Gainesville, Florida State University, the University of Houston, the University of Kansas at Lawrence, Louisiana State

\*Advanced Placement and AP are registered trademarks of the College Board, which was not involved in the production of, and does not endorse, this product.

Math + Science =  
Where the Jobs Are

Of the 10 fastest growing occupations, eight are science, math or technology-related.



University, Northern Arizona University, Temple University, the University of North Texas, the University of Texas at Dallas, and Western Kentucky University.

### Funding

A non-profit organization, NMSI is leveraging public-private cooperation to solve one of our nation's most pressing challenges: Staying competitive in the crucial fields of math and science.

- + ExxonMobil is the lead funder with a commitment of \$125 million.
- + The Bill & Melinda Gates Foundation and the Michael & Susan Dell Foundation are also major donors and have collectively committed \$15 million over the next three years.
- + IBM and Perot Systems have provided millions of dollars of in-kind assistance.

### Leaders

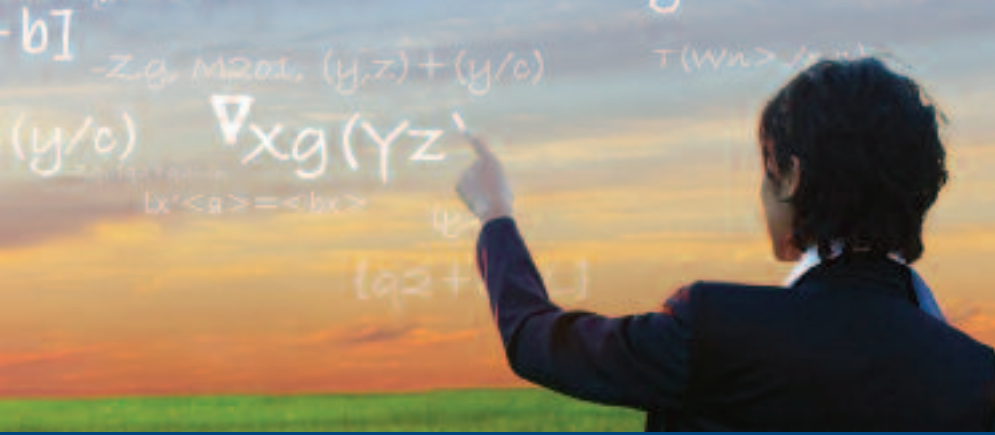
- + A prestigious board of directors has been assembled that includes top executives from the National Academies, leading universities, major U.S. corporations, state education agencies, foundations focusing on education, and former NASA Astronauts.
- + The Chief Executive Officer is Tom Luce, former Assistant Secretary of Education and cofounder of the National Center for Educational Accountability.
- + The Chief Program Officer is John Winn, former state education commissioner of Florida.

### Approach

NMSI serves as a holding company to channel private sector money to replicate proven programs, establish benchmarks, monitor implementation, and provide on-going support and expertise. Over the course of a grant, recipients are expected to seek other sources of funding and become self-sustaining, which becomes feasible as programs demonstrate success.

### Looking Ahead

In the next five years, NMSI expects to have Advanced Placement Training and Incentive Programs in 25 states, impacting students in up to 2,000 American high schools. It is anticipated that the UTeach program will be replicated in as many as 50 universities, boosting dramatically the number of highly qualified math and science teachers in the United States.



*U.S. students recently finished 15th in reading, 19th in math, and 14th in science in the ranking of 31 countries by the Organization for Economic Cooperation and Development.*

## Advanced Placement Training and Incentive Program

In order to implement the NMSI training and incentive program for Advanced Placement courses, a non-profit organization is created in each state. The goal of the training and incentive program is to increase significantly the number of students taking and passing math, science, and English Advanced Placement exams in high school.

### Key Elements

- + Experienced “lead teachers” to coach other AP and Pre-AP teachers
- + Formal training to upgrade the content knowledge of math and science teachers currently in the classroom
- + Financial incentives for teachers and students based on results
- + Open enrollment to provide opportunities for students from diverse backgrounds
- + More time on task for students through prep sessions and after-school tutoring
- + High standards with accountability for results

*“The Labor Department projects that by 2014 there will be more than 2 million job openings in science, technology, and engineering, while the number of Americans graduating with degrees in those subjects is plummeting.” — The Economist, April 12, 2008*

### The Impact

The AP training and incentive program also dramatically increases college readiness. Students passing AP exams are three times more likely to earn a college degree than students who do not pass. African-American and Hispanic students who pass an AP exam are four times more likely to earn a college degree than those who do not pass.

AP students in the U.S. are internationally competitive in math and science, while their non-AP counterparts are not. American AP calculus and physics students’ scores rank at or near the top against all other countries, while their non-AP U.S. counterparts were at or near the bottom.

## AP Training and Incentive Programs

### Student Profile: TODD COLEMAN

When Todd Coleman got to the University of Michigan, it wasn't long before his friends in engineering classes noticed that he seemed better prepared than they were.

"They would joke that they wanted to send their kids to whatever high school I went to," he says, chuckling at the memory.

In truth, Todd went to two high schools in Dallas. He attended Carter High School half of the day and the Science and Engineering Magnet School the other half of the day, so he had the benefit of a host of Advanced Placement Program courses. He participated in a pioneering program that provided financial incentives for students to take more rigorous AP coursework.

Todd was encouraged to take Advanced Placement courses in English, physics, math, and computer science — and made high scores of 4 or 5 on all of them. "It was an incredible boost — when I came into college, I had earned enough course credits for sophomore status, which allowed me to double major in electrical engineering and computer engineering and still graduate on time," he says.

Todd went on to get his Master of Science and Ph.D. in electrical engineering at MIT. Today, at 30, he is an assistant professor at the University of Illinois at Urbana-Champaign and is also affiliated with the Beckman Institute. When he is not teaching class or mentoring graduate students, he conducts research on wireless communications and neuroscience. "We do know the brain communicates by neurons spiking," he explains. "I am interested in the computation aspects, how the brain represents information."

That curiosity comes naturally to him. As a young boy, he was fascinated by how things fit together. Building with toy Lego blocks was his favorite pastime. His teachers noticed he was good at math and science and recommended that he consider a career in engineering.

Today as Professor Coleman at one of the top engineering schools in the country, he actively mentors aspiring engineering students — high school students as well as college students from underrepresented groups such as minorities and women. He advises the younger students to follow their passion, to take advantage of whatever cards have been



*“When your teachers tell you to pursue a career, you ought to think about it. Everyone is talented at something – I was fortunate that mine was math and science.”*

*— Todd Coleman*

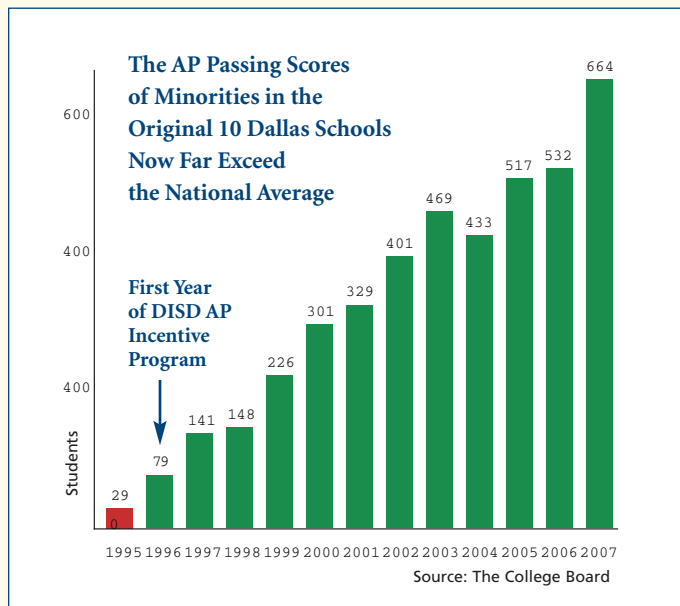
handed to them, and to follow their talents and interests.

He is a strong advocate of AP courses as a way for students to reinforce their potential in math and science. “All my AP teachers were excellent. I did not have a single bad teacher. You are so well prepared as a result,” he says. “It gives you a head start in college, so you can pursue a double major like I did. Or, you don’t have to take as heavy a course load so you can take part in campus organizations and have more free time, more flexibility in college.”

Most of his friends in high school were athletes, he says, but he never felt uncomfortable pursuing a different path. It enabled him to get summer internships at Intel, Microsoft and Silicon Graphics. Both of his parents were teachers and they encouraged his studies.

“There still seems to be some social stigma against math and science in terms of being nerdy, but I never looked at it that way,” he says. “I enjoyed it and I pursued it. It might be a somewhat vain perspective, but that’s where the money is. People in math and science generally make more money. Look at the entrepreneurs on top today and the people in technology development — Google is the biggest, hottest company in the

country and it was started by a bunch of computer science and engineering students. It’s worth keeping in mind when you are picking a major.”



*“If we want to find solutions to problems like pollution, if we want to continue to be a leader in technology and medicine, math and science are essential.”*  
— John Souther

## AP Training and Incentive Programs

### Student Profile: JOHN SOUTHER

John Souther would agree that math can take you places. In his case, math helped take him from the wide-open skies of Wichita Falls, Texas, to the historic halls of Harvard University and to a job at a giant financial company in Chicago. At 23, he is an internal consultant at Sears Holding Company and says, “My job is looking at numbers and making sure they add up right, gaining new insights from those figures. You have to have some math background to find meaning from the numbers.”

“From what I’ve seen, the people who succeed are the ones who understand how things work. You gain true insights into everything by examining the data, so the ones who succeed are data-driven and have a strong background in math and science,” he explains. “Math and science are the true cornerstone of being able to always improve, no matter what field you are in.”

Does he agree that math is the new literacy in today’s global, technological world? Absolutely. “When you look at the areas where progress is being made, it’s because of math and science. That’s what pushes everything forward. If we want to find solutions to problems like pollution, if we want to continue to be a leader in technology and medicine, math and science are essential.”

He discovered as a student at Wichita Falls High School that taking math and science Advanced Placement Program classes gave him an advantage in college coursework as well as the business world. “They definitely give you a higher level thinking experience than you would expect in a regular class. You have to take the initiative and focus extra hard on the academics, but then you can use those critical thinking skills anywhere in life. You definitely develop skills that you need for the future.”

Thanks to the AP Strategies training and incentive program, John received the financial help to pay for the AP tests. “I could not have paid for all 12 of those tests. The cost is cheaper than taking the actual course in college, but while I was still in high school, it would have been hard to pay for all of them.” He helped his family at their family music store, selling musical instruments and music books, and still made time for the Meals on Wheels and food bank programs in Wichita Falls, as well as track and football.

By the time he graduated, Souther had passed a dozen AP courses and was ranked



first in his class. “If you are unsure it’s going to be too much work, you should know the teachers are always going to be there for you. They want to see you succeed. The training and tutoring help you understand the test as well as the material and that gives you an advantage. It is definitely something you should try.”

He describes his AP teachers as amazing people, who were great influences on his life. “They are incredible,” he says. When Souther left Wichita Falls to attend Harvard, he had a full academic scholarship, but his mother worried that Cambridge, Massachusetts, was a long way from home — after all, John had never spent time outside of Wichita County before. But he thrived at Harvard and graduated on time in 2007, partly because his AP training helped him pass more advanced classes in college. He’s now weighing whether to pursue his original goal of a career in medicine or go to graduate business school instead. Either way, he’s grateful to have a strong foundation in math.

“We need to do more to push people to engage in math while they are in school,” he recommends. “While some students may shy away from math because they think it will be too difficult, math actually takes the hardness out of the work. You always have a right and wrong answer. It is very black and white. That can be fun — and it is definitely useful, something that will help you the rest of your life.”

### **American Students Are Increasingly at a Global Disadvantage**

- + During much of the 20th century, Americans entering the workforce were considered the best educated in the world. But foreign countries now claim a higher percentage of their entering workforce with the equivalent of a high school diploma — the U.S. has dropped to 17th.
- + Thirty years ago, 30% of students attending college worldwide were Americans. Today, the U.S. can claim only 14%. The rest of the world is becoming more educated.

(National Center on Education and the Economy, 2007)

*UTeach graduates have a 70% teacher retention rate, compared to a national average of 50%.*



## UTeach Programs

The UTeach mission is to recruit, prepare, and retain qualified science, math, and computer science teachers. Originated at The University of Texas at Austin in 1997, the program provides full teaching certification for undergraduate majors earning math, science, and computer science degrees without added time or cost to their degree.

### Key Elements

- + Active recruitment by offering the first two courses free of charge
- + A compact degree plan that allows students to graduate in four years with a degree in math or science and fulfill requirements for a teaching certification
- + A focus on acquiring deep content knowledge in math and science as well as teaching skills
- + Courses taught by faculty who are actively engaged in the teaching and learning of math and science
- + Early and intensive field experiences from the first semester
- + Personal attention and guidance from highly experienced master teachers, faculty, and successful public school teachers

### The Impact of UTeach Programs: UT Austin

The University of Texas at Austin now graduates more than double the number of secondary math and science teachers than it did before the UTeach program.

More than 85 percent of those certified go on to teach math and science. Five years later, more than 70 percent are still in the classroom, compared with a 50 percent teacher retention rate nationally.

NMSI, in conjunction with the UTeach Institute, is awarding grants of up to \$2,400,000 to non-profit institutions of higher education to start UTeach-type programs. The UTeach Institute, which was created to assist higher education institutions that are replicating UTeach programs, will be working hand-in-hand with NMSI to support grantee efforts.

In 2007, NMSI announced the first 13 winners of UTeach replication grants from among the 52 universities that applied. The UTeach Institute estimates that in their first five years, those 13 grantees will enroll over 5,600 students in their programs, and starting in four years, our UTeach grants will produce an average of 500 new math and science teachers per year for the next five years thereafter.

## UTeach

### Student Profile:

#### KATIE WEBER

Biology teacher Katie Weber is part of the new wave of young women entering careers in math and science, disproving old misconceptions that women weren't suited for math and science.

Katie was one of the outstanding participants in the UTeach program, which enables students to gain a teaching certificate while earning a bachelor's degree in math and science. She says she was surrounded in UTeach by "women who were really good at math and science." Gender prejudice was not something she encountered as a student herself, she says, because she had teachers who valued the women in science and there were "tons of really bright women" in her classes.

Her interest in biology began developing in high school in Houston. "I was really fascinated by human genetics, which inspired my interest. The heredity aspect was fascinating, how traits are passed along through our genes. Genetics uses a lot of math, and I was probably pretty good at that as well, so it was a good fit."

In fact, it was such a good fit that she received University Honors during each of her nine semesters at The University of Texas at Austin and she was selected to be the speaker at the commencement ceremony for graduates of the College of Natural Sciences.

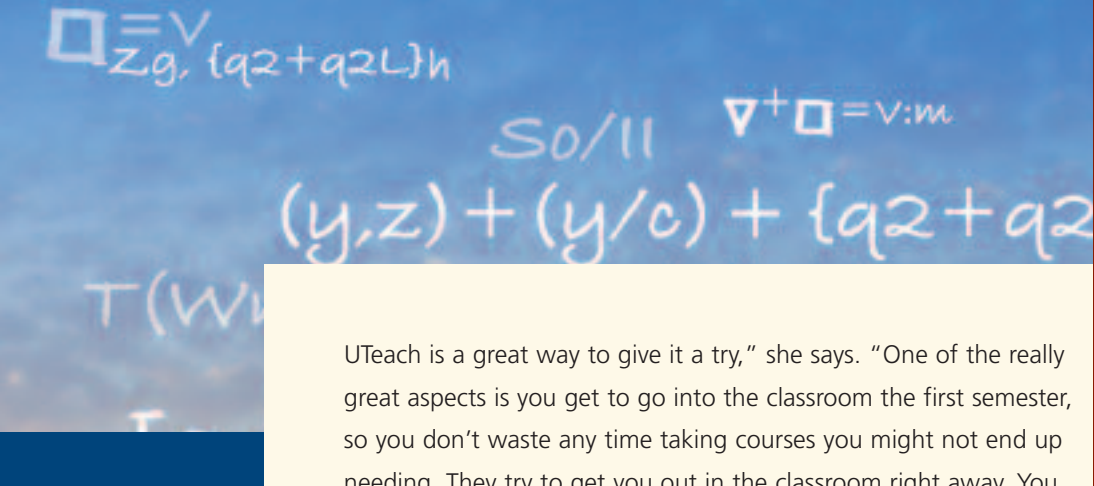
Katie credits her parents with raising her to believe she could do whatever she wanted to do. In addition to her academic achievements, she lettered as a swimmer in high school and worked on the rowing team at The University of Texas at Austin. These days she is concentrating on running and trained 40 to 60 miles a week in preparation for the Boston Marathon.

Teaching science is her primary passion and she says the UTeach program helped her find the perfect niche for her talents. She had entered UT Austin as a business major and considered a career in accounting, but was drawn more to idea of teaching Spanish or the biology that fascinated her in high school. When she approached the School of Education, they recommended the UTeach program to build on her strengths in math and science.

"Teaching is like a calling. If you think you would like it,



*"It's fun to get up and go to school every day. It's more exciting than going to an office and having to sit in front of a computer all day like a lot of my friends do. Every day is different. The best part is building relationships with the students — and sparking their interest in science." — Katie Weber*



*“Teaching is like a calling. If you think you would like it, UTeach is a great way to give it a try.”*

— Katie Weber

UTeach is a great way to give it a try,” she says. “One of the really great aspects is you get to go into the classroom the first semester, so you don’t waste any time taking courses you might not end up needing. They try to get you out in the classroom right away. You have the support of the master teachers, so you don’t feel like you’re alone. They work closely with you on planning your lessons before you go out and then they come out and observe and give you feedback that is really helpful.”

Katie learned from her practice teaching that she enjoyed teaching middle school more than high school. Today she teaches seventh graders at Henry Middle School in Leander, Texas, an area just north of Austin. “The seventh graders are a lot of fun; I enjoy the age,” she says. “I think they are old enough to be independent and responsible, but young enough that they have not developed egos that are too big. They want their teachers to like them and want to do well in school. They are very open-minded at that age and beginning to develop their special interests, so it’s fun to get them participating in science.”

Her teaching style? “Organized chaos,” she says with a laugh. “Basically my goal is to be the facilitator and let the kids explore and discover the answers for themselves. That’s incorporated with direct teaching where appropriate.”

The frog dissection, she says, usually is the students’ favorite project. “They act like they are going to be grossed out, but I have never had a student so disturbed they could not do it. They all get into it.”

Grading papers is still a challenge, but Katie says she has learned to make it manageable, so she will have time to train for the marathon and to stay active with her church. Someday she might like to be involved in curriculum design and teacher preparation, she says, but for now at 25, her UTeach experience has reaffirmed that teaching science is what she is most passionate about.

**The percent of Ph.D.s awarded to women in scientific fields is going up, but is still limited in several areas.**

Did you know?	Field	1987	2006
Women contributed 46% of the workforce in the U.S., but held just 26% of the jobs in the fields of engineering, science and technology.	Biomedical Science	39%	50%
	Chemistry	21%	34%
	Math	16%	27%
	Computer Science	14%	21%
	Engineering	7%	20%
	Physics	9%	18%

## UTeach

### Student Profile:

#### JESSE DE LA HUERTA



When Jesse De La Huerta started school in Brownsville, a border city on the southernmost tip of Texas, he did not speak English. He began his pre-kindergarten class as an English as Second Language student. But by his kindergarten year, his mother put him in all English classes. “She felt it was ‘sink or swim’ and wanted me to become fully English speaking as quickly as possible rather than get stuck in the ESL classes,” he recalls now. “And she was right.”

Jesse went on to graduate near the top of his class at Rivera High School and earned his undergraduate degree in math from The University of Texas at Austin in 2004. Today he teaches math at the International High School, a magnet school in Austin, Texas, where he says he has found his calling teaching math to students of many different nationalities and languages.

**About a third of high school math students and two-thirds of those enrolled in physical science have teachers who did not major in the subject in college — or are not certified to teach it.**

As he learned from his mother, math is a universal language. “My mom is from Mexico and she didn’t know English all that well, so when I was growing up, the only thing she could help me with that did not require reading English was math. While I was in the early grades, she was working as a teacher’s aide for the 5th and 6th grade classes, so she would give me the same work to do that the 5th and 6th grade students were doing. I got a good foundation early,” he explains.

It wasn’t long before Jesse was teaching his teachers. He remembers the first time his class was offered a bonus problem in critical thinking. “The teacher wasn’t expecting anybody to do it, but I went home and worked on it and solved it.” His teacher couldn’t figure out how he solved the problem, so he showed her how to work through it. She was so impressed that she encouraged him to take more math courses.

While he was in high school, Jesse took as many Advanced Placement courses in math

*“UTeach gives you the chance to see for yourself ... UTeach prepares you so well to teach with different methods, you feel well-prepared from the start.”*

— Jesse De La Huerta

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as he could, which gave him a significant head start on his math classes in college. He started out majoring in mechanical engineering, switched to math, and then added some business courses. Then he heard about the new UTeach program and liked the fact that it offered two degrees at once and that “they let you teach right off the bat to see if you like it.”

“Once I saw that I liked it — and I figured I would — I decided to finish as a math major and become a teacher,” he recalls. “I discovered I have this way of explaining math to people that makes sense to them.”

When he got his diploma, he put it in a big frame and gave it to his mom. After all, she was one of his most dedicated teachers. When he had balked at going to college — “I can be hard-headed” — it was his mother who convinced him that he’d be wasting his life if he did not continue his education.

Jesse’s first teaching assignment after he graduated turned out to be a fortuitous “accident.” He was assigned to fill a last-minute vacancy at the International High School. He explains, “There are kids from all over the world who come to learn English and the curriculum at the same time. I realized helping them was exactly what I wanted to do. The kids here love to be here and want to learn. I see a big difference from day one to the final day. We have 16 countries represented. The students come from a different world. Many have never seen a computer or used a computer. Ninety percent of them speak Spanish, so I can use my Spanish. But if I can’t, I will draw it for them, sing it for them, dance, whatever I need to do to help them learn math.”

Today he is a big fan of the UTeach program and has encouraged his friends to enter the program. “It’s a great thing. Our country needs the math teachers and a lot of students don’t know what to do with their lives. I explain to them, ‘You need that little piece of paper that says you graduated. If you like math and can also get a teaching option at the same time, that gives you an extra option.’ Some of my friends in business have seen how much I enjoy what I do and they have gone back to school and are going to try UTeach.”

“Not everyone can be a teacher,” he adds, “but UTeach gives you the chance to see for yourself, and if it is not a good fit, you can get out. If you stay in, UTeach prepares you so well to teach with different methods, you feel well-prepared from the start.”

**Eighty percent of jobs  
in the next decade will  
require some form of  
math and science.**

**(National Science Foundation)**

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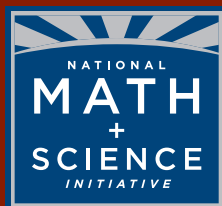
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*“Only by providing leading-edge human capital and knowledge capital can America continue to maintain a high standard of living, including providing national security for its citizens.”*

*– Norman Augustine, Chair, Rising Above the Gathering Storm Committee*



MULTIPLYING SUCCESS

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