TAPPING AMERICA'S POTENTIAL

The Education for Innovation Initiative

AeA

Business-Higher Education Forum

Business Roundtable

Council on Competitiveness

Information Technology Association of America

Information Technology Industry Council

Minority Business RoundTable

National Association of Manufacturers

National Defense Industrial Association

National Venture Capital Association

Semiconductor Industry Association

Software & Information Industry Association

TechNet

Technology CEO Council

Telecommunications Industry Association

U.S. Chamber of Commerce

Gaining Momentum, Losing Ground

GOAL:

Increase the annual number of U.S. science, technology, engineering and mathematics bachelor's-level graduates to 400,000 by 2015.

Progress Report 2008

www.tap2015.org

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The Education for Innovation Initiative

Gaining Momentum, Losing Ground

July 2008

Introduction

The Business Community Takes a Stand

In July 2005, 15 of America's most prominent business organizations[1] joined together to express their deep concern about the ability of the United States to sustain its scientific and technological leadership in a world where newly energized foreign competitors are investing in the capacity for innovation — the key driver of productivity and economic growth in advanced economies.

The business organizations formed the Tapping America's Potential (TAP) coalition to advocate for renewed attention to U.S. competitiveness and America's capacity to innovate.

TAP established a goal to double the number of U.S. science, technology, engineering and mathematics (STEM) graduates with bachelor's degrees by 2015.

TAP and other business, scientific and education coalitions helped to galvanize broad bipartisan agreement among federal policymakers on the need for action on U.S. competitiveness. Despite this consensus, and the enactment of landmark authorizing legislation, Congress and the administration have thus far failed to adequately fund the innovation policy agenda advocated by TAP.

America's Business Leaders Are Committed

In the three years since the TAP report was released, data on U.S. student performance, global economic competition and the link between innovation capacity and long-term economic performance have only served to reinforce the deep consensus in the business community that the United States must address its competitiveness challenges. American business leaders are more committed than ever to the policy agenda laid out in the 2005 report.

America's business leaders are frustrated that while governments around the world are building their national innovation capacity through investments in research and STEM education, the United States is standing still. Failure to change the status quo places America's future economic and technological leadership at risk.

1. AeA, Business-Higher Education Forum, Business Roundtable, Council on Competitiveness, Information Technology Association of America, Information Technology Industry Council, Minority Business RoundTable, National Association of Manufacturers, National Defense Industrial Association, Semiconductor Industry Association, Software & Information Industry Association, TechNet, Technology CEO Council, Telecommunications Industry Association, and U.S. Chamber of Commerce are the original 15 organizations that released the report in July 2005. National Venture Capital Association joined later that year.

Update on TAP Goal

The business organizations that came together in 2005 to found TAP established a bold 10-year goal: "Double the number of U.S. science, technology, engineering and mathematics graduates with bachelor's degrees by 2015."

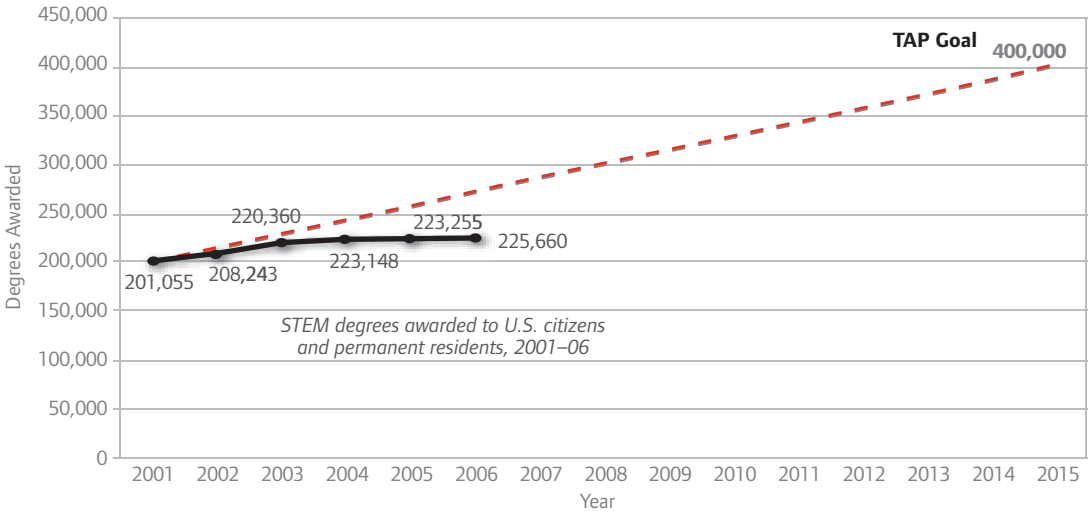
America's business leaders recognize that highly educated technical professionals constitute the key differentiator in global economic competition. They are the world's innovators, and their presence attracts capital and infrastructure investments, feeding a virtuous cycle of investment and capacity building that drives more rapid innovation, accelerated productivity growth, and higher levels of sustained economic growth and high-wage employment.

"The key to America's competitiveness challenge is innovation. Technological innovation drives productivity growth. It creates new products and processes — even whole new industries — thereby generating high-wage employment and a higher standard of living for all Americans. ... The wellsprings of innovation require constant nurturing, and maintaining U.S. innovation leadership demands hard work and investment. We can meet this challenge."

— **Harold McGraw III**
Chairman, President and CEO
The McGraw-Hill Companies

At the time the goal was established, 2001 was the most recent year for which data were available on U.S. bachelor's degrees. In that year, slightly more than 200,000 STEM bachelor's degrees were awarded to U.S. citizens

U.S. STEM Bachelor's Degree Production Not on Track To Meet TAP Goal



Source: National Science Foundation.

and permanent residents. In the prior decade, the number of STEM bachelor's degrees awarded annually was relatively stable and hovered slightly below 200,000. Over the same period, projected demand for STEM graduates in the U.S. workforce grew markedly, and economic competitors, such as China and India, greatly increased their output of STEM graduates. The TAP goal of 400,000 U.S. STEM graduates with bachelor's degrees by 2015, while ambitious, is necessary to meet future workforce demands and the global competitiveness challenge.

Why Major in a STEM Field?

There are a number of reasons why students should pursue a bachelor's degree in STEM fields, including:

- The Bureau of Labor Statistics projects that employment in science and engineering occupations will grow 70 percent faster than the overall growth for all occupations.
- STEM graduates on average enjoy better employment prospects and higher starting salaries than graduates in non-STEM fields.

Since the TAP report was issued three years ago, 2002–2006 data have become available that show U.S. STEM bachelor's degrees awarded in that period fall short of what will be required to reach 400,000 by 2015. While the number of STEM degrees awarded has remained relatively flat for three years, the policy changes the business community has called for to attract and retain more undergraduate STEM majors have not been enacted. Congress has authorized, but not yet funded, the expansion of science and engineering research and STEM education programs that will make STEM majors more attractive to undergraduates.

Private-sector demand for STEM graduates has increased and may help pull more students into these majors. The latest STEM workforce data show that, in 2006, the already low unemployment rate for STEM graduates dropped to 2.5 percent, and starting salaries were higher for students graduating with STEM degrees, particularly those with engineering degrees, than for most other majors.

In addition, there is a desperate need for STEM majors to teach math and science in U.S. schools. Research indicates that a highly qualified teacher is one of the most important factors in raising student achievement, yet according to the Bureau of Labor Statistics, school districts across the country have difficulty hiring qualified math and science teachers.

Progress on the TAP Agenda

Progress on Recommendations

Recommendations	Progress
1. Build public support for making improvement in STEM performance a national priority.	MIXED PROGRESS Uneven public understanding but broad bipartisan support among policymakers at all levels
2. Motivate U.S. students and adults, using a variety of incentives, to study and enter STEM careers, with a special effort geared to those in currently underrepresented groups.	MIXED PROGRESS Strong initial federal response but relatively weak follow-through; strong support from business leaders and states
3. Upgrade K–12 math and science teaching to foster higher student achievement, including differentiated pay scales for mathematics and science teachers.	LITTLE PROGRESS Greater attention from states, local school systems and the private sector but no significant federal response
4. Reform visa and immigration policies to enable the United States to attract and retain the best and brightest STEM students from around the world to study for advanced degrees and stay to work in the United States.	NO PROGRESS Broader immigration politics prevented enactment of widely supported targeted reforms for highly educated, foreign-born professionals
5. Boost and sustain funding for basic research, especially in the physical sciences and engineering.	NO PROGRESS Despite broad bipartisan consensus, federal policymakers have not increased funding to match their pledges

Building a Consensus for Investments in U.S. Innovation

Since the TAP recommendations were issued three years ago, the policy landscape has changed in a positive direction, but progress toward implementation has been frustratingly halting and slow.

"America's horn of plenty over the past century has been filled by our ability to innovate and create new technologies that spur economic growth and improve the quality of our lives. The race to stay ahead in the brain race is critical to our future world leadership, and we need our government, our education system and the private sector to step up to the challenge."

— Anne M. Mulcahy
Chairman and CEO
Xerox Corporation

The policies TAP advocates are not new. For more than 10 years, economists and policy experts have pointed out that America's failure to invest adequately in its innovation capacity will have negative long-term consequences for U.S. economic competitiveness. Those voices have only grown louder as global economic competition has grown more intense and America's competitors have increased their investments in math and science education and in science and engineering research.

What is new, however, is the deep commitment of America's business leaders to change the dynamic and reorient national policy toward greater investment in U.S. innovation leadership. The July 2005 TAP report was but one expression of this new commitment.

From Rhetoric to Legislation

In November 2005, then-Minority Leader of the House of Representatives Nancy Pelosi unveiled the House Democrats' Innovation Agenda calling for increased federal investments in science, research, and math and science education, as well as incentives for small business to increase its innovation capacity.

President Bush, responding to the concerns of America's business leaders, announced the American Competitiveness Initiative (ACI) in his February 2006 State of the Union address to Congress, which proposed to double federal support for basic physical sciences and engineering research over 10 years at three key civilian

science agencies, to renew the federal commitment to improving U.S. student achievement in math and science, and to implement high-skilled immigration reform and a permanent R&D tax credit.

For the first time, an American president and congressional leaders articulated an explicit link between physical sciences and engineering research and student achievement in math and science, and future U.S. economic competitiveness. The ACI and the House Democrats' Innovation Agenda were more than just budget proposals — they were a new rationale for public investments in America's science and technology enterprise.

As a result of these and related legislative efforts, on August 9, 2007, the America COMPETES Act was signed into law. The legislation authorizes an increased federal investment in STEM education and science and engineering research. The America COMPETES Act is designed to:

- **Strengthen K–12 math and science education** by improving teacher training in math and science; increasing support for the Robert Noyce Scholarship Program, which provides scholarships for STEM undergraduate majors who agree to become K–12 math and science teachers; increasing the number of teachers prepared to teach Advanced Placement and pre-International Baccalaureate college preparatory courses; and providing Math Now grants to improve elementary and secondary math instruction.

- **Expand undergraduate and graduate science and engineering programs** through increased support for the National Science Foundation (NSF) STEM Talent Expansion Program, which provides grants to universities to devise creative programs to recruit and graduate more undergraduate STEM majors.

"Our companies have an opportunity to give back to the community, to help students get excited about education in general, and math and science in particular. We can help them make the connection between studying math and science now and having great careers in engineering and science later."

— William H. Swanson
Chairman and CEO
Raytheon Company

- **Increase funding for basic research in the physical sciences** by authorizing substantial new investments in basic research at NSF, the National Institute of Standards and Technology (NIST), and the Department of Energy (DOE) Office of Science — providing a blueprint for future appropriations to double research at these key agencies in seven to 10 years.

The America COMPETES Act is a significant policy advance for U.S. innovation and competitiveness. However, unless sufficient appropriations follow over the next several years, the TAP agenda with regard to STEM education and science and engineering research will not be realized.

Two Steps Forward, One Step Back

In a disheartening repeat of previous years, deep consensus and nearly unique bipartisan agreement on the need to make innovation a priority did not, in the end, result in significant increased funding for basic research in the physical sciences or STEM education. Instead, appropriations provided either flat funding or real declines in fiscal year (FY) 2008, in constant dollar terms, for research and education programs.

There is an urgent need, however, to forge ahead to meet the TAP goal. Recent data illustrate why business leaders and policymakers must continue working together on STEM education priorities if the United States is to remain the world's innovation leader.

"America's economic future lies with its next generation of workers and their ability to develop new technologies and products. This means we must strengthen math and science education in the U.S."

— Craig Barrett
Chairman
Intel Corporation

Weak U.S. Performance in Science and Mathematics Literacy

Average scores of 15-year-old students on combined science literacy scale and mathematics literacy scale, by Organisation for Economic Co-operation and Development (OECD) jurisdiction, 2006

Combined science literacy scale

Jurisdiction	*Score*
OECD average	**500**
OECD jurisdictions	
Finland	**563**
Canada	**534**
Japan	**531**
New Zealand	**530**
Australia	**527**
Netherlands	**525**
Korea, Republic of	**522**
Germany	**516**
United Kingdom	**515**
Czech Republic	**513**
Switzerland	**512**
Austria	**511**
Belgium	**510**
Ireland	**508**
Hungary	**504**
Sweden	**503**
Poland	**498**
Denmark	**496**
France	**495**
Iceland	**491**
UNITED STATES	**489**
Slovak Republic	**488**
Spain	**488**
Norway	**487**
Luxembourg	**486**
Italy	**475**
Portugal	**474**
Greece	**473**
Turkey	**424**
Mexico	**410**

Mathematics literacy scale

Jurisdiction	*Score*
OECD average	**498**
OECD jurisdictions	
Finland	**548**
Korea, Republic of	**547**
Netherlands	**531**
Switzerland	**530**
Canada	**527**
Japan	**523**
New Zealand	**522**
Belgium	**520**
Australia	**520**
Denmark	**513**
Czech Republic	**510**
Iceland	**506**
Austria	**505**
Germany	**504**
Sweden	**502**
Ireland	**501**
France	**496**
United Kingdom	**495**
Poland	**495**
Slovak Republic	**492**
Hungary	**491**
Luxembourg	**490**
Norway	**490**
Spain	**480**
UNITED STATES	**474**
Portugal	**466**
Italy	**462**
Greece	**459**
Turkey	**424**
Mexico	**406**

Average is higher than the U.S. average

Average is not measurably different from the U.S. average

Average is lower than the U.S. average

Source: National Center for Education Statistics, U.S. Department of Education and Institute of Education Sciences, *Highlights from PISA (Programme for International Student Assessment) 2006*, 2007.

Investments in Basic Research Drive Innovation

Investments in basic research, particularly in the physical sciences and engineering, have led to a wide range of transformative innovations that have spawned new industries, created new high-wage jobs and positively impacted our daily lives. From medical imaging and laser-based medical therapies to global positioning systems (GPS) and MP3 players, federally funded research has been the foundation of many groundbreaking scientific discoveries, including the following:

Magnetic Resonance Imaging (MRI)

- MRI technologies save lives every day by providing detailed images that help physicians detect critical illnesses, often during the early stages of development.
- From the 1970s to the 1990s, the National Institutes of Health, NSF and DOE funded research that led to the development of MRI.

GPS

- GPS provides travelers with in-vehicle navigation, enables emergency and rescue workers to locate people in distress, and allows researchers to track and monitor natural disasters.
- The Department of Defense (DoD), DOE, the Air Force and Office of Naval Research funded research leading to the development of GPS.

Semiconductors

- Personal computers, cellular phones, MP3 players, cameras, video recorders, medical equipment and other devices all rely on semiconductors to function.
- NSF, DOE, Defense Advanced Research Projects Agency, Office of Naval Research and the Air Force funded research to develop and enhance semiconductors.

These and many other innovations arising from federal research investments also have spurred new industries, reinvigorating the nation's manufacturing and creating high-wage jobs — a model that can serve the United States into the future with an increase in government resources targeted to basic research.

Can We Get There from Here?

Given the limited progress to date on raising U.S. undergraduate STEM major graduation rates, is TAP's goal of producing 400,000 U.S. graduates annually with bachelor's degrees in STEM fields achievable? The answer is yes, but only if policies are in place to create the right incentives.

The America COMPETES Act, if funded in spending bills yet to be enacted, will help to increase demand for STEM graduates by doubling federal support for basic research in math, engineering and physical sciences; increase the supply of incoming freshmen with the requisite skills to pursue STEM majors by improving K–12 STEM education; and increase recruitment of new STEM majors by highlighting the value of STEM careers and their importance to individual and national economic success.

In the appendix, we present examples of progress made toward each of the specific recommendations offered in the 2005 TAP report. The story is one of a glass half full. The business community has helped change the political and policy landscape; and nearly all of TAP's recommendations are included in pending legislation, recently enacted legislation or in the president's budget request. To date, however, very few have been implemented. The number of undergraduate STEM degrees won't begin to grow at the requisite rate until more resources start flowing into university research programs, new — and newly energized — math and science teachers start flowing into K–12 schools, and STEM teaching and student performance improves — at all levels.

"Highly skilled workers, trained in science, technology, engineering and mathematics, are the ones who generate breakthrough innovations that lead to productivity gains, economic growth and higher standards of living. America enjoys a high standard of living, but we are falling behind in producing the technical talent we will need to sustain our economic leadership in the world."

— Joseph M. Tucci
Chairman, President and CEO
EMC Corporation

Conclusion

Since the TAP report was issued three years ago, Congress and the administration appeared to get serious about addressing America's competitiveness challenge but have failed to provide matching federal money for STEM education and science and engineering research.

The America COMPETES Act, signed into law last year, represents a substantial step forward toward the realization of the TAP innovation agenda. Follow-through by Congress and the administration on spending bills over the next several years will be necessary, however, before the vision of significantly enhanced U.S. innovation capacity embodied in the Act becomes reality.

The collapse of comprehensive immigration reform in 2007 has stymied much-needed reform of the employment-based green card and H-1B visa systems. Highly educated foreign-born professionals, particularly those educated at U.S. universities, are one of America's greatest competitive advantages. The United States should embrace these innovators rather than sending them home to compete against U.S. businesses.

"The nature of competition and the forces of innovation shift the frontiers of science, business and technology at a rate we've never seen before. ... To be competitive, any individual — like any company, community or country — has to adapt continuously, learning new fields and new skills."

— Samuel J. Palmisano
Chairman and CEO
IBM Corporation

It is incumbent upon the business community to maintain the pressure on policymakers to see that the TAP agenda is fully enacted and implemented. In particular, TAP's priorities include:

- Funding basic science and engineering research at U.S. universities at the levels authorized in the America COMPETES Act;

- Funding STEM education programs at the levels authorized in the America COMPETES Act, including funds for expanding the Robert Noyce Scholarship Program at NSF, Math and Science Partnerships (MSP) programs at both NSF and the Department of Education, Math Now, Adjunct Teacher Corps, and programs to develop and expand Advanced Placement and International Baccalaureate programs;

- Enacting targeted reforms to welcome more highly educated foreign-born professionals into the United States; and

- Complementing federal action with state, local and private-sector initiatives.

The business community continues to feel a sense of urgency about the future competitive position of the United States. If anything, the stakes are higher today than when the TAP report was released three years ago. While federal innovation investments have stalled in the United States, foreign competitors are continuing to build their own capacity to innovate by investing in research and education, opening their doors to talent from around the world, and creating a favorable climate — through tax credits and other incentives — to attract private-sector research investments.

If policymakers continue to take U.S. economic and technological leadership for granted, they will leave us with an America that is potentially weaker and less able to compete in the global economy. For the sake of our children and grandchildren, we cannot afford to let that happen.

"The bottom line is that improved training in science, technology engineering and math provides benefits to all students, which will in turn help ensure a productive, innovative workplace — in all fields — for decades to come."

— Michael G. Morris
Chairman, President and CEO
American Electric Power
Company, Inc.

Appendix: Examples of Progress on Specific TAP Recommendations

Recommendations	Examples of Progress
1. Build public support for making improvement in STEM performance a national priority.	• In the three years since the TAP report was issued, although there has not been significant change in public attitudes, there is now widespread recognition among state and federal policymakers that improvement of math and science education and more robust support for science and engineering research must be key national priorities. The National Academies' "Rising Above the Gathering Storm" report played a major role in raising public awareness and building support.
Launch a campaign to help parents, students, employees and community leaders understand why math and science are so important to individual success and national prosperity. *(Business)*	• Business has stepped up to the challenge and has launched several initiatives, particularly in math and science education, to expand technical literacy and communicate the value of math and science for both individual career success and national economic competitiveness. • Examples include ExxonMobil's print, Internet and television ads in conjunction with the company's $125 million contribution to the National Math and Science Initiative; Business Roundtable's work with North Castle on teen attitudes toward math and science; and the public education campaign funded by The Broad Foundation and the Bill & Melinda Gates Foundation to make education a front-burner issue in the 2008 presidential campaign.
Expand the State Scholars Initiative to encourage students to take rigorous core academic courses in high school. *(Business)*	• The State Scholars Initiative, www.wiche.edu/Statescholars, with funding from the U.S. Department of Education, operates in 24 states and uses business leaders to motivate students to complete a rigorous course of study in high school.
Provide role models and other real-world examples of the work that engineers and scientists do. *(Business)*	• TAP launched a Web-based campaign profiling CEOs with technical degrees to illustrate the fact that science and engineering are the most common undergraduate degrees among Fortune 500 chief executives; dozens of companies provide scientists and engineers to speak at schools and conduct lessons. • The Maryland Business Roundtable for Education launched a teen Web site, www.BeWhatIWantToBe.com, that includes profiles of scientists and engineers in the state.

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Recommendations	Examples of Progress
2. Motivate U.S. students and adults, using a variety of incentives, to study and enter STEM careers, with a special effort geared to those in currently underrepresented groups.	• On February 2, 2006, President Bush signed into law the Deficit Reduction Act of 2005, which established academic competitiveness grants and Science, Mathematics and Research for Transformation (SMART) grants to encourage more U.S. students to pursue undergraduate degrees in math, science and engineering. • A 2008 summit meeting, America's Competitiveness: Hispanic Participation in Technology, sponsored by IBM and cosponsored by ExxonMobil, Lockheed Martin and Univision, focused on specific actions to increase STEM majors and careers.
Create more scholarships and loan forgiveness programs for students who pursue two-year, four-year and graduate degrees in STEM (including students who plan to teach math and science, particularly in high-poverty schools). *(Federal, State, Business)*	• The Deficit Reduction Act of 2005 made student loan forgiveness programs for science and math teachers in high-need areas permanent and raised the maximum amount eligible for forgiveness to $17,500. • An example among the many corporate-supported STEM scholarships, Texas Instruments' Math Scholars program at the University of North Texas Dallas Campus provides scholarships to encourage students, especially from underrepresented groups, to get bachelor's degrees in math with math teacher certification and agree to teach in Dallas-area schools for at least two years after graduation.
Build on existing programs such as SMART at the DoD, the Science and Technology Scholarship Program at NASA, Robert Noyce scholarships at NSF, and federal loan forgiveness programs that provide up to $17,500 for secondary math and science teachers. *(Higher Education, Business, Federal, State)*	• On August 9, 2007, President Bush signed into law the America COMPETES Act, which authorizes expansion of the Robert Noyce Scholarship Program: $90 million in FY 2008. • The Consolidated Appropriations Act of 2008, which funds civilian agencies for FY 2008 and was enacted into law in December 2007, directs NSF to increase funding for this program by a very modest amount: $15 million in FY 2008.
Supplement Pell Grants for eligible students who successfully complete core academic courses in high school. *(Higher Education, Business, Federal, State)*	• The Deficit Reduction Act of 2005 included academic competitiveness grants ($750/student in freshman year; $1,300 in sophomore year) and SMART grants ($4,000/student in math and science fields in junior and senior years) for Pell Grant-eligible students who have completed a rigorous academic high school program.

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Recommendations	Examples of Progress
Offer programs, such as the Professional Science Master's, that encourage college graduates to pursue fields outside of academia that combine science and/or math with industry needs. *(Higher Education, Business, Federal, State)*	• The America COMPETES Act authorizes NSF to give grants to colleges and universities to establish Professional Science Master's programs. • Professional Science Master's programs grew from 74 in 2005 to 120 in 2008.
Encourage private-sector involvement in consortia of industries and universities that establish clear metrics to increase the number of graduates. *(Higher Education, Business)*	• A number of private-sector organizations, including companies and private foundations, have partnered with universities to encourage more American students to pursue undergraduate degrees in math and science, but as of yet, there is no nationally coordinated effort.
Eliminate the security clearance backlog that discourages many talented U.S. citizens — graduating students and adults — from entering key national security STEM careers by providing an expedited clearance process. *(Federal)*	• Federal agencies have invested significant effort and resources to reduce the backlog of security clearances. While the situation has improved since the first TAP report was issued in 2005, a significant backlog remains, and delays in processing security clearances continue to discourage U.S. citizens from filling vital technical positions that require clearances.
Establish prestigious fellowships for exceptional recent college graduates or those at midcareer that lead to certification and a five-year commitment to teach math or science in schools with high-poverty populations. *(Federal, State, Business)*	• The America COMPETES Act authorizes significant expansion of the Robert Noyce Scholarship Program: $90 million in FY 2008. The Consolidated Appropriations Act of 2008 directs NSF to increase funding for this program by a modest amount: $15 million in FY 2008. The Robert Noyce Scholarship Program offers fellowships for math, science and engineering majors who commit to gaining an education certificate and teaching math and science at the K–12 level, particularly in high-need school districts. The program also offers support for science and engineering professionals to become math and science teachers.
Create opportunities for high-achieving math and science students, such as advanced courses, math or science immersion experiences, corporate internships, charter schools, local magnet programs, and regional/state magnet schools. *(State, Business)*	• The America COMPETES Act includes support for math and science specialty high schools and incentives and training for teachers to offer Advanced Placement and International Baccalaureate courses in math and science. • The Ohio Business Roundtable and the Ohio Business Alliance for Higher Education and the Economy worked with other state partners to establish the Ohio STEM Learning Network, a public-private partnership managed by Battelle, that will create five regional STEM-based schools targeting low-income and minority students.

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Recommendations	Examples of Progress
Adopt curricula that include rigorous content as well as real-world engineering and science experiences so that students learn what it means to do this work, what it takes to get there and how exciting these fields are. *(District, Business)*	• The America COMPETES Act authorizes grants to schools to align K–12 curricula with workforce needs. The bill also includes provisions that would afford students real-world engineering and science experiences. • Project Lead the Way's engineering education program, which makes math and science relevant for middle and high school students, is now in 2,000 schools across the country.
3. Upgrade K–12 math and science teaching to foster higher student achievement, including differentiated pay scales for mathematics and science teachers.	• The America COMPETES Act authorizes federally funded professional development programs for math and science teachers. More significantly, states and school districts across the nation are focusing attention on improving math and science teaching.
Promote market- and performance-based compensation and incentive packages to attract and retain effective math and science teachers. *(Business, District, State, Federal)*	• The business community continues to advocate for market- and performance-based compensation and incentive packages for demonstrably effective math and science teachers, but this remains a controversial proposition that is opposed by some members of the education community.
Provide the flexibility for high school teachers, retirees and other qualified professionals to teach these subjects part time. Resources in No Child Left Behind (NCLB) that can be used to develop alternative teacher compensation systems and the proposed federal teacher incentive program are particularly crucial for helping to address shortages of math and science teachers. *(Business, District, State, Federal)*	• While some individual school districts allow for flexibility for part-time teaching by qualified professionals, there is no nationally coordinated effort to increase the use of this approach.
Support cost-effective professional development and other technical assistance to fill gaps in teachers' content knowledge and prepare them to teach the content effectively. *(State, District, Higher Education, Federal, Business)*	• The America COMPETES Act authorizes a variety of professional programs for math and science teachers, including teacher institutes funded by NSF, support for K–12 math and science teachers to earn master's degrees, and opportunities for professional development at national laboratories. • The National Governors Association, the Council of Chief State School Officers, higher education and professional organizations, and corporate foundations are playing a leadership role in this issue. Approaches include strategies such as the National Science Teachers Association's e-professional development Web portals — with resources, online classes and interactive learning activities — and Intel's math program, taught by a mathematician and a math educator, that provides U.S. K–8 teachers with 80 hours of effective professional development on mathematics content.

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Recommendations	Examples of Progress
Promote and strengthen the use of existing resources in federal education laboratories, regional technical assistance centers, NCLB and focused MSP programs to support best practices, with a priority on those who teach math in schools that are not making adequate yearly progress (AYP). *(State, District, Higher Education, Federal, Business)*	• National attention to math and science education has resulted in greater attention to identifying and promulgating best practices, but a more focused effort on leveraging existing federal resources is still required.
Include incentives in the Higher Education Act and in state policies for colleges and universities to produce more math, science and engineering majors and to strengthen preparation programs for prospective math and science teachers. *(Federal, State, Higher Education)*	• Such incentives are currently under consideration by Congress in the context of Higher Education Act reauthorization.
Strengthen and enforce the highly qualified teacher provisions in NCLB for math and science teachers to ensure that they have the requisite knowledge in the subjects they are assigned to teach. *(Federal, State)*	• Legislative proposals to strengthen the highly qualified teacher provisions in NCLB for math and science teachers are currently under consideration by Congress in the context of reauthorization of NCLB.
Launch a Math Next initiative as a logical next step to the U.S. Department of Education's focus on Reading First. *(Federal, State)*	• The America COMPETES Act authorizes the Department of Education to give Math Now grants to elementary and secondary schools to improve student achievement in math. Funding for Math Now was not included in the Consolidated Appropriations Act of 2008. Additional congressional action would be needed to get this program started. • The U.S. Department of Education convened a National Mathematics Advisory Panel that issued a March 2008 report calling for changes in K–8 math education.
Provide high-quality online alternatives and post-secondary options for students in any middle school or high school that does not offer advanced math and science courses. *(State)*	• The America COMPETES Act authorizes the Department of Education to fund the development of Advanced Placement and International Baccalaureate courses, including the development of online courses. Congress did not explicitly fund these programs in the Consolidated Appropriations Act of 2008. • More than half the states have established virtual high schools.

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Recommendations	Examples of Progress
4. Reform visa and immigration policies to enable the United States to attract and retain the best and brightest STEM students from around the world to study for advanced degrees and stay to work in the United States.	• Legislation on this issue has not passed. • Reform of U.S. visa and green card policies to attract and retain more highly educated foreign-born professionals was included in the comprehensive immigration reform bill that passed the Senate in 2006. No similar legislation passed the House, and the bill was not enacted. Similar provisions stalled in the Senate when included in failed comprehensive immigration reform in 2007.
Provide an expedited process to obtain permanent residence for foreign students who receive advanced degrees in these fields at U.S. universities. *(Federal)*	• Reform of U.S. green card policies to award permanent resident status to foreign-born students who earn advanced STEM degrees from U.S. institutions was included in the comprehensive immigration reform bill that passed the Senate in 2006. No similar legislation passed the House, and the bill was not enacted. The Senate rejected a similar provision when it considered comprehensive immigration reform in 2007. • In 2008, bills were introduced in the House and Senate to exempt U.S. STEM advanced degree recipients from the green card cap.
Ensure a timely process for foreign students who want to study STEM fields at U.S. universities to obtain the necessary visas by clearing Department of Homeland Security requirements. *(Federal)*	• The departments of State and Homeland Security and the Federal Bureau of Investigation have streamlined the process of approving visas for foreign students who wish to study in the United States. Wait times for student visas for applicants from most countries have been dramatically reduced. As a result, foreign student enrollment at U.S. institutions has increased over the last two years.
5. Boost and sustain funding for basic research, especially in the physical sciences and engineering.	
Reverse declines in the federal share of total R&D spending, particularly for basic research in the physical sciences and engineering at NSF, NIST, DoD and the DOE Office of Science, by adding a minimum of 7 percent a year to enable research to keep up with growth and inflation. *(Federal)*	• Substantial increases for research funding at NSF, NIST and DOE were included in the president's budget request to Congress for both FY 2008 and FY 2009. A significant increase for research at DoD was included in the FY 2009 budget request. Although both the House and Senate passed individual bills that met or exceeded these requests, the Consolidated Appropriations Act of 2008 — the omnibus spending bill that funded most civilian agencies for FY 2008 — did not. Action on the FY 2009 request is pending.

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