



American Competitiveness Initiative

- [President's Letter](#)
- [Overview](#)
- [Leading the World in Innovation](#)
- [American Competitiveness Initiative Research](#)
- [Leading the World in Talent and Creativity](#)
- [Conclusion](#)

[Full PDF Document](#) (3.94 MB)

President's Letter

My fellow Americans,

One of the great engines of our growing economy is our Nation's capacity to innovate. Through America's investments in science and technology, we have revolutionized our economy and changed the world for the better. Groundbreaking ideas generated by innovative minds in the private and public sectors have paid enormous dividends—improving the lives and livelihoods of generations of Americans.

To build on our successes and remain a leader in science and technology, I am pleased to announce the American Competitiveness Initiative. The American Competitiveness Initiative commits \$5.9 billion in FY 2007 to increase investments in research and development, strengthen education, and encourage entrepreneurship. Over 10 years, the Initiative commits \$50 billion to increase funding for research and \$86 billion for research and development tax incentives. Federal investment in research and development has proved critical to keeping America's economy strong by generating knowledge and tools upon which new technologies are developed. My 2007 Budget requests \$137 billion for Federal research and development, an increase of more than 50 percent over 2001 levels. Much of this increased Federal funding has gone toward biomedical research and advanced security technologies, enabling us to improve the health of our citizens and enhance national security. We know that as other countries build their economies and become more technologically advanced, America will face a new set of challenges. To ensure our continued leadership in the world, I am committed to building on our record of results with new investments—especially in the fields of physical sciences and engineering. Advances in these areas will generate scientific and technological discoveries for decades to come.

The bedrock of America's competitiveness is a well-educated and skilled workforce. Education has always been a fundamental part of achieving the American Dream, and the No Child Left Behind Act is helping to ensure that every student receives a high-quality education. Accountability and high standards are producing positive results in the classroom, and we can do more to provide American students and workers with the skills and training needed to compete with the best and brightest around the world. Building on our successes, the American Competitiveness Initiative funds increased professional development for teachers, attracts new teachers to the classroom, develops research-based curricula, and provides access to flexible resources for worker training.

As we increase investments in research and development, strengthen education, and provide more flexible training for workers, we continue to keep taxes low, avoid unnecessary and burdensome regulations, promote free and fair trade, maintain the integrity of our markets, and foster entrepreneurship. Over the past five years, my Administration has lowered taxes to create more jobs, opened new markets to U.S. products and services, created incentives for private sector innovation, and protected intellectual property rights.

America's economy is strong and getting stronger. My 2007 Budget recognizes the importance of innovation to our economic future—fostering and encouraging all the components that make our economic engine the envy of the world. In partnership with the private sector, State and local governments, and colleges and universities, the American Competitiveness Initiative will promote new levels of educational achievement and economic productivity. With the right policies, we will maintain America's competitive edge, we will create more jobs, and we will improve the quality of life and standard of living for generations to come.

GEORGE W. BUSH
THE WHITE HOUSE
February 2, 2006

[Back to Top](#)

Overview

Keeping our competitive edge in the world economy requires focused policies that lay the groundwork for continued leadership in innovation, exploration, and ingenuity. America's economic strength and global leadership depend in large measure on our Nation's ability to generate and harness the latest in scientific and technological developments and to apply these developments to real world applications. These applications are fueled by: scientific research, which produces new ideas and new tools that can become the foundation for tomorrow's products, services, and ways of doing business; a strong education system that equips our workforce with the skills necessary to transform those ideas into goods and services that improve our lives and provide our Nation with the researchers of the future; and an environment that encourages entrepreneurship, risk taking, and innovative thinking. By giving citizens the tools necessary to realize their greatest potential, the American Competitiveness Initiative (ACI) will help ensure future generations have an even brighter future.

"The role of government is not to create wealth; the role of our government is to create an environment in which the entrepreneur can flourish, in which minds can expand, in which technologies can reach new frontiers." – President George W. Bush, May 2001

Sustained scientific advancement and innovation are key to maintaining our competitive edge, and are supported by a pattern of related investments and policies, including:

- Federal investment in cutting-edge basic research whose quality is bolstered by merit review and that focuses on fundamental discoveries to produce valuable and marketable technologies, processes, and techniques;
- Federal investment in the tools of science—facilities and instruments that enable discovery and development—particularly unique, expensive, or large-scale tools beyond the means of a single organization;
- A system of education through the secondary level that equips each new generation of Americans with the educational foundation for future study and inquiry in technical subjects and that inspires and sustains their interest;
- Institutions of higher education that provide American students access to world-class education and research opportunities in mathematics, science, engineering, and technology;
- Workforce training systems that provide more workers the opportunity to pursue the training and other services necessary to improve their skills and better compete in the 21st century.
- Immigration policies that will continue to enable the United States to attract the best and brightest scientific minds from around the world to work alongside the best and brightest American scientists;
- Private sector investment in research and development that enables the translation of fundamental discoveries into the production of useful and marketable technologies, processes, and techniques;
- An efficient system that protects the intellectual property resulting from public and private sector investments in research; and

- A business environment that stimulates and encourages entrepreneurship through free and flexible labor, capital, and product markets that rapidly diffuse new productive technologies.

An important element of the *American Competitiveness Initiative* is Federal investment in research and development (R&D). Under President Bush, this investment has increased by more than 50 percent to \$137 billion—the largest sustained increase since the Apollo space program in the early 1960's. Similarly, President Bush and Congress have provided historic funding increases for K-12 education over the last five years and have successfully instituted critical policy reforms as a part of the President's No Child Left Behind Act.

American Competitiveness Initiative Goals:

- 300 grants for schools to implement research-based math curricula and interventions
- 10,000 more scientists, students, post-doctoral fellows, and technicians provided opportunities to contribute to the innovation enterprise
- 100,000 highly qualified math and science teachers by 2015
- 700,000 advanced placement tests passed by low-income students
- 800,000 workers getting the skills they need for the jobs of the 21st century

This Administration has consistently pursued policies and investments that reflect the need for a vigorous science and technology enterprise, as outlined by the National Science and Technology Council's 2004 report, *Science for the 21st Century*, and by the President's 2004 plan to inspire [A New Generation of American Innovation](#).

Recognizing the critical importance of science and technology to America's long-term competitiveness and building on these previous efforts, President Bush introduced the *American Competitiveness Initiative*, an aggressive, long-term approach to keeping America strong and secure by ensuring that the United States continues to lead the world in science and technology, in his State of the Union Address on January 31, 2006.

This \$5.9 billion ACI includes \$1.3 billion in new Federal funding and an additional \$4.6 billion in R&D tax incentives. Specifically, the ACI:

- *Doubles*, over 10 years, funding for innovation-enabling research at key Federal agencies that support high-leverage fields of physical science and engineering: the National Science Foundation, the Department of Energy's Office of Science, and the National Institute for Standards and Technology within the Department of Commerce;
- *Modernizes* the Research and Experimentation tax credit by making it permanent and working with Congress to update its provisions to encourage additional private sector investment in innovation;
- *Strengthens* K-12 math and science education by enhancing our understanding of how students learn and applying that knowledge to train highly qualified teachers, develop effective curricular materials, and improve student learning;
- *Reforms* the workforce training system to offer training opportunities to some 800,000 workers annually, more than tripling the number trained under the current system;
- *Increases* our ability to compete for and retain the best and brightest high-skilled workers from around the world by supporting comprehensive immigration reform that meets the needs of a growing economy, allows honest workers to provide for their families while respecting the law, and enhances homeland security by relieving pressure on the borders.

[Back to Top](#)

Leading the World in Innovation

Scientific and Technological Foundations of Economic Growth

During the past five years, the U.S. economy has shown remarkable vitality and resilience. The current economic expansion is steady and strong, with GDP growing at an annual rate of over 3.5 percent for three years. After-tax incomes are rising, household net worth is at an all-time high, and the unemployment rate is low. Meanwhile, inflation remains in check, and we have had extraordinary and sustained productivity growth—averaging a 3.4 percent annual rate for the past half-decade. The American economy today is the envy of the world.

Our prosperity is no accident. It is the product of risk-takers, innovators, and visionaries. We owe our global leadership in large measure to our willingness to build an economy and culture that welcomes and encourages innovation and flexible, open markets. By increasing U.S. innovation capacity through the bolstering of our world-class R&D enterprise and through investments in our education and information infrastructure, we have achieved new discoveries and breakthroughs that drive productivity, grow the economy, and solve important societal problems.

Research pays off for our economy. It leads to breakthroughs that inspire new products and have spawned entire industries. In fact, economists estimate that as much as half of post-World War II economic growth is due to R&D-fueled technological progress. Today's revolutionary technologies and many of our most popular consumer products have roots deep in basic and applied research. Long before there were computers or the Internet, scientists were unlocking the secrets of lasers, semiconductors, and magnetic materials upon which today's advanced applications were built. This enterprise was fueled in large part by Federal investment in basic research that was necessary but not necessarily profitable for the private sector to undertake over the long term.

Global Science and Technology: Status and Outlook

By nearly every relevant metric, the U.S. leads the world in science and technology. With only about five percent of the world's population, the U.S. employs nearly one-third of all scientists and engineers and accounts for approximately one-third of global R&D spending (U.S. R&D spending of over \$300 billion is as much as the rest of the G-8 nations combined). Chart 1 illustrates that, even after adjusting for population and size of the economy, the U.S. is among the world leaders in R&D spending and the number of scientists and engineers.

President Bush's FY07 Budget brings the total Federal R&D investment to a record \$137 billion, an increase of more than 50 percent over the 2001 level. The conduct of Federal R&D, historically measured in constant dollar outlays, is also at a record high level in inflation-adjusted terms (Chart 2). Funding for basic research alone has increased over 32 percent from 2001-2007. More importantly, R&D funding increases since 2001 reversed a decade-long trend of flat or declining Federal investment in scientific research and development.

While the U.S. is supporting science at unprecedented levels, the rest of the world is not standing still. Following the successful U.S. model, many countries are working hard to build their own innovation capacity by pouring resources into their scientific and technological infrastructure. This competitive drive is a positive development for the world—accelerating worldwide economic growth and trade, contributing to greater peace and stability, and raising the standard of living for many people. But because of these trends, science, technology, and innovation now move at a faster pace, and the ability of foreign nations to compete with America in the increasingly integrated global economy is much greater.

The enhanced innovation capacity of our economic competitors makes it increasingly important to make our own economy more flexible and responsive. This will require us to pursue pro-growth economic policies—policies that have been an ongoing priority of the Bush Administration. It also requires a long-term vision to strengthen Federal support for the Nation's innovation enterprise. As a result, President Bush has called for the integrated package of investments and policies in the ACI.

A New Generation of American Innovation

President Bush has long believed that government must work to strengthen the environment for innovation and that giving workers the best technology and training will help ensure that the American economy remains the most flexible, advanced, and productive in the world. Since 2001, the Administration has focused on three principles: creating a business climate that allows innovators to pursue their ideas (through policies on taxes, trade, IP/patents, tort system, etc.); cultivating high-skilled workers (through education, job training, and immigration policies); and supporting the advanced infrastructure needed to support innovation (through investments in R&D, broadband, etc.).

In April 2004, the President announced [A New Generation of American Innovation](#)—a series of specific measures to inspire innovation and technology development in energy, health care, and information technology. Specifically, the policies intend to help:

- **Provide a Cleaner and More Secure Energy Future through Hydrogen Fuel Technology.** As part of his commitment to request \$1.2 billion over five years in research funding to bring hydrogen and fuel cell technology from the laboratory to the showroom, the President announced that DoE plans to fund hydrogen research and demonstration projects totaling \$350 million (\$575 million with private cost share) to overcome key obstacles on the path to the hydrogen economy.
- **Transform Health Care through Health Information Technology.** President Bush believes that innovations in electronic medical records and the secure exchange of medical information will help transform health care in America and improve the relationship between doctors and patients. Accordingly, the President set an ambitious goal of assuring that most Americans have electronic health records within the next 10 years. To achieve the President's 10-year goal, the Administration is taking steps to urge coordinated public and private sector efforts that will accelerate broader adoption of health information technologies.
- **Promote Innovation and Economic Security through Broadband Technology.** The President has called for universal, affordable access to broadband technology by 2007 and wants to ensure Americans have plenty of technology choices when it comes to purchasing broadband. The Administration has implemented a wide range of policies to promote new technologies, eliminate access taxes, reduce regulatory barriers, and increase spectrum availability in order to make broadband more affordable and available. The Administration's policies are working—between 2001 and 2005 broadband penetration has increased 440 percent, from 7 million lines to 38 million lines.

[Back to Top](#)

American Competitiveness Initiative Research

The centerpiece of the *American Competitiveness Initiative* is President Bush's strong commitment to double investment over 10 years in key Federal agencies that support basic research programs in the physical sciences and engineering.

Strengthening Innovation Capacity Through Intellectual Prosperity Reforms

In the United States, intellectual property-intensive industries—the biotechnology and information technology sectors, for example—account for over half of all U.S. exports, represent 40 percent of our economic growth, and employ 18 million Americans whose wages are 40-percent higher than the U.S. average. A recent study valued U.S. intellectual property at approximately \$5 trillion—or about half of U.S. GDP. The U.S. Patent and Trademark Office (USPTO) has launched a vigorous reform effort aimed at enabling the Office to examine patent and trademark applications in a more timely manner, without compromising quality.

A critical component of this strategy has been reforming USPTO's fee structure and implementing new strategic initiatives to improve the quality and efficiency of the patent and trademark examination process. The President has also requested that USPTO have full access to its fee collections in the 2005 through 2007 budgets. These reforms have helped USPTO increase its annual spending authority by over 60 percent since 2001. In other efforts to strengthen intellectual property protections, the Administration has insisted on including updated intellectual property protections in trade agreements such as CAFTA-DR (the U.S.-Central America-Dominican Republic Free Trade Agreement), and the Administration-wide Strategy Targeting Organized Piracy (STOP) initiative is pursuing aggressive IP protection both domestically and overseas.

Physical sciences and engineering include high-leverage areas of research that develop and advance knowledge and technologies that are used by scientists in nearly every other field. President Bush plans to double, over 10

years, investments in innovation-enabling physical science and engineering research at the National Science Foundation (NSF), the Department of Energy's Office of Science (DoE SC), and the Department of Commerce's National Institute of Standards and Technology (NIST) core activities. In addition to the doubling efforts at these three agencies, the President's FY 2007 Budget also makes other similarly high-leverage programs a significant priority, such as basic and applied research at the Department of Defense (DoD).

In 2007, the ACI proposes overall funding increases for NSF, DoE SC, and NIST of \$910 million, or 9.3 percent, above FY 2006 (Figure 1). To achieve doubling within ten years, overall annual increases for these ACI research agencies will average roughly 7 percent. This amounts to a total of \$50 billion in new investments in high-leverage, innovation-enabling fundamental research that will underpin and complement shorter-term research performed by the private sector.

Past research has spawned such technologies as personal computers, the Internet, fiber optics, bar codes, medical imaging devices, balloon catheters, hearing aids, laser eye surgery, air bags, and global positioning devices and satellite telecommunications systems. And in every case, research funding at NSF, DoE SC, or NIST core (consisting of NIST lab research and construction accounts), has been essential to proceed to the point at which the private sector recognizes a potentially marketable product and invests in its development. These agencies make research decisions based on systematic planning and merit-review allocation processes designed to identify and support the most promising ideas and the teams most likely to succeed in carrying them out. As a result of these processes, grants and in-house research from these agencies have a strong track record of leading to scientific publications, patents, and eventually to new products and technologies.

Because the sciences—and especially their applications—are interconnected, research in physical science and engineering provides tools and technologies for all other fields. Ultimately, of course, everything is made of atoms and their sub-components. As such, basic techniques for the imaging, manipulation, and simulation of matter at the atomic scale are of value for applications in every field. To use the information in the human genome, for example, it is necessary to understand the functions of the proteins whose blueprints are encoded in DNA, a feat that is enabled by tools that visualize the immensely complex structure of these building blocks of life. And those tools—bright x-ray sources and powerful computation, for example—are products of physical science and engineering. Important opportunities for improving these powerful tools exist today and sustained leadership in science and technology for innovation demands that we seize them.

Impact of Basic Research on Innovation

The development of MP3 technologies illustrates the unexpected benefits of basic research. In 1965, a hand-sized storage and playback device that would hold 15,000 recorded songs was the stuff of science fiction. Even simple hand-held calculators were rare and expensive at that time. Research funded by the Department of Defense, the National Science Foundation, the National Institutes of Health, the Department of Energy, and the National Institute of Standards and Technology contributed to the breakthrough technologies of magnetic storage drives, lithium-ion batteries, and the liquid crystal display, which came together in the development of MP3 devices. The device itself is innovative, but it built upon a broad platform of component technologies, each derived from fundamental studies in physical science, mathematics, and engineering.

ACI Research Agencies

The National Science Foundation (NSF) is the primary source of support for university and academic research in the physical sciences, funding potentially transformative basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, materials science, mathematics, and engineering. It is well regarded for management of funding through a competitive, peer-reviewed process. The NSF funding derived from the ACI initiative is expected to support as many as 500 more research grants in 2007 and provide opportunities for upwards of 6,400 additional scientists, students, post-doctoral fellows, and technicians to contribute to the innovation enterprise.

The Department of Energy's Office of Science (DoE SC) supports scientific studies and infrastructure for a wide range of R&D related to economically significant innovations including high-end computing and advanced networking, nanotechnology, biotechnology, energy sources, and other materials science research. It is the

principal supporter of world-class Federal research facilities, providing scientists with the necessary tools to advance scientific understanding for innovation and discovery. In addition to making possible support for approximately 2,600 more researchers in FY 2007 than in FY 2006, the ACI provides for the construction of a number of cutting-edge scientific research tools with direct implications for economically relevant R&D, including the world's most powerful civilian supercomputer and an x-ray light source user facility with world-leading capabilities to study materials, chemicals, and biological matter at the scale of an individual atom. Additional DoE SC facilities supported by the ACI include: completion of the Centers for Integrated Nanotechnology and Functional Nanomaterials; support for domestic fusion facilities underpinning the future ITER nuclear fusion project; and maximum capacity operation of the full suite of major x-ray light source and neutron research facilities.

Overcoming Technological Barriers to the Hydrogen Economy

The "hydrogen economy" would use domestic sources of energy to create hydrogen gas, which in turn could be used as a transportation fuel. Other possibilities include using hydrogen-bearing fuels such as alcohol or natural gas as potentially economical and long-lasting sources of electrical power for portable electronics such as cell phones and laptop computers, or even for powering buildings that are remote from power lines.

Many technical and economic hurdles remain before these technologies can be made widely available. Reducing costs, improving efficiencies, and making the technology reliable enough for everyday use will all be important. If these technical goals are achieved, the broad use of hydrogen as a fuel may prove to have environmental advantages as well. The Department of Energy is leading the President's Hydrogen Fuel Initiative to achieve these goals.

NIST research helps support this developing technology in many ways. Projects currently under way at NIST are providing measurements, data, and technologies needed to develop and test the performance of hydrogen-based power sources and to improve the efficiency of hydrogen production methods.

A new imaging facility at the NIST Center for Neutron Research provides a rare portal for visualizing water and hydrogen transport in fuel cells. Neutrons reveal how water forms and moves while a fuel cell is operating. Mastering the combined challenge of managing incoming humidity, proper hydration of fuel cell membranes, and the handling of water byproducts is essential to the development of fuel cells that are practical for automotive and residential applications as well as portable devices.

The Department of Commerce's National Institute of Standards and Technology (NIST) is a high-leverage Federal research agency that performs high-impact basic research and supports the successful technical translation and everyday use of economically significant innovations such as new materials and processes; electronics, information technologies, and advanced computing processes; advanced manufacturing integration, biotechnologies, and new energy sources such as hydrogen; and nanotechnology. NIST also plays a critical role in supporting standards-development activities that are used by the private sector and government agencies. In FY 2007, NIST will seek to focus 3,900 scientists and engineers from government, industry, and universities—an increase of 600 researchers over FY 2006—on meeting the Nation's most urgent measurement science and standards needs to speed innovation and improve U.S. competitiveness.

In addition to the high-leverage research in NSF, DoE SC, and NIST core, other Federal agencies fund important research that makes valuable contributions toward the goals of the ACI. One example is the Department of Defense (DoD), which provides strong support for the physical sciences and engineering, including projects with both commercial and military applications ("dual-use" technologies). Past DoD research has resulted in revolutionary technological capabilities such as radar, digital computers, wireless mobile communications, lasers, fiber optics, composite materials, the Internet (and other "packet switched" networks), and satellite navigation. The President's FY 2007 Budget includes \$5.9 billion for DoD basic and applied research, \$440 million, or eight percent, more than requested in the FY 2006 Budget. (The Defense Advanced Research Projects Agency (DARPA) shares in these programs, as well as some more advanced technology development projects beyond

research.) Although the FY 2007 DoD research budget is less than the enacted FY 2006 level, that is only the case due to the removal of hundreds of millions of dollars in annual earmarks.

Maximizing the Effectiveness of ACI Research

The ACI enhances basic research programs in priority agencies that employ best practices for identifying and funding the most promising research ideas. Careful planning, strong technical advisory mechanisms, and systematic merit-based peer review are acknowledged methods for optimizing research success. The idea is not to introduce entirely new government programs, but to increase fundamental research capacity in response to growing numbers of outstanding and novel proposals from the Nation's technical community. It is imperative for the optimal disposition of research funds to uphold these principles in the Federal budget and appropriations process. Earmarking—the assignment of science funding through the legislative process for use by a specific organization or project—is rarely the most effective use of taxpayer funds. In the case of science programs, the practice signals to potential researchers that there are acceptable alternatives to creating quality research proposals for merit-based consideration, including the use of political influence or appeals to parochial interests. The rapidly growing level of legislatively directed research funds undermines America's research productivity. The Administration commends Congress for having taken measures to protect NSF and the National Institutes of Health from this practice. To maximize the effectiveness of ACI research, the President encourages the Congress and the academic community to resist securing research and facilities funding through earmarks, particularly in the ACI agencies.

Goals for ACI Research

While expected new innovations are impossible to predict with specificity, certain capabilities and technology platforms can be anticipated as a result of the ACI:

- World-class capability and capacity in nanofabrication and nanomanufacturing that will help transform current laboratory science into a broad range of new industrial applications for virtually every sector of commerce, including telecommunications, computing, electronics, health care, and national security (NSF, DoE, NIST)
- Chemical, biological, optical, and electronic materials breakthroughs critical to cutting-edge research in nanotechnology, biotechnology, alternative energy, and the hydrogen economy through essential infrastructure such as the National Synchrotron Light Source II and the NIST Center for Neutron Research (DoE, NIST)
- World-leading high-end computing capability (at the petascale) and capacity, coupled with advanced networking, to enable scientific advancement through modeling and simulation at unprecedented scale and complexity across a broad range of scientific disciplines and important to areas such as intelligent manufacturing, accurate weather and climate prediction, and design of safe and effective pharmaceuticals (NSF, DoE)
- Overcoming technological barriers to the practical use of quantum information processing to revolutionize fields of secure communications, as well as quantum mechanics simulations used in physics, chemistry, biology, and materials science (DoE, NIST, NSF)
- Overcoming technological barriers to efficient and economic use of hydrogen, nuclear, and solar energy through new basic research approaches in materials science (DoE, NSF, NIST)
- Addressing gaps and needs in cyber security and information assurance to protect our IT-dependent economy from both deliberate and unintentional disruption, and to lead the world in intellectual property protection and control (NSF, NIST)
- Improvement of sensor and detection capabilities that will result in world-leading automation and control technologies with a broad range of applications important to areas such as national security, health care, energy, and manufacturing (NSF)
- Development of manufacturing standards for the supply chain to advance and accelerate the development and integration of more efficient production practices (NIST)
- Enhanced response to international standards challenges, which impact U.S. competitiveness and limit export opportunities for American businesses by acting as technical barriers to trade (NIST)
- Accelerated work on advanced standards for new technologies (NIST)
- Advances in materials science and engineering to develop technologies and standards for improving structural performance during hazardous events such as earthquakes and hurricanes (NIST, NSF)
- Improving capacity, maintenance, and operations of DoE and NIST labs

R&D Tax Incentives

As part of the *American Competitiveness Initiative*, the President continues to support—for the sixth straight year—making the Research and Experimentation (R&E) Federal tax credit permanent. While temporary extensions of the credit have been enacted in recent years, a permanent R&E credit would enable companies to have certainty in their tax planning and therefore be bold in their R&D investment strategy. The President is also committed to working with Congress to simplify and modernize the credit to make it even more effective and efficient at encouraging private sector innovation.

With an overall R&D effort of over \$200 billion, the private sector accounts for approximately two-thirds of all U.S. R&D spending. Tax policy is used to encourage this research because corporate-funded R&D targets commercial opportunities, helping to turn knowledge and ideas generated as a result of basic and applied research into products and processes that businesses and consumers demand. The R&E tax credit helps to increase this spending by reducing the effective cost of R&D investments to businesses. Economic evidence suggests that the credit has a significant positive impact on private sector research activity. A recent study found that the current tax credit is claimed by over “15,000 firms that operate in every industry and all 50 states and employ millions of Americans.”

Using Technology to Power Our Economy Forward

Reliable and affordable supplies of energy are critical to maintaining an American economy that is competitive in the global marketplace. The recent high costs of energy, particularly for crude oil, refined gasoline, and diesel fuels, have raised the costs associated with producing and transporting goods and services to market. Higher product costs mean less savings, job creation, and prosperity. To address these high fuel costs, President Bush is taking steps to develop alternatives to crude oil for transportation. His 2007 budget will increase research funding for production of cellulosic ethanol from agricultural wastes, helping the farm economy with a new product while increasing America's energy security. He is also promoting technologies to enable greater fuel efficiency through sensible reforms to the Corporate Average Fuel Economy (CAFE) program and through tax incentives for efficient hybrid and clean diesel vehicles contained in the energy bill he signed into law in August 2005. For the long term, the President's Hydrogen Fuel Initiative seeks to develop a new generation of hydrogen vehicles that will eventually eliminate our dependence on foreign oil, improving our energy security.

In addition, the President will act to address the high cost of natural gas, which is straining home heating budgets and leading some industrial firms to relocate overseas where energy costs are lower. Over the past decade, natural gas has been the fuel of choice for new power plants, resulting in increasingly high demand for natural gas with very little new supply. To address the fundamentals driving higher natural gas prices, the President is proposing policies that will diversify the fuels we use in our electric power sector by encouraging new investments in clean coal technology, nuclear power, and renewable energy sources. His 2007 budget supports cutting-edge investments in clean coal and carbon sequestration to enable continued use of our plentiful domestic coal resources with fewer environmental impacts. The President will propose visionary new efforts to recycle spent nuclear fuel, allowing for a rapid expansion of nuclear power around the world, while addressing concerns over proliferation risk and lack of current nuclear waste storage. And renewable energy technologies offer the prospect of homes and buildings that can one day generate more power than they consume, using solar photovoltaic technologies integrated into the building itself. By reducing future demand for natural gas, these resources -- coal, nuclear, and renewables -- will help reduce prices for consumers, keep high-paying manufacturing and industrial jobs here in America, and reduce the need for future imports of natural gas by pipeline or by tanker.

Lower energy prices and secure energy resources will mean a growing and prosperous American economy, one that will vigorously compete in the technology-driven world of tomorrow.

However, the effectiveness of the current credit has been limited in part because of its complexity, antiquated formula, and ongoing uncertainties associated with its renewal (it expired for the 12th time on December 31, 2005). Making the credit permanent, which is estimated to cost \$4.6 billion in FY 2007 and \$86.4 billion over ten years (Table 1), will eliminate problems associated with its temporary nature. In addition, the Administration will work with Congress to make appropriate changes to the credit to simplify and modernize it in order to increase incentives for businesses to invest in research and development over the long term.

Table 1: Budgetary cost of making the R&E tax credit permanent, FY 2007 – FY 2016 (in billions of dollars).

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Cost	4.6	5.9	6.9	7.7	8.3	9.0	9.7	10.5	11.4	12.3	86.4

[Back to Top](#)

Leading the World in Talent and Creativity

Education is the gateway to opportunity and the foundation of a knowledge-based, innovation-driven economy. For the U.S. to maintain its global economic leadership, we must ensure a continuous supply of highly trained mathematicians, scientists, engineers, technicians, and scientific support staff as well as a scientifically, technically, and numerically literate population. The *American Competitiveness Initiative* proposes \$380 million in new Federal support to build on the President's commitment to strengthen our Nation's education system. By improving the quality of math, science, and technological education in our K-12 schools, thus engaging every child in rigorous courses that teach important analytical, technical, and problem-solving skills, we will prepare our citizens to compete more effectively in the global marketplace.

No Child Left Behind

The President's No Child Left Behind Act (NCLB), passed by a bipartisan majority in Congress and signed into law on January 8, 2002, ended decades of low expectations and excuses for poor performance. NCLB requires the presence of highly qualified teachers in every classroom and the use of research-based instruction to optimize student learning. NCLB also requires annual student assessment in reading and mathematics through the early grades and once in high school to detect deficiencies early and offer needed remediation. This landmark piece of legislation has reformed public education to ensure that every child has access to a high-quality education and the opportunity to develop the skills necessary to become a productive citizen in the 21st century.

Since taking office in 2001, President Bush has provided unprecedented funding increases for a number of priority education programs. For example, funding for Title I, which provides financial support for Local Educational Agencies with the highest percentages of children from low-income families, increased by over 45 percent between fiscal years 2001 and 2006. Additionally, funding for targeted programs aimed at increasing achievement in reading, such as Reading First, has increased by over 300 percent.

In addition to yearly assessments administered by states to evaluate the Adequate Yearly Progress (AYP) of students, schools, and districts, a series of nationally administered assessments provide a snapshot view of the Nation's collective education performance and progress. The National Assessment of Educational Progress (NAEP), also called the Nation's Report Card, measures student achievement in reading and mathematics, among other academic subjects, at various grade levels. This year's promising NAEP results show improvements across the board in mathematics and in fourth-grade reading, with African American and Hispanic students posting all-time high scores in a number of areas. These data demonstrate the positive impact NCLB has had on students—an accomplishment for which students, teachers, and parents should be commended. However, much is still to be done to improve U.S. student performance relative to the rest of the world.

As important as the early years are to building a strong foundation in mathematics and reading, rigorous high school preparation can make the difference between success and failure as a student moves on to college or the workplace. In order to build upon the success we have seen in the early grades, President Bush has proposed extending key aspects of NCLB to include the high school years. Expanding accountability and high expectations to high schools is the first step to ensuring an education system that prepares the Nation's students for the jobs of the 21st century. The ***President's High School Reform Initiative*** will:

- Provide grants through State educational agencies to local educational agencies for targeted, proven interventions that increase the achievement of high school students, eliminate the achievement gap, and prepare all students to graduate with the knowledge and skills they need to enter college or the workforce;

and

- Require testing in two additional high school grades to inform schools of the efficacy of their curriculum and identify students in need of additional help.

American Competitiveness Initiative: Education

Although we have seen great progress in student performance in reading and mathematics as a result of NCLB and expect to see similar results at the high school level under the President's High School Reform Initiative, a number of gaps must be addressed if U.S. students are to realize their full potential. President Bush's *American Competitiveness Initiative* seeks to fill these gaps and produce results by establishing a number of new and expanded programs, including:

- *Advanced Placement/International Baccalaureate (AP/IB) Program* to expand access of low-income students to rigorous course work by training 70,000 additional teachers to lead AP/IB math and science courses and to increase the number of AP/IB math and science tests passed by low-income students to 700,000 from 230,000;
- *Adjunct Teacher Corps* to encourage up to 30,000 math and science professionals to become adjunct high school teachers.
- *A National Math Panel* to evaluate empirically the effectiveness of various approaches to teaching math and science and to create a research base to improve instructional methods and materials;
- *Math Now for Elementary School Students* program to promote promising and researched-based practices in mathematics instruction and to prepare students for more rigorous math courses in middle and high school;
- *Math Now for Middle School Students* to diagnose and remedy the deficiencies of students who lack math proficiency and to provide proven methods of intensive and systematic instruction aligned with the goals of NCLB;
- *Evaluation of Federal Science, Technology, Engineering, and Math (STEM) education programs* across agencies to determine which are effective in meeting their stated goals; and
- *Include Science Assessments in NCLB* accountability to ensure children are learning the necessary content and skills to be successful in the 21st century workforce.

PRESIDENT'S ACI INITIATIVE	FY 2007 Budget Request
AP/IB	\$122 million
Adjunct Teacher Corps	\$25 million
National Math Panel	\$10 million
Math Now for Elementary School Students	\$125 million
Math Now for Middle School Students	\$125 million
Evaluation of Federal STEM programs	\$5 million

Training and Recruiting Highly Qualified Teachers

Fundamental to improving student learning and achievement is the presence of highly qualified teachers in every classroom. Teachers must have mastery of content and instructional methods to be effective educators and mentors, yet recent data published as part of the 2003 Trends in International Mathematics and Science Survey indicate that, at the elementary grade level, less than eight percent of students are taught by teachers with a major or specialization in mathematics or science. The statistics improve somewhat at the 8th grade level, where 48 percent of students are taught by teachers who majored in mathematics and 15% by teachers who majored in science, but still a significant majority of children are being taught math and science by teachers who lack significant training in the subjects they teach. NCLB requires teachers to be highly qualified and provides funding through the Improving Teacher Quality State Grants, which can be used to address a variety of challenges for schools and districts, including teacher preparation and qualifications of new teachers, recruitment and hiring, and professional development. Further investment in high-quality professional development that increases teachers' content knowledge is necessary to ensure students get access to more rigorous curriculum.

While a number of Federal programs are focused on recruiting more college math and science majors into

teaching careers, the lag time in education means that it will take years to fill our math and science classrooms with highly qualified math and science teachers. Yet there is an untapped resource among current and retiring science and mathematics professionals who have both content mastery and the practical experience to serve as effective teachers and positive role models for students who are interested in science or mathematics careers. While many scientists and engineers express an interest in teaching, traditional teacher certification programs are seen by many scientists and mathematicians as an unnecessary and unacceptable barrier to becoming a classroom teacher. Being a good practitioner of mathematics or science does not necessarily make one a good teacher of those subjects, but anecdotal evidence does suggest that math and science majors and professionals are more likely to transition to careers in teaching if their teacher certification recognizes the training and experience they possess in their field.

To meet these challenges, the *American Competitiveness Initiative* proposes a two-step approach that provides professional development for current teachers and attracts new teachers to the classroom:

The Advanced Placement Incentive Program expands the Administration's current commitment to the Advanced Placement/International Baccalaureate (AP/IB) programs by increasing funding to \$122 million (\$90 million over fiscal year 2006 appropriations) with a specific emphasis on math and science. This program targets districts with a high concentration of low-income students by offering incentives and training to teachers to become highly qualified instructors of AP/IB math and science courses, while also subsidizing AP/IB testing fees for lower income students. The Department of Education would require applicants to offer incentives, such as salary increments or bonuses, to teachers to become qualified to teach AP/IB courses in mathematics, science, and critical foreign languages by completing training provided or recognized by the College Board or the International Baccalaureate Organization, or the equivalent, and to teachers who increase the number of students passing AP/IB tests in those subjects. The Administration calls on States and the private sector to match, dollar-for-dollar, the Federal Government's investment in this program to meet the five-year goal of training 70,000 new teachers and increasing the number of students achieving passing AP/IB scores to 700,000.

Support Teacher Professional Development

Research confirms that teachers are the single most important factor in raising student achievement. The Department of Education's Teacher-to-Teacher Initiative was created by teachers for teachers and provides access to free professional development activities and keeps teachers informed of new policies and the best practices vital to their craft.

The initiative engages the Nation's best teachers and principals to share strategies for raising student achievement through a variety of resources that highlight real-world examples of how teachers translate education research into practice that works in the classroom. The initiative offers help through free online digital workshops, an eLearning website, and teacher-to-teacher workshops held in cities across the country.

The initiative has helped more than 200,000 teachers learn effective strategies for raising student achievement, including training approximately 4,500 teachers at 18 workshops since 2004. The Department is expanding this initiative by partnering with TechNet, a group of technology companies, to create urban teacher workshops focusing on math, science, and technology. The goal is to enhance teachers' content knowledge so they can motivate students to pursue math and science in school and better prepare students for careers in those fields.

In addition to funding professional development opportunities for current teachers, the *American Competitiveness Initiative* also provides funds to establish an *Adjunct Teacher Corps* program. Through this program, the Department of Education will support partnerships between school districts and public or private organizations that encourage and prepare science, mathematics, and engineering professionals to teach specific high school math, science, and technology courses as adjunct teachers. This initiative would tap the skills of well-qualified individuals who reside outside of the public education system to meet specialized needs in secondary schools. The goal of this \$25 million investment, matched by States and the private sector, is to have a 30,000 member Adjunct Teacher corps by 2015.

Research-Based Teaching Materials and Methods

A pillar of NCLB is its requirement that schools utilize research-based curricula and proven methods to raise student achievement. Thanks largely to the efforts of the National Reading Panel, established by Congress in 1997, we have made great progress in understanding how children learn to read and in developing research-

based diagnostic tools, teaching materials, and “best practices” that improve reading instruction. A report issued by the Panel helped shape several promising Administration initiatives, including the Reading First and the Striving Readers programs. Both of these programs are designed to help schools and school districts improve reading achievement through proven methods of instruction.

We do not have a similarly strong research base in the area of math education. There is little empirical research on how children learn mathematics, and a thorough review of existing mathematics curricula by the Department of Education’s *What Works Clearinghouse* shows that few mathematics curricula are either research-based or proven effective as a result of rigorous independent evaluation.

Building on the successful model of the National Reading Panel and subsequent Reading programs, the *American Competitiveness Initiative* provides funding for several important programs aimed at discovering how students learn math, how best to prepare teachers in these disciplines, and what materials are most effective in raising student achievement and preparing students early on for more rigorous coursework in high school and beyond.

The National Math Panel

Similar to the National Reading Panel, the National Math Panel will bring together experts in mathematics, cognitive science, and education to review the current literature and identify important research findings as well as gaps in our current knowledge. They will work to fill these research gaps and conduct a comprehensive assessment of existing programs so that they can establish principles for effective math instruction.

The Math Now Programs

As research advances our understanding of how students learn and the National Math Panel identifies principles for effective teaching, it is imperative that other teams of mathematicians and educators be prepared to translate these research findings into practical solutions for teachers. The *Math Now* programs will put effective tools into the hands of teachers so that students begin to benefit from our improved understanding of learning and cognition.

Math Now for Elementary Students will lay the groundwork for establishing a strong foundation in math. This program will enable teachers to access proven methods, materials, and practices that will provide students with a solid foundation for more rigorous math coursework in middle and high school.

Math Now for Middle School Students will build on the successes of the elementary school programs and will provide more sophisticated diagnostic tools and remediation strategies for students who have notable deficiencies. This program will promote research-based interventions involving intensive and systematic instruction with the goal of proficiency in algebra for middle-school students.

Evaluating the Impact of Government-Wide Investments in Math and Science Education

While the Department of Education has the primary mission at the Federal level of improving U.S. K-12 education, a number of Federal agencies sponsor programs aimed at generating student interest in science and technology, developing innovative curricular materials, providing teacher preparation and professional development opportunities, and increasing the general public’s understanding of various scientific efforts and issues. Although there are a large number of existing Federal programs that support both formal and informal math and science education and outreach, these programs are quite fragmented across the government and few have been evaluated for their efficacy in improving student learning.

For this reason, the *American Competitiveness Initiative* will provide \$5 million for the purpose of establishing a comprehensive evaluation program that will review past, current, and future federally funded programs to determine what works in preparing teachers and educating students in math and science and how well these programs are aligned with the goals of NCLB. To the extent possible, this evaluation program will incorporate the accountability principles of NCLB and will look to empirical indicators of enhanced student performance as a result of student or teacher participation in these government-sponsored education programs. Funds will be used to assess the quality of program evaluations, to design and carry out evaluations of programs that have not been evaluated, and to develop guidelines for future program evaluations.

Including Science Assessments in NCLB

Currently, NCLB requires every State to develop and administer science assessments once in each of three grade spans by the 2007-08 school year. However, NCLB does not require these assessments in the accountability system. Including science assessments in the accountability system will illustrate the importance of science as part of a student's education and ensure students are learning the content knowledge necessary to prepare them for the jobs of the 21st century.

Encouraging Students to Major in STEM Fields

Through NCLB, it is President Bush's goal to enable every child to leave high school fully prepared to enter college or the workforce. Over the past two decades, enrollment in U.S. institutions of higher education rose from 12.6 million students in 1983 to 15.7 million in 2001. Over that same period, the number of entering freshman who declared their intent to study science and engineering (S&E), as well as the percentage of S&E degrees conferred, remained steady at about one-third of all degrees. Within certain fields, such as engineering and the physical sciences, however, there have been slight declines in enrollment and degree completion, while in other S&E fields, such as the social and behavioral, life, and computer sciences, degree completion rates have increased. Among those who graduate with S&E bachelor's degrees, the retention rate of those who go into S&E graduate education or careers has declined to 28 percent. It is important that our country maintain an adequate flow of well-trained STEM workers, and for that reason President Bush supports a number of programs across the Federal government that seek to increase access to college and to recruit and retain students in STEM majors at the undergraduate and graduate levels.

STEM Education and Workforce Training at the National Science Foundation

The National Science Foundation administers over 48 programs designed to improve science, technology, engineering, and mathematics (STEM) instructional materials and methods, teacher preparation and professional development, student performance and interest, and the recruitment to and retention of students in STEM majors and graduate programs. These education and workforce programs serve the full range of individuals, from preschool students to post-doctoral fellows, as well as seasoned professionals who seek to update their skills or transition to new areas.

Among these programs is the Advanced Technological Education (ATE) program, funded in FY 2007 for \$46 million, which supports partnerships between community colleges, local industries (who also make substantial contributions toward the partnerships), secondary schools, and four-year institutions to train skilled technicians of all ages for careers in the everchanging high-technology workplace. In addition, ATE partner institutions develop strong linkages through joint advisory teams, shared personnel, and formal articulation agreements that allow students to transition easily – and transfer credits – from high school to community college to four-year institution.

An example of a successful ATE Regional Center is the Southwest Center for Microsystems Education (SCME) in Albuquerque, New Mexico. This Center is led by Albuquerque Vocational Technical Institute in partnership with Sandia National Laboratories, the University of New Mexico, Maricopa Advanced Technology Education Center in Semiconductor Manufacturing, the Micro and Nanotechnology Commercialization Education Foundation, Intel, and Texas Instruments, among others. It provides the Microsystems industry with workforce development models, materials, skills standards, and opportunities for communities creating Microsystems technology clusters. A bi-national alliance with two-year technological universities in Mexico is also being fostered by the United States-Mexico Foundation for Science with Albuquerque Technical Vocational Institute to train Mexican faculty in Micro Electrical Mechanical Systems Technology.

To make a college degree more affordable, the President has provided the largest increase in Pell grant funding in the history of the program and has increased by one million the number of students receiving this assistance. In particular, the President supports recent Congressional action to establish the American

Competitiveness Grants program, which provides supplemental grants to low-income college freshman and sophomores who completed a rigorous high school curriculum and maintain at least a 3.0 GPA in college, and juniors and seniors who major in math, science, and critical foreign languages. This new grant program builds on proposals included in President Bush's 2006 Budget request, including the President's proposal to provide enhanced Pell Grants to students who pursue rigorous coursework in high school and the Presidential Math and Science Scholars Fund. As passed in the Deficit Reduction Act, the American Competitiveness Grants will provide a total of \$4.5 billion in grant aid to students through the 2010-2011 academic year, including \$790 million

in the upcoming 2006-2007 academic year and \$850 million in 2007-2008.

American Competitiveness Initiative: Workforce Training

Education, training, and retraining provide individuals with better career options, opportunities for promotion, and the ability to contribute to the U.S. innovation enterprise. According to the Bureau of Labor Statistics, 26 of the 30 fastest growing job categories require some type of post high school education or training. Data show that earnings increase and unemployment decreases with educational achievement and skills attainment. Moreover, a recent survey of American manufacturers revealed that over 80 percent of respondents were facing a shortage of qualified workers overall, and over 90 percent of respondents were facing a moderate to severe shortage of qualified, skilled production employees.

A Commitment to Community Colleges

Community colleges make great training providers because they are affordable, accessible, and perhaps most important, adaptable. Community colleges are able to track changing local labor conditions and partner with local employers to provide training geared toward the jobs that are in demand.

One of the hallmarks of a strong economy is labor market flexibility. When workers can move relatively freely from job to job and place to place following the rhythms of the marketplace, businesses have the workers they need to do the job and workers have opportunities for career advancement. Community colleges, as flexible training providers, help make the U.S. workforce and the U.S. economy more competitive.

In his 2004 State of the Union address, the President proposed "increasing our support for America's fine community colleges, so they can...train workers for industries that are creating the most new jobs." This commitment has been supported by \$125 million in 2005 and 2006 for the Community-based Job Training Grants program to provide training for 100,000 workers. The President's Fiscal Year 2007 budget supports these efforts with a \$150 million request, which would provide training for 160,000 workers.

U.S. colleges and universities provide world-class educational opportunities for those who seek a post-secondary degree. Many individuals, however, opt for post-secondary skills training that lead to an industry-recognized license, certificate, or credential. In addition, many fields require workers to update their skills continually or to retrain on newer technologies through certification programs and technical training classes or workshops. Training and development programs are critical to maintaining a skilled workforce capable of making efficient use of cutting-edge technologies, and greater access to these programs is critically important for individual workers as well as for America's competitiveness.

Yet Federal workforce programs, as currently designed, are an inefficient means to meet the needs of the 21st Century American workforce. Too much money is currently spent on competing bureaucracies and the sometimes cumbersome service delivery infrastructure, and not enough on meaningful education and skills training that leads to job growth and economic prosperity. In general, infrastructure and overhead costs are estimated to consume one third of all Federal training dollars, which amounts to approximately \$1.2 to \$1.5 billion annually.

Several states, including Idaho, Montana, and Indiana, have recognized the need to spend more dollars on worker education and skills training and fewer dollars on overhead and administration and are working to consolidate and streamline their workforce training programs. These States anticipate savings on the order of \$1 to \$2 million each through these efforts, much of which can be passed on to provide more training opportunities for more individuals. However, these States, as well as all other States, could provide additional educational and training opportunities through a new approach to job training in America.

The 2007 Budget introduces an important initiative, Career Advancement Accounts (CAA). CAAs will be self-managed accounts of up to \$3,000 available to workers entering the workforce or transitioning between jobs, or incumbent workers in need of new skills to remain employed or move up the career ladder. The CAAs will give workers the resources they need to increase their skills and compete for the jobs of the 21st century economy. The CAA initiative also provides flexibility for Governors and States to design service delivery systems that best serve their citizens.

These accounts will:

- Empower individuals by significantly increasing workers' choices in the job training and employment services they need to get back to work. Workers will have the resources to take the longer-term training that leads to higher-paying jobs.
- Increase training opportunities by eliminating duplicative training and employment programs and unnecessary overhead. The CAA initiative will offer training opportunities to some 800,000 people annually, more than tripling the number trained under the current system.
- Increase flexibility by allowing individuals to use their accounts for training and other services to help them advance their careers.

American Competitiveness Initiative: Immigration

President Bush has established a goal to better prepare U.S. students and workers to succeed in the 21st century workforce. The President also recognizes that enabling the world's most talented and hardest-working individuals to put their skills to work for America will increase our entrepreneurship and our international competitiveness, and will net many high-paying jobs for all Americans. The United States benefits from our ability to attract and retain needed immigrant and non-immigrant students and workers, and it is important that America remains competitive in attracting talented foreign nationals. President Bush has a comprehensive plan for immigration reform that meets the needs of a growing economy, allows workers to provide for their families while respecting the law, and enhances homeland security by securing and relieving pressure on the borders.

[Back to Top](#)

Conclusion

In the years to come, the United States will face increased economic competition from a number of countries around the world. We will have to work harder to maintain our competitive edge. By laying the foundation today for expanded scientific and technological excellence, we will continue to lead the world tomorrow in inquiry, invention, and innovation. The greatest asset of our Nation is the potential of the American people. America is founded on the belief that every life is precious and holds unique promise. By investing in people, helping them reach their full potential, and rewarding their creativity, we will unleash the natural creativity and ingenuity of the human mind, create new jobs, train workers to fill them, and make our Nation and the world a safer, cleaner, and better place to live. The *American Competitiveness Initiative* provides our Nation with the tools to better educate our children, to train our workforce, and to push the boundaries of our scientific and technological capabilities now and in the future.

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