COMPETITIVENESS AND INNOVATION ON THE COMMITTEE'S 50TH ANNIVERSARY WITH BILL GATES, CHAIRMAN OF MICROSOFT

HEARING

BEFORE THE

COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

MARCH 12, 2008

Serial No. 110–84

Printed for the use of the Committee on Science and Technology

Available via the World Wide Web: http://www.science.house.gov

U.S. GOVERNMENT PRINTING OFFICE
41–066PS WASHINGTON : 2008

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

COMMITTEE ON SCIENCE AND TECHNOLOGY

HON. BART GORDON, Tennessee, *Chairman*

JERRY F. COSTELLO, Illinois
EDDIE BERNICE JOHNSON, Texas
LYNN C. WOOLSEY, California
MARK UDALL, Colorado
DAVID WU, Oregon
BRIAN BAIRD, Washington
BRAD MILLER, North Carolina
DANIEL LIPINSKI, Illinois
NICK LAMPSON, Texas
GABRIELLE GIFFORDS, Arizona
JERRY MCNERNEY, California
LAURA RICHARDSON, California
PAUL KANJORSKI, Pennsylvania
DARLENE HOOLEY, Oregon
STEVEN R. ROTHMAN, New Jersey
JIM MATHESON, Utah
MIKE ROSS, Arkansas
BEN CHANDLER, Kentucky
RUSS CARNAHAN, Missouri
CHARLIE MELANCON, Louisiana
BARON P. HILL, Indiana
HARRY E. MITCHELL, Arizona
CHARLES A. WILSON, Ohio

RALPH M. HALL, Texas
F. JAMES SENSENBRENNER JR., Wisconsin
LAMAR S. SMITH, Texas
DANA ROHRABACHER, California
ROSCOE G. BARTLETT, Maryland
VERNON J. EHLERS, Michigan
FRANK D. LUCAS, Oklahoma
JUDY BIGGERT, Illinois
W. TODD AKIN, Missouri
TOM FEENEY, Florida
RANDY NEUGEBAUER, Texas
BOB INGLIS, South Carolina
DAVID G. REICHERT, Washington
MICHAEL T. MCCAUL, Texas
MARIO DIAZ-BALART, Florida
PHIL GINGREY, Georgia
BRIAN P. BILBRAY, California
ADRIAN SMITH, Nebraska
PAUL C. BROUN, Georgia
VACANCY

CONTENTS

March 12, 2008

COMPETITIVENESS AND INNOVATION ON THE COMMITTEE'S 50TH ANNIVERSARY WITH BILL GATES, CHAIRMAN OF MICROSOFT

WEDNESDAY, MARCH 12, 2008

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Committee met, pursuant to call, at 10:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Bart Gordon [Chairman of the Committee] presiding.

HEARING CHARTER

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

Competitiveness and Innovation on the Committee's 50th Anniversary With Bill Gates, Chairman of Microsoft

WEDNESDAY, MARCH 12, 2008
10:00 A.M.–12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

This year, the Committee on Science and Technology will celebrate its 50th Anniversary. On Wednesday, March 12, 2008, the House Committee on Science and Technology will hold a hearing to highlight this occasion and receive testimony from Bill Gates, the Chairman of the Microsoft Corporation, to discuss our country's technological advances over the past 50 years, the current state of our country's competitiveness, and a look ahead to the challenges we face.

2. Witness

Mr. William H. Gates, Chairman, Microsoft Corporation

3. Brief Overview

Following World War II and throughout much of the 20th century, the United States became a world leader in science and innovation, and economic indicators demonstrated that the United States offered a high standard of living to its citizens. In fact, the U.S. economy grew substantially, and economists estimate that about half of U.S. economic growth was the result of technological innovation.

In the 1990's however, during a period in which the United States was known as the world's lone "superpower," a number of indicators suggested that U.S. prosperity was diminishing. In 1990, the United States had a trade surplus in high-technology products of $54 billion. That surplus turned into a trade deficit of $50 billion by 2004. A number of iconic American companies moved assets, jobs, and ownership overseas. And American students performed poorly in several international assessments of math and science achievement.

On October 12, 2005, The National Academies released a report on Prospering in the Global Economy of the 21st Century entitled *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future.* The *Gathering Storm* report quickly became influential in promoting a national agenda on innovation and competitiveness. Ultimately, recommendations included in the *Gathering Storm* report, as well as some of the suggestions included in the President's American Competitiveness Initiative, became the basis for legislation signed into law last August—the *America COMPETES Act.* This legislation, authored by this committee, makes a significant commitment to our country's future by investing in math and science education and federal research.

In what is likely to be his final congressional testimony before devoting the majority of his time to his philanthropic work with the Bill and Melinda Gates Foundation, Microsoft Chairman Bill Gates will appear before the Science and Technology Committee to share his thoughts on efforts needed to further strengthen our country's competitiveness in the global marketplace, discuss what policies are needed to encourage innovation, and address the role of technology in our country's economic growth.

The Committee looks forward to hearing the unique perspective of Mr. Gates, both as Chairman of Microsoft and as Co-Chair of the Bill and Melinda Gates Foundation, on strengthening our country's competitiveness in the global marketplace. More specifically, the Committee expects Mr. Gates to address issues crucial to our country's competitiveness including a commitment to math and science education, federal investments in research and development, policies that encourage innovation, and the role of technology in our economic growth.

Chairman GORDON. This hearing will come to order. Welcome all. Welcome to today's hearing entitled *Competitiveness and Innovation on the Committee's 50th Anniversary With Bill Gates, Chairman of Microsoft.*

In November of 1957, as a young boy, as a very young boy, I remember looking out into the sky and seeing the blinking red dot passing overhead that struck fear into countless Americans. The launch of Sputnik and the beginning of the space race began a period of unprecedented investment and research in math and science education in this country resulting in the development of new technologies and the advancement of innovation.

During the next 50 years, the United States became a world leader in science and technology, education, research, and most importantly innovation and entrepreneurship. These efforts fueled our economy and allowed each generation of Americans to inherit a better standard of living than their parents, and as the father of a seven-year-old, I fear that our children could be the first generation of Americans that do not inherit a living standard better than their parents, a reverse of the American dream. And let me explain why. Sputnik showed us that we were not the world's technological leader. Today, with rapid economic and technological advances in other countries, I fear we are now on the cusp of another Sputnik moment. I fear that our country has coasted on the investment made for the last 50 years, or as my father would say, we have been eating our seed corn.

Now is the time to act, and I believe this committee has an important role to play in helping bring our country back as a technological leader in the world. Soon after the launch of Sputnik in March of 1958, this committee was established to face the challenges presented by the space age. Although the threat is different, the challenges today remain the same to secure our country's international prominence in the areas of innovation and technological development.

The witness before us today needs little introduction. Bill Gates embodies both the American spirit of innovation and the theological virtue of charity. He has built arguably the most successful technological company in the world and then has turned his financial success into a gift for our society. On this occasion, the 50th anniversary of this committee, as we reflect back on the technological advances of the past and look ahead to the challenges facing our country's competitiveness in the world, I can think of no other witness better suited and well-positioned to help share his insights with this committee.

As I have said before, I am very pleased of the work done by this committee over the past year to develop and shepherd through Congress the *America COMPETES Act.* This legislation was a necessary and important first step in making the commitments needed to bring our country back to technological prominence, and though the passing of the COMPETES Act authorization was a great success, now we have to follow up and be sure that it is fully funded.

I look forward to hearing Mr. Gates on other efforts needed to rebuild our strength and again lead the world for another 50 years. It is my hope that we will continue to look for ways to embrace the global marketplace and not shy away from the challenges we face.

Before I conclude, I want to quickly acknowledge the presence of two Members of the House and past Chairman of the Committee, Mr. Bob Walker on the end over there and Sherry Boehlert, welcome back. And we have another Chairman, Mr. Sensenbrenner, with his canine. There is Mr. Sensenbrenner up on the wall there. Jim Sensenbrenner is still a Member of our committee. I am pleased that you are able to join us today and help us to commemorate this 50th Anniversary of the Committee.

With that, I would like to now recognize Mr. Hall for his opening statement.

[The prepared statement of Chairman Gordon follows:]

PREPARED STATEMENT OF CHAIRMAN BART GORDON

In November of 1957, as a young boy, I remember looking into the sky and seeing the blinking red dot pass overhead that struck fear into countless Americans. The launch of Sputnik and the beginning of the "space race" began a period of unprecedented investment in research and math and science education in this country, resulting in the development of new technologies and the advancement of innovation.

During the next 50 years, the United States became a world leader in science and technology, education and research, and—most importantly—innovation. These efforts fueled our economy and allowed each generation of Americans to inherit a better standard of living than their parents.

As the father of a seven-year-old daughter, I fear that our children will be the first generation of Americans that do not inherit a standard of living better than their parents. And let me tell you why.

Sputnik showed us that we were not the world's technological leader. Today, with the rapid economic and technological advances of other countries, I fear we are now on the cusp of another Sputnik moment. I fear that our country has "coasted" on the investments we made 50 years ago.

Now is the time to act and I believe this committee has an important role to play in helping bring our country back as the technological leader in the world.

Soon after the launch of Sputnik, in March of 1958, this committee was established to face the challenges presented by the Space Age. Though the threat is different, the challenges today remain the same—to secure our country's international dominance in the areas of innovation and technology development.

The witness before us today needs little introduction. Bill Gates embodies both the American spirit of innovation and the theological virtue of charity. He has built arguably the most successful technology company in the world and then has turned his financial success into his gift to our society.

On this occasion of the 50th anniversary of this committee, as we reflect back on the technological advances of the past and look ahead to the challenges facing our country's competitiveness in the world, I can think of no other witness better suited and well positioned to help share insights with this committee.

As I have said before, I am proud of the work done by this committee over the past year to develop and shepherd through Congress the *America COMPETES Act*. This legislation was a necessary and important first step in making the commitments needed to bring our country back to technological prominence. And though COMPETES was a great success, our work is far from done.

I look forward to hearing from Mr. Gates on other efforts needed to rebuild our strength and again lead the world for another 50 years. It is my hope that we will continue to look for ways to embrace the global marketplace and not shy away from the challenges we face.

Before I conclude, I wanted to quickly acknowledge the presence of two former Members of the House and past Chairmen of this committee—Bob Walker and Sherry Boehlert. I am pleased that you were both able to join us today and help us commemorate the 50th anniversary of our committee.

Mr. HALL. Mr. Chairman, I thank you, and of course I thank you, Mr. Gates, for joining us this morning to celebrate the 50th anniversary of the Science and Technology Committee, this committee, and I want to also take the time to say hello to my good friends and former colleagues, Bob Walker and Sherry Boehlert and of course our very able Committee Chairman, Mr. Sensenbrenner.

You know, men and women of America have always stepped forward when the challenges were great. Henry Ford introduced his assembly line innovation with the first Model T's, and men like Henry Kaiser picked up on it and perfected production techniques during World War II that allowed us to out-produce the enemy, producing one cargo ship every 30 days, and one ship in a record four days. And when polio stalked our nation and iron lungs claimed our children, Jonas Salk appeared.

We are honored today, Mr. Chairman, with one who graces our committee room who beat down the doors that shut out imagination and brought about a revolution in communication which changed the world. His foundation is now revolutionizing an assault on malaria, hunger, ignorance, and illiteracy around the world, and let me tell you, we are really honored by your presence.

I think it is important for us to take this time and reflect on the Committee's accomplishments over the last half-a-century as well as explore why scientific enterprise and the work of the Committee are just as important to the United States today as they were in the Cold War when the Committee was created. The Soviet launch of Sputnik on October 4, 1957, was a wakeup call to Americans, and I remember the feeling of going out to the backyard at night and watching the blinking lights slowly cross the Texas sky. Every night that blinking light taunted us that America was no longer the most technologically advanced country in the world. The message was loud and clear that for the first time, the United States had to play catch up and catch up we did. In 1958, under the leadership of Speaker of the House Sam Rayburn, whose Texas 4th District I now gladly represent, the Select Committee on Astronautics and Space Exploration was created. Shortly thereafter, the Committee created NASA and chartered a permanent House Committee on Science and Astronautics, our forerunner. About a decade later, the United States landed on the Moon, proving without a doubt that America was once again the world's technological leader.

The Science and Technology Committee has come a long way in 50 years, taking on some of America's biggest challenges, but we continue to be challenged. Experts have been churning out report after report citing the United States as falling behind other countries in the field of science, technology, engineering, and mathematics education as well as long-term basic research funding. For these reasons, the President and a Republican-led Congress made its priority to make the United States more economically competitive by promoting American innovation and STEM education. We have continued that trend in this Congress, and I am proud to be a supporter of the *America COMPETES Act,* which the President signed into law last year and which calls for a doubling of basic research funding for several agencies within our jurisdiction within a decade.

America COMPETES has been the Committee's top priority, but we played a part in many other important sectors. Research into advanced technologies can help prepare first responders, secure our borders, and develop safe nanotechnology-based products, all the while as Mr. Gates exemplified, improving the economy and creating skilled jobs. Science then forms good policy, and I am proud

to have been a part of the Science and Technology Committee for 27 years doing just that. From this seat I have seen first-hand America's innovative capabilities, and I know we can always do better. America's preeminence in the global community depends on what all of us do today, each of us, all levels of government. Academia, parents, students, and industry have an important role to keep and also to play in keeping America competitive and ahead of the innovation curve.

I look forward to hearing your testimony, Mr. Gates. I understand that both Microsoft and the Bill and Melinda Gates Foundation are doing wonderful things, particularly with regards to STEM education. I am especially eager to hear more about the 35 secondary STEM schools and regional resource centers you have established across Texas in partnership with the Michael and Susan Bell Foundation, the Communities Foundation of Texas, the Governor, and the Texas Education Agency. I hope you plan to extend some of these terrific efforts to reach children in K to 8 grades as well. I would suggest that perhaps you might want to take a look at what the Martha and Josh Morris Math and Engineering Elementary School in my district is accomplishing in this regard to capture the attention and imagination of our youth. This committee will be holding a field hearing there in May to show how this local effort and how well as a partnership such as the ones you describe can work and serve as models for the rest of the country. Our Chairman will lead that visit.

Again, welcome. I look forward to hearing from you. I yield back my time.

Chairman GORDON. Thank you, Mr. Hall. I look forward to going down and joining you in Texas.

If there are additional Members that would like to make statements, you can—written statements, opening statements can be made a part of the record at this point.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Mr. Chairman, I would like to thank you for overseeing this budget hearing and thank Mr. Gates for coming to testify before the Committee today. Your philanthropic work with the Gates Foundation has certainly been admirable and I thank you for your dedication to and commitment to the global community.

With the COMPETES bill, the Committee took an important step to advance the goal of increasing our nation's competitiveness and investing in our children's math and science education. The Committee recognizes in order to truly remain competitive for the next fifty years as we have over the past half century, we must make a serious commitment to invest in research and development. This commitment will necessitate a partnership between the State and Federal Government and the private sector. Your work at Microsoft and the Gates Foundation is an example of exactly that.

I am concerned, Mr. Chairman, about remaining competitive in a global market and securing technology jobs for Americans who have invested the time in professional training and degree programs. Too often, I hear from constituents in my district who have found themselves out of work due to out-sourcing, closing factories, and a failing economy.

I am interested in hearing your thoughts on these issues, Mr. Gates, as your experience guiding a company on the cutting edge of technology production for thirty years and your more recent position of co-chair of your foundation make you an excellent witness for our hearing today. Thank you, Mr. Chairman, for my time.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman.

Today's hearing is important to help us better understand how we, as a nation, can secure our position as a leader in science and technology for the next 50 years and beyond.

As we celebrate the Science and Technology Committee's 50th Anniversary, I am pleased to have Mr. Bill Gates to testify as a world renowned innovator in technology and philanthropist in health, education, and poverty.

As other countries challenge the United States to stay at the forefront in technology and innovation, I know that it is imperative to educate the next generation in the areas of science, technology, engineering and mathematics (STEM).

Through the Bill & Melinda Gates Foundation, Mr. Gates has been able to fund the education of many low-income students that would not have had the opportunity to attend college otherwise.

The $38.7 billion Gates Foundation endowment is, and will continue to, help young people in need.

Children will have a fair chance to grow up less burdened by disease.

Students living in poverty will have better access to books, stimulating teachers, Internet connections, and other tools to help them compete in the global marketplace.

Many of these students who are minorities and women will go on to study in STEM fields. This mission has been a passion of mine over the years.

The Gates Foundation is doing all of these activities, and more.

The size and scale of it is comparable to federal investments in non-defense research and development.

As a strong supporter of the *America COMPETES Act,* that serves the purpose of strengthening science education and research and improving our technology enterprise, I can say that the Microsoft Corporation has certainly done its part to keep America competitive in the global market.

With pioneers like Mr. Gates, this nation will continue to make technological advances for the next 50 years and longer.

While we make such advances, it is my desire to see more programs like the Bill & Melinda Gates Foundation.

Bill Gates is a shining example of innovation and humanitarianism at its best.

Again, welcome, Mr. Gates.

Thank you, Mr. Chairman. I yield back.

Chairman GORDON. And now, on this occasion, the Committee's 50th anniversary, I believe it is particularly relevant to receive the thoughts and ideas of one of the country's truly innovative thinkers.

After founding Microsoft in 1975, Mr. Gates has built the company into one of the world's leading software and technological companies. His company's innovations have changed the way we work, the way we process information, and the way we learn. His vision and his accomplishments are truly what can make America an even better country.

Each of us would be hard pressed to have a day pass that we did not use a Microsoft application in the course of our daily routine, but more importantly, Bill Gates is uniquely positioned to share with the Committee the challenges of building a strong, well-educated workforce and the benefits that technology can provide. Moreover, Mr. Gates has taken to heart the adage from those who much is given, much is expected. With the great financial success Mr. Gates has realized, he and his wife, Melinda, have undertaken the daunting challenge of making our world a better place by using the same entrepreneurial spirit and his to conscientiously give away the majority of his fortune while encouraging others to similarly endow to do the same.

Again, we are very pleased to have you and look forward to your testimony. At this time, I would like to yield to the gentleman from

Washington, Mr. Baird, for some brief additional introductory remarks.

Mr. BAIRD. Mr. Gates, I just wanted to, as a proud Washingtonian, let you know how much we admire what you have done for our State and our world and your leadership on science and a committee that is so proud of what you have done and what you are doing for the future in the areas just mentioned. Welcome to the Science Committee, and thank you for helping us to commemorate our 50th anniversary.

Chairman GORDON. Mr. Gates, I told you we are a bipartisan Committee following Sherry Boehlert's good example, and we are fortunate to also have a Democrat and Republican from Washington State, and Mr. Reichert is recognized for any comments.

Mr. REICHERT. There are actually three Republicans in Washington State. I have backup.

Chairman GORDON. On this committee.

Mr. REICHERT. Yes, sir. Thank you, Mr. Chairman, and Mr. Gates, thank you so much for being here today. We are excited to hear your testimony, and I just want to take a moment to say how proud I am to have you here personally as a constituent testifying before our committee, and also, I am proud to have Microsoft in Washington State and am especially proud to have Microsoft in the 8th District which I am privileged to represent.

Through your leadership, Microsoft has remained not only a leading innovator but also a beacon for thousands of small businesses across the country. That American dream is alive and well, and that vision of determination, great success, can come from modest beginnings. Microsoft is truly an engine of our nation's economic growth, and your company and your philanthropy continue to make tremendous contributions to Washington State, to our country, and to the global community. These are challenging times, and I look forward to hearing your perspectives on immigration, math and science, foreign aid, and other critical areas we need to improve so that America can remain a leader in this increasingly kind of competitive global economy.

I yield back, Mr. Chairman. Thank you.

Chairman GORDON. Thank you, Mr. Reichert. Let me mention to our Members, and I know we don't have a full delegation here because they knew we were having votes on the Floor. Unfortunately, our bipartisan spirit does not move over or flow over to the Floor, so I think we are going to have a little bit of a contentious morning. We don't want that to stand in the way of this good testimony.

With Ralph Hall's concurrence, we have some ground rules here. One, Mr. Gates has got to leave right at 12:00, and so we are going to have to cut off at 12:00. The second thing is what I would like for us to do during these votes is to sort of alternate. I want to keep the hearing going, and so some of you might go down and vote and come back and ask questions, some can stay here, but we want to keep the proceedings going. Mr. Baird?

Mr. BAIRD. Mr. Chairman, in the interest of most of us can hear Mr. Gates, is it possible that we pair in a sense? I know that we, basically, that we keep even numbers on this side so that we don't affect the Floor tally in any way. There are eight of us I think on our side of the aisle. You know, basically match it up in some way.

Chairman GORDON. I think folks will want to go vote, but what we will try to do is we will ask the staff maybe on each side to send half down and ask the other half to stay and then reverse. We will do it the best we can, and I am sure that it will work out.

Mr. HALL. Kind of an assembly line.

Chairman GORDON. Right. We will now begin the questions, and the Chairman recognizes himself. Oh, I guess if we have a rock star, we should let him rock. So, Mr. Gates, you are now recognized.

STATEMENT OF MR. WILLIAM H. GATES, CHAIRMAN, MICROSOFT CORPORATION; CO-CHAIR, BILL AND MELINDA GATES FOUNDATION

Mr. GATES. Thank you. It is a privilege to be here. Chairman Gordon, Ranking Member Hall, Members of the Committee. I am Bill Gates and I am the Chairman of Microsoft. With my wife, Melinda, I am also the founder of the Bill and Melinda Gates Foundation, and it is an honor to be here to commemorate your 50th anniversary.

During these 50 years, incredible advances in science and technology have revolutionized the way people around the world communicate, run businesses, find information, and much more. I am optimistic that over the decades ahead, information technology will continue to transform business productivity and have a profound positive impact on our day-to-day lives. It will also help us address important global challenges related to education, health care, energy, and other issues.

Many of the key advances of these 50 years were pioneered by researchers working in U.S. universities and for U.S. companies. United States' preeminence in science and technology and this nation's unmatched ability to turn innovation into thriving business have long been the engine of job creation and the source of our global economic leadership.

I know we all want the United States to continue to be the world's center for innovation, but our position is at risk. There are many reasons for this, but two stand out. First, U.S. companies face a severe shortfall of scientists and engineers with expertise to develop the next generation of breakthroughs. Second, we don't invest enough as a nation in the basic research needed to derive long-term innovation. If we don't reverse these trends, our competitive advantage will erode. Our ability to create new high-paying jobs will suffer.

Addressing these issues will take commitment, leadership, and partnership on the part of government, private, and non-profit sectors. Let me start by saying that business has a critical role to play. The private sector must contribute to building a workforce that has the skills to innovate and compete. That is why Microsoft is committed to improving educational quality and encouraging young people to study math and science through programs like Partners in Learning which has reached more than 80,000 teachers and three million students.

Non-profit organizations also have an important role to play. The Bill and Melinda Gates Foundation for its part has invested almost $2 billion to help establish or improve nearly 2,000 U.S. high

schools and provided over $1.7 billion for college scholarship programs.

But organizations like these cannot address the issues alone. Only government has the resources to effect change on a broad scale. If this nation is to continue to be the global center of innovation, Congress, the current Administration, and the next president must act decisively. It starts with education. Today, graduation rates for our high school students and their level of achievement in math and science rank at the bottom among industrialized nations. Thirty percent of ninth-graders and nearly half of African-American and Hispanic ninth-graders do not graduate on time. Fewer than 40 percent of high school students graduate ready to attend college.

As a nation, we must have a fundamental goal that every child in the United States should graduate from high school prepared for college, career, and life. To achieve this, we need metrics that reflect what students learn and the progress they make. Touch metrics may be difficult to develop, but they provide the essential foundation for deciding which programs best improve outcomes in our public schools.

Better data will also help us identify the most effective teachers and adopt better policies for recruiting, training, and retaining these teachers for our public schools.

If the problem of high schools is one of quality, the issue at our universities is quantity. Our higher education system doesn't produce enough top scientists and engineers to meet the need of the U.S. economy. According to the bureau of labor statistics, we are adding over 100,000 computer-related jobs each year, but only 15,000 students earned Bachelor's degrees in computer science and engineering in 2006 and that number continues to drop.

One of the most important steps Congress can take to address this problem is to fully fund the *America COMPETES Act.* Introduced by this committee, this Act would significantly increase funding for the National Science Foundation's Graduate Fellowship and Teacher Training Scholarship Programs. As bad as the disparity between supply and demand looks, these numbers understate the severity of the problem. Today our university computer science and engineering programs include large numbers of foreign students. In fact, the Science and Engineering Indicators Report showed that 59 percent of doctoral degrees and 43 percent of all higher ed degrees in engineering and computer science are awarded to temporary residents. But our current immigration policies make it increasingly difficult for these students to remain in the United States. At a time when talent is the key to economic success, it makes no sense to educate people in our universities, often subsidized by U.S. taxpayers, and then insist that they return home.

United States' innovation has always been based in part on the contribution of foreign-born scientists and researchers. For example, a recent survey conducted by several universities showed that between 1995 and 2005 firms with at least one foreign-born founder created 450,000 new U.S. jobs. Moreover, as a recent study shows, for every H–1B holder that technology companies hire, five additional jobs are created around that person. But as you know, our immigration system makes it very difficult for U.S. firms to

hire highly skilled foreign workers. Last year at Microsoft, we were unable to obtain H–1B visas for over a third of our foreign-born candidates. An example is the story of Arpit Guglani, a talented young man who graduated from the University of Toronto. He graduated in 2006, and we offered him a job but he has not been able to obtain an H–1B visa for two straight years and we were forced to rescind his job offer. He is exactly the type of science and engineering graduate that we need to continue to add jobs and drive innovation.

There are a number of steps that Congress and the White House should take to address this problem, including extending the period that foreign students can work here after graduation. Increasing the current cap on H–1B visas, clearing a path to permanent residency for high-skilled, foreign-born employees, eliminating per-country green card limits, and significantly increasing the annual number of green cards.

I want to emphasize that to address the shortage of scientists and engineers we must do both, reform our education system and our immigration policies. If we don't, American companies simply will not have the talent they need to innovate and compete.

Finally, we must increase our investment in basic scientific research. In the past, federally funded research helped spark industries that today provide hundreds of thousands of jobs. Even though we know that basic research drives economic progress, real federal spending on research has fallen since 2005. I urge Congress to increase funding for basic research by 10 percent annually for the next seven years. I fully support Congress' efforts to fund basic research through the *America COMPETES Act.*

I believe the country is at a crossroads. For decades, innovation has been our engine of prosperity. Now, economic progress depends more than ever on innovation. Without leadership from Congress and the President to implement policies like those I have outlined today and the commitment of the private sector to do its part, the center of progress can shift to other nations that are more committed to the pursuit of innovation.

I want to conclude by again congratulating the Committee on its 50th anniversary and to thank you for this opportunity to share my perspective. I would be happy to respond to any questions you may have on these topics.

[The prepared statement of Mr. Gates follows:]

PREPARED STATEMENT OF WILLIAM H. GATES

Chairman Gordon, Ranking Member Hall, Members of the Committee, my name is Bill Gates and I am Chairman of Microsoft Corporation. I am also a Co-Chair, with my wife Melinda and my father Bill, Sr., of the Bill & Melinda Gates Foundation. It is an honor for me to speak here today on the occasion of the Committee's 50th anniversary.

Today I am here to highlight the gathering threat to U.S. preeminence in science and technology innovation, and to propose a four-part plan that I believe will help us maintain our position as the world's innovation leader.

During the last 50 years, the world has witnessed truly revolutionary advances in science and technology. We as a nation can take pride in knowing that American scientists, researchers, and entrepreneurs have been at the forefront of many of these advances. Our unmatched ability to turn new ideas in science and technology into thriving businesses has been the engine of growth and job creation that has made our economy among the most dynamic and competitive in the world.

This committee can also take pride in knowing that it is responsible for many of the key federal policies that provided the foundation for U.S. technology leadership. Through its efforts, the Committee has shaped our national approach and guided our investments in areas such as space travel, aviation, computing and networking, biotechnology, energy, education, and many other fields.

I share this committee's deep faith in the power and importance of technology. Having spent the last 30 years with one of the world's leading software companies, I am amazed every day at the potential for technology to create new opportunities and improve people's lives. This view is shared by the Bill & Melinda Gates Foundation, which focuses on finding innovative solutions that can help improve health care and education, and reduce poverty.

As rapidly as science and technology have advanced over the past 50 years, I believe these advances will pale in comparison to the innovations of the next 50 years, or even the next 10 years.

In many ways, the incredible advances of the past few decades have really just laid the foundation for much more profound change in the years ahead. There are about a billion PCs in use around the world today. The number of people who use cell phones is close to three billion. About 300 million people are connected to broadband Internet. Software permeates every sector of the economy and almost every aspect of our day-to-day lives.

The implications of these developments are profound. Computing and software are increasingly available everywhere: in the office and the home; in our cars; in stores, restaurants, and public spaces. In the future, we will be able to tap into computing capabilities on an increasingly broad range of devices. We will have instant access to all of our personal information—and all of the content, information, and computing power we want or need—at any time and from any location.

These changes will have a dramatic impact on business. Not only will productivity and efficiency continue to improve, but we are moving closer and closer to the time when information systems will have the flexibility, intelligence, and self-awareness to adapt automatically as business conditions change. These systems will deliver precisely the information, services, and applications that employees and customers need, when and where they need them.

These changes will also have a profound impact on the way people *live*—the way we share experiences and communicate with the people we care about; the way we preserve memories of past events; the way we access entertainment; the way we learn; and how we interact with our communities and our governments.

These advances also have the potential to help us address some of the most pressing global challenges that we face today.

In education, information technology can help us eliminate some of the barriers that prevent us from providing a high-quality education to everyone; barriers such as lack of access to great educational content and relevant curricula, a shortage of effective teachers, and a paucity of data that would help us improve student performance.

My involvement in education initiatives at both Microsoft and at the Bill & Melinda Gates Foundation has shown me the great things that information technology can do to improve education. One of the Foundation's earliest initiatives, which it undertook in partnership with Microsoft, was its U.S. Libraries Program. The goal of this program was simple: to ensure that every person in the United States who could reach a public library would have access to the Internet. Today, 99 percent of U.S. public libraries offer free computer and Internet services, and some 14 million people regularly use these services. In my view, the U.S. Libraries Program is a great example of how the public and private sectors can work together to use the power of information technology to address important social needs.

In health care, information technology can reduce the cost of health care and help ensure that patients receive the most effective care possible. New technologies, such as Microsoft's HealthVault, are giving people simple, secure ways to manage their family's health information and providing the ability to control who can access that information. These technologies put patients at the center of the health care system by giving them the tools to create a complete picture of their health and allowing them, for the first time, to make fully informed treatment decisions.

The Bill & Melinda Gates Foundation, for its part, has committed more than $6 billion to organizations worldwide to promote innovation in access to health care, including research to develop new tools to fight diseases that cause the greatest amount of illness and death in developing countries. For example, the Foundation has provided over $250 million to support collaborative research between a not-for-profit and the pharmaceutical industry aimed at developing a preventative malaria vaccine. Late last year, the Foundation issued a challenge grant to Rotary International: if Rotary raises $100 million in the fight to eradicate polio, the Foundation

will match it, dollar for dollar. The Foundation also recently provided funding to support the International Medical Corps' mobile clinics and other public health efforts in Kenya, and has committed more than $650 million to the Global Fund to Fight AIDS, TB, and Malaria. With initiatives like the Product Red campaign, the Global Fund is paving the way for business to join with government on these issues. These efforts, together with those of countless other companies and institutions, hold tremendous promise for alleviating existing inequities in global health care.

Computing and software will also play an increasingly central role in scientific research. We are rapidly moving into an era of data-centric computational science in which researchers across a wide range of disciplines routinely use software and computers as essential tools for investigation and collaboration. The ability to use computers to model complex systems is transforming the way we learn about everything from genomics and biosciences to physics and astronomy. In the future, scientific computing will play a profoundly important role in advances that will help us treat diseases, address climate change, and confront many other critical issues.

* * * * *

As I hope these remarks reflect, I am optimistic about the potential for technology to help us find new ways to improve people's lives and tackle important challenges. I am less optimistic, however, that the United States will continue to remain a global leader in technology innovation. While America's innovation heritage is unparalleled, the evidence is mounting that we are failing to make the investments in our young people, our workers, our scientific research infrastructure, and our economy that will enable us to retain our global innovation leadership.

In particular, I believe that there are two urgent reasons why we should all be deeply concerned that our advantages in science and technology innovation are in danger of slipping away.

First, we face a critical shortfall of skilled scientists and engineers who can develop new breakthrough technologies. Second, the public and private sectors are no longer investing in basic research and development (R&D) at the levels needed to drive long-term innovation.

If the United States truly wants to secure its global leadership in technology innovation, we must, as a nation, commit to a strategy for innovation excellence—a set of initiatives and policies that will provide the foundation for American competitive strength in the years ahead. Such a strategy cannot succeed without a serious commitment from—and partnership between—both the public and private sectors. It will also need to be flexible and dynamic enough to respond to rapid changes in the global economy.

I believe this strategy must place top priority on achieving four fundamental goals:

1. **Strengthening educational opportunities,** so that America's students and workers have the skills they need to succeed in the technology- and information-driven economy of today and tomorrow;
2. **Revamping immigration rules for highly skilled workers,** so that U.S. companies can attract and retain the world's best scientific talent;
3. **Increasing federal funding for basic scientific research,** to train the next generation of innovators and provide the raw material for further innovation and development by industry; and
4. **Providing incentives for private-sector R&D,** so that American businesses remain at the forefront in developing new technologies and turning them into new products and services.

I. Strengthening Educational Opportunities

Like many others, I have deep misgivings about the state of education in the United States. Too many of our students fail to graduate from high school with the basic skills they will need to succeed in the 21st century economy, much less prepared for the rigors of college and career. Although our top universities continue to rank among the best in the world, too few American students are pursuing degrees in science and technology. Compounding this problem is our failure to provide sufficient training for those already in the workforce.

This committee, of course, has been a leading advocate for expanding educational opportunities for American students and workers in the vital areas of science, technology, engineering, and math (STEM). The *America COMPETES Act,* which was drafted by this committee and passed by Congress last year, includes provisions to train thousands of new STEM teachers and to provide current teachers with STEM-

related resources through the National Science Foundation's (NSF) Noyce Teacher Scholarship Program and Math and Science Partnerships Program. America COMPETES authorized expansion of the Noyce Program, an important step toward recruiting 10,000 new STEM teachers annually, a goal that I have advocated previously. It also authorized competitive grants to increase the number of teachers serving high-needs schools and to expand access to advanced placement and International Baccalaureate programs in these schools.

These initiatives—and many others this committee has spearheaded—represent critical strides in the much-needed effort to reform our faltering educational system, and I commend you for your vision and efforts. At both Microsoft and the Bill & Melinda Gates Foundation, we are investing in innovative approaches to broaden and deepen educational opportunities, which I will discuss more in a moment.

But in order to ensure the continued success of our young people now and in the future, the public and private sectors must do more.

A. Secondary Education

The United States today has one of the lowest high school graduation rates in the industrialized world. Three out of every 10 ninth-graders—and nearly half of all African American and Hispanic ninth-graders—do not graduate on time.[1] Of those who do graduate and continue on to college, over a quarter must take remedial courses on material they should have learned in high school.[2] In all, fewer than 40 percent of our high school students graduate ready to attend college.[3]

Our record on high school math and science education is particularly troubling. International tests indicate that U.S. fourth graders rank among the top students in the world in science and above average in math. By eighth grade, they have moved closer to the middle of the pack. By 12th grade, U.S. students score near the bottom of all industrialized nations.[4] As a result, too many U.S. students enter college without even the basic skills needed to pursue a degree in science and engineering.

To better understand and address these problems, the Bill & Melinda Gates Foundation has invested over $1.9 billion to help establish 1,124 new high schools and improve 761 existing high schools. All of these schools operate under a common mission: that all students should have the opportunity to graduate from high school ready for college, career, and life. These schools approach this mission in different ways—some are large, many are small, some are organized around academic themes, others offer a standard college-preparatory curriculum—but all have common elements:

- **High Expectations:** They set high expectations for all students and engage students with challenging, relevant course work.
- **High Levels of Support:** They provide personal attention and support in a safe, respectful environment so that students can achieve at the highest levels.

Through these efforts, we have learned a great deal about what works to improve student outcomes, and what doesn't. We also have concluded that creating a successful system requires better information and greater clarity about the following three sets of questions:

- **Do we know how we are doing?** Do we have transparent, common student performance data as the foundation for measuring impact and making decisions?

No enterprise can be effective if it does not have clear goals and a way to measure its progress toward achieving its goals. At both Microsoft and the Bill & Melinda Gates Foundation, this approach is our lifeblood; it is how we identify our weaknesses and how we improve. Education is no different. We must strengthen our ability to measure what students are learning, the progress they are making over time, and their readiness for college and work. I recognize that developing better information in these areas may be difficult, but it is central to identifying the most effective means of improving educational outcomes in our public schools.

---

[1] See Diplomas Count: The Graduation Project, *Education Week* (2007).

[2] See National Center for Education Statistics, U.S. Department of Education, *Remedial Education at Degree-Granting Post-secondary Institutions in Fall 2000* (2003).

[3] Greene, Jay and Forster, Greg, *Public High School Graduation and College Readiness Rates in the United States,* Education Working Paper No 3, Center for Civic Innovation, Manhattan Institute (2003).

[4] National Center for Education Statistics, U.S. Department of Education, *Highlights from TIMSS* (1999). Note that eighth graders did better in the 2003 version of TIMSS, but that version did not test high school students.

In recent years, school systems have taken important first steps toward greater transparency and accountability in how they assess student achievement. Congress and the Administration have supported increased funding for state data systems and the development of a new State Education Data Center. Now we need to develop data systems that can measure student progress over time and expand the scale of these systems so they are truly national in scope. We also need better student- and teacher-level data so that we can better assess which methods—and which teachers—are most effective at improving student learning.

Getting this right is the most critical first step to improving U.S. high schools and K–12 education more broadly. We need to use these data as the basis for action, adjusting practices based on what we actually *know* about the performance of students—rather than on what we may perceive or assume.

- **Do we know where we're going?** Are we clear about our destination—ensuring that every student graduates from high school ready to succeed in college, career, and life?

All 50 states have now adopted standards that define what young people should know and be able to do, and all states now measure their students' proficiency in core subjects. It is not clear, however, whether these standards are aligned with the demands of college and work or whether existing assessments accurately measure student proficiency. The Bill & Melinda Gates Foundation has supported the American Diploma Project Network, in which more than 30 states agreed to align their standards to the benchmarks developed by Achieve, Inc., a nonpartisan, nonprofit organization that helps states raise academic standards, improve assessments, and strengthen accountability. Working with the Education Trust, the Thomas B. Fordham Foundation, and leaders from higher education and business, Achieve and its partners developed benchmarks to reflect what college professors and employers believe new students and employees need to know in order to be successful.

In addition to adopting high school standards that better reflect what is takes to be successful in college and work, we need to develop better methods for measuring whether students are meeting these standards; a better understanding of the systemic changes that are required to ensure that all students gain the knowledge and skills that are essential for success; and better methods to assess how our own standards compare to those of educational systems elsewhere in the world. Ultimately, we need to identify a smaller set of clear, high, and common state standards that reflect what young people truly need to know to be successful in the 21st century, along with a common set of measurements to help us understand how well our schools are performing in key areas. At the same time, we must allow for the creativity and uniqueness that teachers and school communities bring to their work.

- **Do we have what we need to get there?** Are we providing the support, working conditions and incentives necessary for teachers to be truly effective?

We all know that no one is more committed to helping our young people succeed than our teachers. Many of us can identify a teacher who had a profound impact on our lives. Research tells us that no other single factor in the educational system has greater impact on student performance. By helping teachers succeed, we can have a dramatic positive effect on student achievement.

We need to ensure that our policies, processes, and systems will develop enough talented, dedicated teachers to ensure that every student has an effective teacher every year. This will be a massive undertaking. Before we take major steps, we need to be very clear about how these policies will affect student performance. Here is what we know:

- **Some teachers consistently generate much larger gains in student achievement than others,** even when they are assigned students with similar baseline performance levels. That fact alone is not particularly surprising, but the *magnitude* of the difference is. In elementary and middle school, for example, being assigned a teacher in the top quartile of effectiveness rather than a teacher in the bottom quartile will result in the math test scores of the *average* student in the class moving up 6–10 percentage points in a single year compared to similar students.[5]

[5] See Robert Gordon, Thomas Kane & Douglas Staiger, *Identifying Effective Teachers Using Performance On The Job,* Brookings Institution (2006). Similar estimates of teacher effects have been reported in other papers. *See, e.g.,* Eric Hanushek, Steve Rivkin & John Kain, Teachers, Schools and Academic Achievement, *73 Econometrica 2* (2005), at 417–458; Daniel Aaronson, Lisa Barrow & William Sander, Teachers and Student Achievement in the Chicago Public High Schools, *24 J. Labor Econ. 1* (2007), at 95–135.

- **Our most needy students are disproportionately taught by less experienced and less effective teachers.** Data from Los Angeles suggest that, compared to students in the wealthiest schools, students in the poorest schools were significantly more likely to have a teacher in the bottom quartile of all teachers as measured by teacher impact on student performance.[6] In addition, the highest-need students are much more likely to be assigned a novice teacher who will gain experience and then move on to a more affluent school. In essence, our highest-need students too often help provide on-the-job training for novice teachers while students with fewer needs reap the benefits—thus exacerbating the achievement gap between high- and low-needs students.

We have to find better ways to reward and retain the most effective teachers and assign more of them to classes where they are needed the most. It should be a given that every child has an effective teacher every year of their school career.

While governments will take the lead in reforming America's public education system, the private sector can and must support these efforts. At Microsoft, we have a number of education-focused initiatives. Through our Partners in Learning program, Microsoft works closely with governments and non-governmental organizations throughout the world to offer a wide variety of educational resources to teachers and schools, including teacher-training programs, software tools, and best practices. In the United States, Partners in Learning has reached more than 80 thousand teachers and over three million students, and actively supports states as they strive to prepare their students for careers in the 21st century. In Michigan, for instance, we created Career Forward, an online course that in its first year has already attracted over 17,000 participating students.

In 2006, Microsoft, in partnership with the Philadelphia school district, opened a *School of the Future.* This neighborhood public high school—built on a standard budget and meeting all state and district requirements—offers a technology-based education model that can be replicated in other communities. In my view, the School of the Future offers an exciting example of what public-private partnerships can achieve, even when working within existing financial and regulatory constraints. This school has provided strategies that are being adopted throughout the district. And in a district where approximately 20 percent of students are absent from high school every day, the School of the Future has achieved over a 90 percent attendance rate.

The Bill & Melinda Gates Foundation also pursues a partnership model to advance educational reform. Let me highlight three examples in particular:

- **Texas:** Beginning in 2005, the Bill & Melinda Gates Foundation partnered with the Communities Foundation of Texas, the Governor of Texas, the Texas Education Agency, and the Michael & Susan Dell Foundation to support the creation of 35 STEM schools and six regional resource centers across the state. Already, these efforts have helped attract technology businesses to the Austin area.
- **Ohio:** The Ohio STEM Learning Network has launched efforts to create a state-wide network of five STEM hubs and schools. Designed from a systems engineering approach, this network will scale to a state-wide system of innovative STEM schools with a $12 million grant from the Bill & Melinda Gates Foundation and with support from a public-private partnership that includes the Battelle Memorial Institute, the Ohio Business Roundtable, the Ohio Department of Education, the Ohio Business Alliance for Higher Education and the Economy, the Cleveland Clinic Foundation, and many other local partners. This project has already attracted over $210 million in public funding and represents unprecedented multi-sector partnerships.
- **North Carolina:** Governor Easley, the Department of Public Instruction and the New Schools Project launched the Learn and Earn program, designed to improve high schools, better prepare students for college and career, create a seamless curriculum between high school and college, and provide work-based learning experiences for students. The schools, located on two- and four-year college campuses, seek to have all students graduate with two years of college credit or an associate's degree. The goal is to have 75 of these schools in operation statewide by 2008. Forty-two schools have already opened and 30 are scheduled to open in the fall.

---

[6] See Gordon et al., *supra* n. 5.

Each of these partnerships incorporates new methods to improve STEM education in public high schools. And each is designed to be clear about its goals, rigorous and transparent about measuring effectiveness, and deliberate in how it develops and retains skilled teachers. We hope that these partnerships will point the way to policies and approaches that not only better align our public high schools with the demands of the 21st century economy, but also provide better opportunities for all of our children.

B. Higher Education

In contrast to our public high schools, America's colleges and universities rank among the best in the world. Unfortunately, we are not graduating enough students with degrees in the STEM disciplines to meet the growing demand from U.S. companies for workers in these areas. Without people who have the skills necessary to drive the next wave of technology innovation, it will be impossible for the United States to retain its global innovation leadership.

Consider these facts. The U.S. Department of Labor has projected that by 2014, there will be more than two million job openings in the United States in STEM fields.[7] Yet the number of American students graduating with degrees in these fields is actually *declining*. Indeed, the number of undergraduate engineering degrees awarded in the United States fell by about 15 percent between 1985 and 2005.[8] This decline is particularly alarming when we look at educational trends in other countries, many of which award a higher percentage of college degrees in engineering than does the United States.[9]

This is not a new problem. For years, however, the decline in the percentage of graduate STEM degrees awarded to American students was offset by an increase in the percentage of foreign students obtaining these degrees from American universities.[10] But various factors—including our immigration policies (which I will address in a moment)—are making it increasingly difficult for U.S. companies to hire foreign-born graduates of our universities. Indeed, according to a 2007 study, 40 percent of all recent foreign-born doctoral degree recipients in the United States intended to leave.[11]

Tackling the shortage of U.S.-born scientists and engineers will require determination by government and support by industry. The goal should be to "[d]ouble the number of science, technology, and mathematics graduates by 2015."[12]

The Bill & Melinda Gates Foundation, for its part, has invested $1.7 billion in college scholarship programs—including the Gates Millennium Scholars, The Washington State Achievers Program, and the D.C. Achievers Program—which together will help more than 17,000 young people attend college. Most of the scholarship recipients are from low-income families.

One of the most important steps that Congress can take to address this issue is to fully fund the *America COMPETES Act*. Among other things, that Act authorized increases in the NSF's Graduate Fellowship Program and the Integrative Graduate Education and Research Traineeship program that would provide funding for about 1,000 more STEM graduate students than were funded in Fiscal Year 2007. With these increases, the NSF will support more than 35,000 STEM graduate students during Fiscal Year 2008 and approximately 41,000 during 2009.

If we want U.S. leadership in science and technology over the next 50 years to match that of the last 50 years, America's young people must come to see that science and technology degrees open the door to a wide range of interesting and lu-

---

[7] National Science Foundation, National Science Board, *Science & Engineering Indicators 2008,* at Apx. Table 3–7 (2008), available at *http://www.nsf.gov/statistics/nsb0803/nsb0803.pdf.* According to another recent study, major U.S. technology companies today average more than 470 U.S.-based job openings *each* for skilled workers, while defense companies have more than 1,265 job openings each for skilled workers. See National Foundation for American Policy, *Talent Search: Job Openings and the Need for Skilled Labor in the U.S. Economy,* at 1 (2008), available at *http://www.nfap.net/pdf/080311talentsrc.pdf*

[8] *Science and Engineering Indicators 2008, supra* note 7, at 2–19 & Apx. Table 2–28.

[9] *Id.* at Apx. Table 2–28.

[10] For example, one recent study concluded that, in 2005, roughly 43 percent of U.S. higher educational institutions' engineering and computer science degree recipients were temporary residents, and that temporary residents received 59 percent of the doctoral degrees awarded in those fields that year. *See Science and Engineering Indicators 2008, supra* note 7, at Apx. Tables 2–30 & 2–32.

[11] See Jacob Funk Kirkegaard, *The Accelerating Decline in America's High-Skilled Workforce: Implications for Immigration Policy* (2007), at 23 (citing Aurora (2007)).

[12] The Business Roundtable, *Tapping America's Potential: The Education for Innovation Initiative* (2005), available at *http://www.businessroundtable.org/pdf/20050727002TAPStatement.pdf*

crative career opportunities. If we fail to inspire our young people in this way, we simply will be unable to compete with technology innovators abroad.

C. Lifelong Learning

Governments at all levels are rightly focused on promoting job growth and skills training, encouraging the development of local industry, and enhancing their global competitiveness. But meeting these objectives is a long-term effort that cannot be accomplished by government alone. The private sector shares responsibility for providing continuing education to enhance skills and improve employment prospects for our citizens.

Information technology workers now account for a significant percentage of the U.S. labor force. The U.S. Department of Labor projects that, by 2014, nearly one-third of new jobs will be in the fields of computer systems design and services, and that one-sixth will be in the information sector.[13] The success of many business enterprises will depend on the degree to which the available pool of workers possesses the right combination of science, technology, and engineering skills.

During the last decade, Microsoft has launched a wide range of commercial and philanthropic programs aimed at providing IT skills training to U.S. workers. Our commercial offerings include IT skills training and certification in cooperation with hundreds of commercial partners, and the Microsoft IT Academy, which provides online IT training programs and other resources to accredited educational institutions across the United States.

Through our flagship digital inclusion programs—Partners in Learning and Microsoft's Unlimited Potential Community Technology Skills Program—we provide technology access and training to all types of learners, no matter where they happen to be on the continuum of IT skills and knowledge. We offer skills training for school children, for teachers who need to learn how to incorporate technology as part of their classroom instruction, and for community learners.

In 2006, Microsoft joined with the U.S. Department of Labor to provide $3.5 million in cash and software to 20 of the Department's One-Stop Career Centers, which are located throughout the country. We also donated our innovative Digital Literacy curriculum to those Centers. We have similar partnerships with the Boys and Girls Clubs and the National Urban League.

Although IT skills are in high demand, it can often be difficult for qualified job seekers with limited experience to connect with potential employers. To address this challenge, Microsoft recently launched the Students to Business (S2B) program, which is designed to help companies connect with and hire talented university or post-graduate students for jobs or internships in the technology industry. Through the S2B program, Microsoft collaborates with universities and businesses to provide students with specialized IT training and internship opportunities and helps match qualified job candidates with open positions at thousands of Microsoft partner companies so that students are able to find the right job for their IT capabilities. Microsoft S2B also helps match students to internships. Because IT professionals who have had one or more internships as students tend to secure better jobs when they enter the workforce, the S2B program provides IT students with a range of opportunities to build their experience and strengthen their resumes.

All of these steps are important, but to achieve the kind of wide-ranging changes that are necessary, government and business must work together. As a nation, our goal should be to ensure that ultimately every job seeker, every displaced worker, and every individual in the U.S. workforce has access to the education and training they need to succeed in the knowledge economy. This means embracing the concept of "lifelong learning" as part of the normal career path of American workers, so everyone in the workforce can use new technologies and meet new challenges.

II. Revamping Immigration Rules for Highly Skilled Workers

The second set of policies that we must consider if we are going to address the shortage of scientists and engineers centers on our immigration rules for highly-skilled workers. Today, knowledge and expertise are the essential raw materials that companies and countries need in order to be competitive. We live in an economy that depends on the ability of innovative companies to attract and retain the very best talent, regardless of nationality or citizenship. Unfortunately, the U.S. immigration system makes attracting and retaining high-skilled immigrants exceptionally challenging for U.S. firms.

---

[13] Daniel Hecker, Occupational Employment Projections to 2014, *Monthly Labor Review* (2005), at 72, available at *http://www.bls.gov/opub/mlr/2005/11/art5full.pdf*

Congress's failure to pass high-skilled immigration reform has exacerbated an already grave situation. For example, the current base cap of 65,000 H–1B visas is arbitrarily set and bears no relation to the U.S. economy's demand for skilled professionals. For fiscal year 2007, the supply ran out more than four months before that fiscal year even began.[14] For fiscal year 2008, the supply of H–1B visas ran out on April 2, 2007, the first day that petitions could be filed and six months before the visas would even be issued.[15] Nearly half of those who sought a visa on that day did not receive one.[16]

This situation has caused a serious disruption in the flow of talented STEM graduates to U.S. companies. Because an H–1B petition generally can be filed only for a person who holds a degree, when May/June 2007 graduates received their degrees, the visa cap for fiscal year 2008 had already been reached. Accordingly, U.S. firms will be unable to hire those graduates on an H–1B visa until the beginning of fiscal year 2009, or October 2008.

As a result, many U.S. firms, including Microsoft, have been forced to locate staff in countries that welcome skilled foreign workers to do work that could otherwise have been done in the United States, if it were not for our counterproductive immigration policies. Last year, for example, Microsoft was unable to obtain H–1B visas for one-third of the highly qualified foreign-born job candidates that we wanted to hire.

If we increase the number of H–1B visas that are available to U.S. companies, employment of U.S. nationals would likely grow as well. For instance, Microsoft has found that for every H–1B hire we make, we add on average four additional employees to support them in various capacities. Our experience is not unique. A recent study of technology companies in the S&P 500 found that, for every H–1B visa requested, these leading U.S. technology companies increased their overall employment by five workers.[17]

Moreover, the simple fact is that highly skilled foreign-born workers make enormous contributions to our economy. A recent survey by Duke University and the University of California–Berkeley found that one quarter of all start-up U.S. engineering and technology firms established between 1995 and 2005 had at least one foreign-born founder.[18] By 2005, these companies produced $52 billion in sales and employed 450,000 workers.[19]

The United States will find it far more difficult to maintain its competitive edge over the next 50 years if it excludes those who are able and willing to help us compete. Other nations are benefiting from our misguided policies. They are revising their immigration policies to attract highly talented students and professionals who would otherwise study, live, and work in the United States for at least part of their careers. To address this problem, I urge Congress to take the following steps.

First, we need to encourage the best students from abroad to enroll in our colleges and universities and, if they wish, to remain in the United States when their studies are completed. One interim step that could be taken would be to extend so-called Optional Practical Training (OPT), the period of employment that foreign students are permitted in connection with their degree program. Students are currently allowed a maximum of 12 months in OPT before they must change their immigration status to continue working in the United States. Extending OPT from 12 to 29 months would help to alleviate the crisis employers are facing due to the current H–1B visa shortage. This only requires action by the Executive Branch, and Congress and this committee should strongly urge the Department of Homeland Security to take such action immediately.

Second, Congress should create a streamlined path to permanent resident status for highly-skilled workers. Rather than allowing highly-skilled, well-trained

---

[14] United States Citizenship and Immigration Services Press Release, *USCIS Reaches H–1B Cap* (June 1, 2006) (indicating that the H–1B cap for FY 2007 was reached on May 26, 2006), available at *http://www.uscis.gov/files/pressrelease/FY07H1Bcap_060106PR.pdf*

[15] United States Citizenship and Immigration Services Press Release, *USCIS Reaches FY 2008 H–1B Cap* (Apr. 3, 2007) (indicating that more H–1B petitions were filed on April 2, 2007—the first day on which petitions could be filed that year—than there were H–1B numbers available under the cap), available at *http://www.uscis.gov/files/pressrelease/H1BFY08Cap040307.pdf*

[16] United States Citizenship and Immigration Services Press Release, *USCIS Updates Count of FY 2008 H–1B Cap Filings* (Apr. 10, 2007) (stating that USCIS had received approximately 120,000 H–1B petitions subject to the cap as soon as petitions could be filed, and that those petitions would be subjected to a lottery to determine which 65,000 would be accepted and adjudicated), available at *http://www.uscis.gov/files/pressrelease/H1Bfy08CapUpdate041007.pdf*

[17] National Foundation for American Policy, *H–1B Visas and Job Creation* (2008), available at *http://www.nfap.com/pdf/080311h1b.pdf*

[18] Vivek Wadhwa et al., *America's New Immigrant Entrepreneurs* (2007), available at *http://memp.pratt.duke.edu/downloads/americas_new_immigrant_entrepreneurs.pdf*

[19] *Id.*

innovators to remain for only a very limited period, we should encourage a greater number to become permanent U.S. residents so that they can help drive innovation and economic growth alongside America's native-born talent. While some foreign students will undoubtedly choose to return home after graduation, it is extremely counterproductive to prevent them from remaining here to contribute their talents and expertise to our economic success if that is what they would like to do.

Third, Congress should increase the cap on visas. The current cap is so low that it virtually assures that highly skilled foreign graduates will leave the United States and work elsewhere after graduation. By increasing the number of visas granted each year, Congress can help U.S. industry meet its near-term need for qualified workers even as we build up our long-term capability to supply these workers domestically through education reform.

Ultimately, however, if we are to align our immigration policy with global realities and ensure our place as the world's leading innovator, Congress must make additional changes to our employment-based immigration system.

The current system caps employment-based visas—or "green cards"—at 140,000 per fiscal year. Because that number includes spouses and children of applicants, the actual number of visas available for workers is far fewer than 140,000. Moreover, the number of green cards issued to nationals of any one country cannot exceed seven percent of the total number of visas issued in a given fiscal year. These two factors have caused multi-year backlogs for thousands of highly skilled individuals and are having a chilling effect on America's ability to attract and retain great talent.

I urge Congress to pass legislation that does away with per-country limits and significantly increases the number of green cards available in any fiscal year. Failure to do so will add to the already years-long wait for green cards and only encourage talented foreign nationals who are already contributing to innovation in U.S. companies to leave and take their talents elsewhere. Innovation is the engine of job growth; if we discourage innovation here at home, economic growth will decline, resulting in fewer jobs for American workers.

I want to emphasize that the shortage of scientists and engineers is so acute that we must do both: reform our education system *and* reform our immigration policies. This is not an either/or proposition. If we do not do both, U.S. companies simply will not have the talent they need to innovate and compete.

III. Increasing Federal Funding for Basic Scientific Research

Another fundamental goal of a strategy for innovation excellence should be to increase federal funding for basic scientific research. Federally funded research supports the education of the next generation of scientists and engineers, those who will largely determine whether the United States remains innovative and globally competitive. Federally funded research also provides the raw material that U.S. companies transform into commercially successful products. Thanks to the *Bayh-Dole Act* and related legislation, universities and other recipients of federal research funds have strong incentives to ensure that the results of their research do not just end up sitting on a shelf, but instead are licensed to industry under terms that promote the development of useful new products.

Countless products and technologies that we take for granted today had their origins in research conducted with federal funds. Government support was critical, for instance, to the development of public-key encryption technology, which became the foundation for most e-mail applications, digital certificates, and virtual private network software, as well as non-Internet technologies such as ATMs and credit card machines. Research initially conducted by NASA has been applied to improve the safety and effectiveness of angioplasties and breast cancer detection. Funding from the NSF led to the development of Magnetic Resonance Imaging. And of course, the Internet itself has its genesis in ARPANET, a project of the Defense Department's Advanced Research Projects Agency. There are many other examples.

The leaders of U.S. scientific institutions recognize the importance of federal funding for basic scientific research. As NSF Director Arden Bement has noted, "[m]ore than a dozen major studies have now concluded that a substantial increase in federal funding for basic scientific research is critical to ensure the preeminence of America's scientific and technological enterprise."[20]

Unfortunately, federal research spending has been stagnant or shrinking over the past several decades. According to the Task Force on the Future of American Inno-

[20] National Science Foundation Press Release, *National Science Foundation Requests $6.85 Billion for Fiscal Year 2009,* (Feb. 4, 2008), available at *http://www.nsf.gov/news/news_summ.jsp?cntn_id=111084&govDel=USNSF_51*

vation, "[a]s a share of GDP, the U.S. federal investment in both physical sciences and engineering research has dropped by half since 1970. In inflation-adjusted dollars, federal funding for physical sciences research has been flat for two decades. . . ."[21] This stagnation in spending comes at a time when other governments, such as in China and the EU, are increasing their public investments in R&D.

Passage of the *America COMPETES Act* potentially represents a welcome reversal of this trend, and again I support this committee's call to Congress to fully fund America COMPETES. Many important programs are at risk if this Act is not fully funded. For example, the Act extends funding for two important NIST initiatives—the Manufacturing Extension Partnership and the Technology Innovation Program, both of which have proven track records of producing return on investment and creating jobs. I also urge Congress to establish a mechanism to measure and report on the Administration's progress on implementing the initiatives established or funded by America COMPETES.

As a nation, our goal should be to increase funding for basic scientific research by 10 percent annually over the next seven years. We also need to ensure that the private sector has greater visibility into the status and progress of federally funded research projects so that companies can collaborate more effectively with universities and other publicly funded researchers.

IV. Providing Incentives for Private-Sector R&D

The fourth critical element of a strategy for innovation excellence should be to strengthen incentives for private-sector R&D. Private companies are often in the best position to engage in the kinds of applied research and development that yield useful new products. Yet the inevitable pressure on companies to generate profits and maximize shareholder value may deter them from investing heavily in R&D, particularly since these investments are often viewed as riskier than other investments.

While understandable, the reluctance of U.S. companies to invest more heavily in R&D is deeply troubling. If one looks at the personal computer industry, for instance, much of the foundational work for the industry was done in the private sector, at venerable institutions such as Bell Labs and Xerox PARC. Companies today, however, often seem less willing to invest heavily in R&D—or at least seem to focus most of their spending on development and relatively little on true research.

If the United States is to remain a leading innovation economy, U.S. industry must invest more in R&D. To spur this needed investment, Congress should reinstitute the R&D tax credit, which expired last year, and make that tax credit permanent. Doing so would help convince American businesses that longer-term R&D investments—especially those that might take years before they generate any profits—are worthwhile.

I appreciate the importance of such R&D incentives through my work at Microsoft. Last year, Microsoft invested over $7 billion in R&D. The R&D tax credit provides an important incentive to encourage Microsoft—like thousands of other U.S. companies—to increase our R&D investment in the United States. The credit is a positive stimulus to U.S. investment, innovation, wage growth, consumption, and exports—all contributing to a stronger economy and a higher standard of living. As other countries recognize the long-term value of private-sector R&D and offer permanent and generous incentives to attract R&D projects, it is vital that the United States renews its commitment to U.S.-based R&D by enacting a seamless, permanent R&D tax credit.

Conclusion

I believe this country stands at a crossroads. For decades, innovation has been the engine of prosperity in this country. Now, economic progress depends more than ever on innovation. And the potential for technology innovation to improve lives has never been greater. If we do not implement policies like those I have outlined today, the center of progress will shift to other nations that are more committed to the pursuit of technical excellence. If we make the right choices, the United States can remain the global innovation leader that it is today.

These four policy prescriptions—strengthening educational opportunities, revamping immigration rules for highly skilled workers, increasing federal funding for basic scientific research, and providing incentives for private-sector R&D—should in my

[21] Task Force on the Future of American Innovation, *Measuring the Moment: Innovation, National Security, and Economic Competitiveness,* at 9 (2006), available at *http://futureofinnovation.org/PDF/BII-FINAL-HighRes-11-14-06_nocover.pdf*

view be top priorities as Congress and the Administration consider how to maintain the Nation's leadership in science, technology, and innovation.

I want to conclude by again congratulating this committee on its 50th anniversary and commending the Committee for its tremendous efforts to advance the state of science and technology innovation in America. I am convinced that the U.S. IT industry—like many other innovative American industries—would not be the global leader it is today without the initiatives this committee helped design and implement.

Thank you for the opportunity to share my perspective on these issues with you this morning. I'd be happy to respond to any questions you may have on these topics.

BIOGRAPHY OF WILLIAM H. GATES

William (Bill) H. Gates is Chairman of Microsoft Corporation, the worldwide leader in software, services and solutions that help people and businesses realize their full potential. Microsoft had revenues of $51.12 billion for the fiscal year ending June 2007, and employs more than 78,000 people in 105 countries and regions.

On June 15, 2006, Microsoft announced that effective July 2008 Gates will transition out of a day-to-day role in the company to spend more time on his global health and education work at the Bill & Melinda Gates Foundation. After July 2008, Gates will continue to serve as Microsoft's Chairman and an advisor on key development projects. The two-year transition process is to ensure that there is a smooth and orderly transfer of Gates' daily responsibilities. Effective June 2006, Ray Ozzie has assumed Gates' previous title as Chief Software Architect and is working side by side with Gates on all technical architecture and product oversight responsibilities at Microsoft. Craig Mundie has assumed the new title of Chief Research and Strategy Officer at Microsoft and is working closely with Gates to assume his responsibility for the company's research and incubation efforts.

Born on October 28, 1955, Gates grew up in Seattle with his two sisters. Their father, William H. Gates II, is a Seattle attorney. Their late mother, Mary Gates, was a school teacher, University of Washington regent, and Chairwoman of United Way International.

Gates attended public elementary school and the private Lakeside School. There, he discovered his interest in software and began programming computers at age 13.

In 1973, Gates entered Harvard University as a freshman, where he lived down the hall from Steve Ballmer, now Microsoft's Chief Executive Officer. While at Harvard, Gates developed a version of the programming language BASIC for the first microcomputer—the MITS Altair.

In his junior year, Gates left Harvard to devote his energies to Microsoft, a company he had begun in 1975 with his childhood friend Paul Allen. Guided by a belief that the computer would be a valuable tool on every office desktop and in every home, they began developing software for personal computers. Gates' foresight and his vision for personal computing have been central to the success of Microsoft and the software industry.

Under Gates' leadership, Microsoft's mission has been to continually advance and improve software technology, and to make it easier, more cost-effective and more enjoyable for people to use computers. The company is committed to a long-term view, reflected in its investment of approximately $7.1 billion on research and development in the 2007 fiscal year.

In 1999, Gates wrote *Business @ the Speed of Thought,* a book that shows how computer technology can solve business problems in fundamentally new ways. The book was published in 25 languages and is available in more than 60 countries. *Business @ the Speed of Thought* has received wide critical acclaim, and was listed on the best-seller lists of the *New York Times, USA Today,* the *Wall Street Journal* and Amazon.com. Gates' previous book, *The Road Ahead,* published in 1995, held the No. 1 spot on the *New York Times'* bestseller list for seven weeks.

Gates has donated the proceeds of both books to non-profit organizations that support the use of technology in education and skills development.

In addition to his love of computers and software, Gates founded Corbis, which is developing one of the world's largest resources of visual information—a comprehensive digital archive of art and photography from public and private collections around the globe. He is also a member of the board of directors of Berkshire Hathaway Inc., which invests in companies engaged in diverse business activities.

Philanthropy is also important to Gates. He and his wife, Melinda, have endowed a foundation with more than $28.8 billion (as of January 2005) to support philanthropic initiatives in the areas of global health and learning, with the hope that in the 21st century, advances in these critical areas will be available for all people.

The Bill and Melinda Gates Foundation has committed more than $3.6 billion to organizations working in global health; more than $2 billion to improve learning opportunities, including the Gates Library Initiative to bring computers, Internet access and training to public libraries in low-income communities in the United States and Canada; more than $477 million to community projects in the Pacific Northwest; and more than $488 million to special projects and annual giving campaigns.

Gates was married on Jan. 1, 1994, to Melinda French Gates. They have three children. Gates is an avid reader, and enjoys playing golf and bridge.

DISCUSSION

Chairman GORDON. Thank you, Mr. Gates, and I now yield myself five minutes. I went the other day to a roll-out with OECD on a report called the PISA report on education 15-year-olds and mainly the EU countries and the United States. As usual, we do very poorly there. And I was trying to find some common denominators. Really, it was Finland that almost overhauled their whole education system a few years ago which has also overhauled their whole standard of living and improved it on a national basis. And I was trying to get common denominators, you know, what are the things they do; and they really emphasized that they want to have national standards but they want to have a contract in essence with the students, the parents, and the student to work in whatever is the best way to get there. So it wasn't just one common road.

Let me say to those folks, I know there were a lot of people who couldn't get in today, and Mr. Gates shortened his testimony, but his full testimony is going to be on our website, *www.science.house.gov,* which is an award-winning website. You can find links to a lot of other things. But I think that it really will be beneficial if you want to read his full scholarly work. You will learn a lot more than what was just said here.

Now, in your statement, when you talked about secondary education, you talked about transparency, you talked about having student performance data as formation of measures for impact and making decisions and also developing that national scope. I want to see if you can help me get through this is that our teachers now are concerned that they have these national tests, that they are having to teach to the test and other things are falling off the table. From what you have seen and studied and around the world, how do we best combine those standards so you can measure teachers, students, and their success versus the problem of just teaching to the test?

Mr. GATES. The tests largely are about fundamental skills, math skills and reading skills, and these are exactly the qualifications that employers are interested in people having. And if you look at the other nations that do well on PISA, they are very serious about viewing tests as the metric and then looking at individual teachers, at schools, at systems based on how those test results are coming about.

The United States in PISA were among the best at the fourth-grade level, and were in the middle at the eighth-grade. It is only by senior year that we drop to the bottom of those results. And so clearly in the high school period, there is some level of rigor that exists in these other nations' systems that isn't as strong in our systems, the background of the teachers, and comparing tech-

niques. And so we would say that data that looks at these results and learning from that data is of great importance. In fact, there is funding for these data systems that are part of the America COMPETES. You know, we are gathering more data as a country. That is a great thing. Now, there is a tendency when that data doesn't come out well to say, okay, whose problem is it and even a temptation to say, if the data are so bad, let us stop testing because it is really depressing to keep looking at these numbers. In fact, the amount of investment required to fix those numbers is very high, and it is a tough problem. Where do you get at the local, State, and federal level the resources to do those things? But you know, I don't think that reducing the availability of the data and understanding that data really is the right way to go.

Chairman GORDON. When you mentioned depressing, I think what is most depressing about that is our students in the elementary level come out pretty well. Then at the middle school, not quite as well, and then it starts to fall off the table in high school. I think what we are talking about is not trying to produce a lot of elite Ph.D.s but rather those folks, whether high school graduate or junior college or college graduate that can work at that higher technological level, and as we looked into it, what we found was that on the middle school level, 63 percent of the math teachers have neither a certification to teach math or do they have a degree in it. Ninety-three percent of the physical science teachers have neither certification nor degree. So it is hard to be able to teach something that you don't have that core background, as good a teacher as you might be. And that is one of the things we want to try to do in COMPETES. I am from Tennessee, the home of country music, and we say that the song all starts with the words, and I think school all starts with teachers and we are going to try to get better educated teachers.

As I looked over your resume, I got a little bit of a head start but we are somewhat contemporaries in terms of age, and you think of Bill Gates as sort of a measuring stick not too many people measure up too well. So I was trying to look at common measures here. I noticed that you are a billionaire, and I am not. I noticed that I am a college graduate, and you are not. But I also noticed that we both have seven-year-old daughters, and I suspect you are a little bit obsessed as I am in making sure that she gets the best education so that she can be able to compete in, as we were growing up sort of a national world but very much an international world now. This is a little personal question that I suspect other folks would like to know. Outside of good schools, good parenting, in terms of hardware and software, what are those items now that you would recommend for us that want to help our seven-year-olds and older children to be able to adapt to this new technology in this new world?

Mr. GATES. In some ways, I envy kids who are growing up today to the degree they are encouraged and get a chance to use the new tools. The ability to pursue your curiosity is really phenomenal today, and when I was growing up, you know, the best you could do was read the World Book alphabetical, which was not very enticing. Today, if you have access to the Internet online, which either at home or through local libraries through a program that

Microsoft and my foundation was very involved in, most kids do have some way of getting access. The breadth of information is out there, whether it is things like Wikipedia, Encarta, and now the greatest teachers being videotaped, and so you can go off and watch courses. Even as an adult now I can go up and I just watched an MIT course that was quite phenomenal in terms of updating me on some science advances. So my kids are out on the Internet, and my son and daughters often ask questions that my answer is, hey, let us go study that and learn about the stars or whatever it is they are curious about, whereas when I grew up my parents had to say they didn't know the answer and it wasn't easily at hand.

So there is a huge advantage in having the Internet widely accessible that people should take advantage of.

Chairman GORDON. And I think we have to recognize if we don't, somebody else is somewhere else.

Mr. GATES. That's right. This is a global tool. It is good and absolute that they are able to educate people as well. We always have to think there is, you know, improving the whole pool of the world's knowledge and innovation and then making sure the United States gets its share of it. But those are both valuable things, and I would say the one that is most at risk is our relative share.

Chairman GORDON. Which means first to market, and that is R&D. Thank you, Mr. Gates. Mr. Hall is recognized.

Mr. HALL. Thank you, Mr. Chairman. Mr. Gates, you mentioned engineers, and with China and India graduating record numbers of engineers with skills, I guess the question I really want to ask is what skills are going to be required by the future U.S. science and engineering workforce in order for them to compete with foreign scientists and engineers? And in asking that, I have to ask you how you recommend we change our education system, if you do so recommend, to produce graduates with the skills necessary to fit the new competitive environment and the evolving needs of industry. And my final question on that is whether or not Microsoft employs scientists and engineers from foreign universities, primarily China or India, and if so, what is the quality of these engineers versus those graduated in the United States. And you can take any or all of those or none of them.

Mr. GATES. The United States' preeminence today is still very, very strong, that is, if you in science and engineering looked at what are the top 20 universities in the world, anywhere from 15 to 19 of those, people would probably agree are U.S. universities. So the quality of our top schools and their engineering and computer science departments is very, very high. Now, over time, other countries see that, and they are trying to match that. You know, in China there is one university, Ching Wa, that is nearly as good as the best U.S. universities. But still, if you look at the raw number of engineers being graduated, that would overstate the current status. For the very top engineers, the U.S. universities still have the strong position. But as I have said, the majority of the students in the computer science department, are foreign-born. And so we educate them. We provide the world's very best education and the research, funding, and various things are a major factor there; and then those are the students who are not allowed to stay and work

in the country because of the limits we have, and that is where we create jobs around them. So the U.S. universities are still the best, and the kind of funding that the government has provided really is a huge part of that.

Also, the ability of the U.S. universities to work in collaboration with business. That is a practice, whether it is information technology or biology, the United States has been a leader in. The *Bayh-Dole Act* that incentivizes universities to get their research out into the marketplace, that has been a fantastic thing that has given these university-business collaborations. And so, the preference of a company like Microsoft is very much to take these graduates of U.S. institutions and hire them and employ them here in the United States because all of the complementary jobs, management, testing, the various things, we can find the best candidates here in the country, but unfortunately, the jobs are going to go where the engineering talent is, and the other jobs around it will follow where that engineering talent is.

In terms of improving the high schools, both Microsoft and my foundation have been involved in this. There are a number of new high schools that have as a theme science and technology to kind of have projects to get kids enthused about those topics. Overall we see the numbers dropping and the numbers of women and minorities are also very low in these fields, despite a lot of good effort that is being put into that. So we think it is at the high school level that you can develop a fascination and understanding of these topics to make them far more engaging. And we are seeing good results in a number of these schools which are mostly charter schools but taking a different approach to education. We think we can get a lot more people to stay in science and technology.

Mr. HALL. And then in quality we are there but in quantity we are not?

Mr. GATES. Well, if the quality is the quality of the graduates of our top universities, we are number one by a lot still. If you take the broader picture of the quality of all our high school graduates, that is where this PISA study comes in and says that broad number, the United States does not measure up very well. But the people who get the best public school education and some of the people who get a private school education, those people go into these top universities, you know, about 40 percent of the computer science departments are U.S.-born students, and they come out and they are the best. They are the most attractive. Those graduates are the most attractive.

So we have a piece that absolutely is still the best.

Mr. HALL. And if we educate them, we ought to try to keep them?

Mr. GATES. Absolutely. All of those people graduating from these top universities are going to get job offers of high-paying jobs in many, many different countries. So they have a choice where they end up being employed.

Mr. HALL. Well, we have not done too well with our immigration situation in general, so we will try to do a little better with the quality of our education.

I yield back. Thank you.

Chairman GORDON. Thank you, Mr. Hall. Our university system was or is the magnet for the best and brightest around the world. They would come in and besides our home grown, we would bring in the best for that innovation and jobs were created. Unfortunately, we are not quite the magnet—there are alternatives now, and hopefully we can get back to bringing the best and brightest and keeping them and helping them to produce jobs in this country.

Mr. Baird, the Chairman of our subcommittee that oversees the National Science Foundation is recognized.

Mr. BAIRD. Thank you, Mr. Chairman. Mr. Gates, thank you for your comments. I just want to follow up on two issues. One, thank you for your recognition of the Chairman's *America COMPETES Act*. I want you to know that that will set a budget today that allows for precisely the kind of expansion that you have called for. The Democratic budget allows for a substantial expansion for science and math research and education, and we hope our friends on the appropriations side can support that effort as well.

I also share your concern about how difficult it can be to bring international scholars here for either work or education purposes to the extent that our Research and Education Subcommittee can. We have already had two hearings on this general topic, and we will do everything we can to try to facilitate that arrival of scholars and the retention of scholars who have trained here.

Given your technical expertise, I would like to ask you a broad question about a technical issue. One of the great merits of technology is that it changes so fast that it brings us better and better things, but it also creates a problem with legacy information, and I am particularly interested in the issue of Open XML and the broader question about standards and your belief about how things like Open XML and international standards for the Internet, the pros and cons of those, and where you see those heading.

Mr. GATES. Well, thank you. That is an important area because we are building up more and more records that you want to be able to access and understand, and you want to be able to preserve those records over a period of time. In fact, these digital archives will cover a lot of people's activities, and you know, parents will be able to go back and get essays from children, or researchers will be able to go back and get the data from different experiments; and even libraries, a lot of their collections will be in this digital format, and you will want to be able to access that.

Microsoft is very engaged in the standards process. There is a new standard that we put in front of the International Standards Organization called Open XML, and it uses XML in a way that means that anybody using our software or other software that meets the standard will be able to access it out into the future. So it is very important to us that Open XML become an ISO standard so that families and researchers and archivists world-wide will be able to access information from the past and use it to interact in the future. And it is by mining data like this that I think a lot of the advances in understanding how education is best done or understanding what should be done in the medical field, so it is both an important thing for innovation and an important thing for citizens to have access to information.

Mr. BAIRD. I appreciate that. I actually have believe it or not some old five and one-half-inch floppy disks in the CPM format which if I ever achieve anything of note some poor librarian is going to have to go and find an old CPM machine and dig out my great works from back then, which will not be hard because there will be very few. But I think your point is well-taken, and I applaud Microsoft for its leadership in this area and the whole issue of standards.

One of the issues on H–1B is I want to particularly want to compliment your company on is I hear from constituents, hey, wait a second, why are we doing more to let folks internationally train, either stay or come into our country. Shouldn't we be doing more to educate our own people? Microsoft has really been a leader of that. Schools throughout this country have benefited from Microsoft's leadership. One of the thoughts that I have kicked around a little bit, is there a way we should—I know there is a small fee for an H–1B visa, and that goes back to the education system. But is there a way we should actually ask companies to put maybe a little more skin in the game if you will through internships or other things? In other words, if you are applying for an H–1B position to come to your company, then your company must demonstrate—not yours per se but one's company because you have already done it, but many companies I don't think have followed the example of Microsoft. What are the pros and cons of that and how might we do that?

Mr. GATES. Well, certainly the importance of being able to retain and hire these world top engineers is super-important, and the fact that there is this limit, you know, I can't overstate the impact that has not only on the decision on the people who are educated here to stay here, but also on their decision to even come to the United States in the first place. You know, if you want to say, "Okay, how do we compete with Asian countries?" The fact that their smartest people often want to come here has been a huge advantage to us and in a sense, we are kind of throwing that away. You know, to be honest, if there was a way that we could get the freedom to hire these people that set a threshold for the companies involved to be concretely be involved in giving back to education, you know, I think that would be acceptable as long as it is concrete and it really solves the problem that we are all facing here. I think that even without that though it is a total win-win situation for the economy and job creation to not force these people to be employed outside the United States. We actually, partly because of the current immigration policies, created an office up in Vancouver, Canada, because that government, like virtually every government other than the United States, recognizes that competing for talent and encouraging talent, particularly talent educated in a country, getting them to stay, that that is very, very important. And so just, you know, across the border you have quite a contrast in terms of how high-skilled workers are treated.

Mr. BAIRD. I appreciate that. I think the hard part and we need to impress upon this Congress and the Administration, is the urgency of this matter for our competitiveness. Thank you.

Chairman GORDON. Thank you, Dr. Baird. Mr. Rohrabacher, I am not picking on you, but I want to remind our Members that Mr.

Hall and I agreed that Mr. Gates can leave at 12:00. So we are going to try to keep everybody to five minutes. Again, not picking on you, so I recognize you——

Mr. ROHRABACHER. I noticed the rule was just employed at this moment.

Mr. GATES. I will try to be more succinct.

Mr. ROHRABACHER. Thank you very much, and again, thank you for coming here to help us celebrate this 50th anniversary. I have been on this committee 20 years and been a very proud Member of this committee for 20 years, and this is the most bipartisan committee that you will find in the United States Congress, although I am not the most bipartisan guy that you will meet in the United States Congress.

A couple things that I have learned over these last 20 years is that when the fundamentals of the economics of a solution are wrong, sort of like programming a computer, if the fundamental programming is wrong, in the end there is going to be problems. You have to go to the fundamentals. And just to be frank, I think some of the things you are suggesting are not going to the fundamentals but instead I think they are going way after the programming problems. For example, in education, let me note that the hearings we had on education were very enlightening for me, but what I learned seemed to be different than what my other members learned and that was that math and engineering and science teachers have no difference in pay in our public education schools than do basket weaving and English literature teachers. Do you believe that we need to pay our science and mathematics teachers more money in order to attract higher quality people to be science and mathematics teachers?

Mr. GATES. I definitely think that you want to set high standards and those standards should be based on how well you do for the students, which we need to come up with ways of measuring that that people view as very, very reliable.

Mr. ROHRABACHER. Because I have only got five minutes, I may, if I can, just go directly to the issue. Should science and math teachers be paid more than other teachers in order to attract higher quality people in a public education to those parts of the education system?

Mr. GATES. If you are measuring these teachers' ability to really improve the students' capabilities and selecting for those people who do it, you will find that there is a supply shortage, and because of that supply shortage, you will probably have to pay this group somewhat more. And there are various experimental——

Mr. ROHRABACHER. So you do believe that if you pay more money, you actually will attract more people to a profession and get more of it?

Mr. GATES. If you tie it to an ability to really look at the improvement that they drive. The effect is——

Mr. ROHRABACHER. Well, also if you improve the basket weaver teachers, it is less important than if we improve the science and mathematics. Now, let us relate that directly to the other issue that you brought up today which is immigration. Let me just note that if we bring in more people from the outside, realizing that we are bringing the most talented people from other countries, will it

not hurt those countries and will it also not depress the wages in our own country that people like yourself would have to pay your employees in order to get quality people or in order to train people within the society of our own society?

Mr. GATES. No.

Mr. ROHRABACHER. It wouldn't? Okay.

Mr. GATES. These top people are going to be hired. It is just a question of what country they do their work in.

Mr. ROHRABACHER. We are really not talking about top people here. You know, the bottom line——

Mr. GATES. These salaries are not——

Mr. ROHRABACHER.—line is there is a lot of other people in this society rather than just the top people. It is the B and C students that fight for our country and kept it free so that people like yourself would have the opportunity that you have had. Those people, whether or not they get displaced by the top people from another country is not our goal. Our goal isn't to replace the job of the B students with A students from India——

Mr. GATES. That is right.

Mr. ROHRABACHER.—and the B students deserve to have good jobs and high-paying jobs.

Mr. GATES. That is right, and what I have said here is that when we bring in these world-class engineers, we create jobs around them. And if we don't—the B and C students are the ones who get those jobs around these top engineers. And if these top engineers are forced to work, say, in India, we will hire the B and C students from India to work around them.

Mr. ROHRABACHER. But according to *Business Week,* we have over 150,000 computer programmers have lost their job in this country since the year 2000. Now, my reading of all of this is that there are plenty of people out there to hire but people want to have the top quality people from India and China and elsewhere and they are willing to let these 150,000 American computer programmers just go unemployed.

Mr. GATES. Actually, *Business Week* doesn't do surveys. I think you are referring to a quote in *Business Week* from an Urban Institute study——

Mr. ROHRABACHER. That is what I said, according to *Business Week.*

Mr. GATES. Well, they quote. It is not according to *Business Week.*

Mr. ROHRABACHER. Okay.

Mr. GATES. There was a study that a group at Urban Institute did——

Mr. ROHRABACHER. Okay.

Mr. GATES.—that was deeply flawed in terms of how it defined what an engineer is. When we say that these jobs are going begging, we are in business every day. We are not kidding about it. These jobs are going begging, and the result is that in a competitive economy——

Mr. ROHRABACHER. You would have to raise wages.

Mr. GATES. No, no, we just——

Mr. ROHRABACHER. It is like every time the jobs are going begging, you raise wages. Now, in a——

Mr. GATES. No, we——

Mr. ROHRABACHER. Okay.

Mr. GATES. It is not an issue of raising wages, these jobs are very, very, very high-paying jobs.

Mr. ROHRABACHER. Okay. There are a lot of——

Mr. GATES. We are hiring as many of these people as we can.

Mr. ROHRABACHER. Let me give you a one example——

Chairman GORDON. Mr. Rohrabacher, if I could.

Mr. ROHRABACHER. Yes.

Chairman GORDON. If you don't mind, we will finish this on the second round.

Mr. ROHRABACHER. I am one of the guys who helped Kosovo become independent, I am on the Foreign Relations Committee, having their hearing there. Maybe at the reception tonight which you are going to be at, maybe we can continue this discussion.

Chairman GORDON. I am sure he is excited to know you will be there. Thank you, Mr. Rohrabacher, and Ms. Giffords, one of our new Members from Arizona. And I will warn you, somehow she is going to work Arizona into her question. I don't know how it is going to be, but that is what will happen. Ms. Giffords is recognized.

Mr. HALL. And this witness won't forget Rohrabacher.

Ms. GIFFORDS. Thank you, Mr. Chairman. Thank you, Mr. Gates, for coming before our committee today.

The first question I have is one that I struggle with serving as a new Member on the Science Committee, a new Member coming from the great State of Arizona, about I hear my colleagues and I had a chance to face these portraits of former Chairmen. Several of the portraits that face me have images of the Shuttle program or the space program. I happen to be married to an astronaut which also makes NASA and the issue of the space race that we had with the Russians more relevant probably than most people. But even today's testimony when I hear the Chairman and also Ranking Member Hall talk about what it was like to look up into the sky and see Sputnik or to listen to the words of Neil Armstrong walking on the Moon, it moved people in a way that I don't think has any comparable type of experience in today's world.

I know what we did here as Americans was something unique, and I know that it generated a new generation of engineers and scientists and mathematicians, kids that were so inspired. So my question to you, Mr. Gates, is what today is comparable? I believe it is energy, but sometimes I don't see that transition going to kids in terms of kids being excited about solar technology, new ways of moving vehicles around, heating and cooling our homes; but you know, you have a chance to work with a lot of kids, you work in a lot of different countries. What is going to be that thing that is really going to make relevant a lot of the STEM education focus that we are talking about?

Mr. GATES. Well, I would think that the direct use of advanced technology and the chance to participate in making breakthroughs in those technologies is in some ways more evident today than ever in the past. You know, if we look at the frontiers of science that we have today, teaching computers to see, teaching them to hear, the kind of modeling of the world that is very important for all the

energy challenges we face or the kind of software that we need to make in health breakthroughs, you know, I think that it is more exciting even now that you can say here is what you are learning that will help you make an energy breakthrough. You know, you just look at one group. If you take blind people—historically, you only had access to a few books that many years after they were available they were put into Braille. Today because of speech synthesis and capabilities that we built into our software, blind people can browse the Internet and have the same access to information that you have. And to me, you know, there are just dozens of examples like that where technologies empower people to work in new ways, and in some ways it is less abstract even than going to the Moon. You can go and meet those people and talk about how their life was changed. Or you can look at diseases that we haven't yet conquered and see what impact that is having, and clearly by advances in biology and information technology are absolutely the reason why we can be optimistic that in the next generation whether it is the diseases of the poor countries or the diseases that are prevalent here, we are very likely to have breakthroughs for virtually all of those things.

Now given that I think there are so many reasons that that would draw people into science, I have to admit it is a surprise to me how few students choose to pursue the fields.

Ms. GIFFORDS. To follow up, Mr. Chairman, Mr. Gates, the high-tech industry in my State of Arizona depends a lot on our ability to recruit and train scientists and mathematicians. In terms of exports in the high-tech field, it totaled about almost $9 billion in 2006 which was an increase of almost $2 billion from 2005. We have a lot of high-tech clusters, particularly in southern Arizona; and you know, I am personally working on the H–1B visa reform because I think that is really the key. I think the University of Arizona, Arizona State University, Northern Arizona University, we are not producing those students. So I ask you because you mentioned in your earlier testimony, aggressively, what can our country do to compete with other specific nations around the world to make sure that we can retain these students who want to come here, who are the best and the brightest from wherever they come from, and have them be part of this work that we are dedicating ourselves to?

Mr. GATES. Well, there are some things in terms of the process that they go through and the uncertainties of the process that are daunting to them, but at the end of the day, by far, the key thing right now they are being told they cannot stay and work here, that is, the backlog on green cards is longer than ever, the H–1B visa thing was by far the worst this year where in the first day they were all gone. So anybody who graduated in June couldn't even be part of the process because they didn't have their degree and you have to have your degree to get into the pool. I will say that this is an issue that the technology industry has a very strong consensus, very clear message on. So if you take an employer like Intel who is very present in Arizona, they depend at the top of their research activity on having the very best scientists. And they are a very good example like Microsoft where if they get those, they create the manufacturing plants and things that reach out and drive

fairly substantial numbers that it is easier for them to cite those activities here in the United States.

Chairman GORDON. Thank you, Ms. Giffords. And now our resident physicist, Dr. Vern Ehlers is recognized.

Mr. EHLERS. Thank you, Mr. Chairman. Also I would just like to comment. Don't feel too sorry for Arizona. Most of the wealthy people in Michigan have moved down to Arizona, and clearly we need more help than they do.

First of all, before I get into my questions, I want to thank you for more or less loaning Ms. Stonesifer to the Smithsonian Board. She has done yeoman work. You know we have had some problems there, and she has done more than any other person that I know of in trying to straighten out this problem. She is a real gem. I was very sorry to hear that she is leaving here for the Foundation. But she is just a marvelous person, and I am sure she has served you well there, too.

I spent most of my life in education. I spent a great deal of my life, over 40 years now, trying to improve math and science education in this country, both before I got here and after I got here. And I very much appreciate your comments about scientists and engineers serving as role models. In all my speeches to scientific and engineering groups I encourage them to visit their nearest school, volunteer to speak to the classes, even better, volunteer to take students on a field trip through their own laboratories, their workplace, or if they are civil engineers, the nearest bridge they are building, things like that.

A hundred years ago, students learned these things on the farm. Today they come to school without a lot of practical experience, and your comments were right on. The more we can get the engineering and scientific communities to interact with the students the better. I always enjoy it when I am invited to speak to high schools. Most of the students don't know much about my background. When I tell them I am a nerd, there is some disbelief there until I show them my plastic pocket protector, but I also tell them that in high school they have a very important choice to make and that choice will determine whether they some day will be a nerd in the workplace or working for a nerd. And they have to make the choice between being one or working for one. That really just tends to wake them up a bit to why they should study science in high school.

I totally agree with the comments you have made, and I hope that through your foundation, and you do marvelous work in your foundation, that through your foundation we can work together on this problem in our elementary and secondary schools. Your comments were right on about PISA and what happens there. Somehow we have to get the picture changed in America. I find it fascinating, for example, that in surveys of parents, parents will say, "Yes, we need better math and science in the schools." When you ask them about their school that their kids are in, they say, "Oh, our school is fine." They just don't recognize the depth of the problem. And I would appreciate any comments you might have about how we can do a better job of waking up America, both the parents and the school boards. The teachers in my experience, and I have worked with a lot of teachers, I never blame them. They have not had the proper education in science or math and have not been

taught how to teach it properly, but they are very eager to do it and very eager to do it well. So here I have concentrated my efforts on professional development programs. I would be interested in ideas you might have about other ways that either business and government together or just government can actively get involved with this problem and helping the teachers in meaningful ways to help them become better math and science teachers.

Mr. GATES. I think the most stunning data I have seen in many years related to education are how the huge difference in the very best teachers versus the teachers who don't do as well, and the willingness to look at that data and say, okay, what is it that those teachers were doing very well, you know, what techniques are they practicing versus the other students, and some of the assumption that, you know, about okay, it is the ones that are certified are going to do better or the ones that have been there a long time. Some of those, as you really get into the data, you know, some of those assumptions don't play out and you really look, okay, what are those differences.

So I think gathering the data and really looking at who is doing well and seeing that students who are far behind, if they are lucky enough to have good teachers, they can be brought all the way up to be well-above average. The difference of having a good teacher is very, very dramatic, and yet, in terms of figuring out what those things are and investing in them and using data to drive that, I would say we are way behind other countries in being able to do that.

One other comment about Patty Stonesifer, and I appreciate your comment, she has done a fantastic job with the Foundation. Fortunately she will stay involved in some special initiatives, although she will step down after 11 years of being CEO, but we'll still have some of her efforts on that.

Mr. EHLERS. And I appreciate that, and I certainly hope your foundation will continue its efforts in math and science education as well because government is by its very nature limited in what it can do. It can't coerce, it can entice. Foundations can do a much better job of coercion.

Mr. GATES. Our biggest partnerships have been where you get one person who is really taking responsibility for improving the education system like the Mayor of New York said, okay, he will base his record on that or the Mayor of Chicago where you have a clear level of responsibility that the right tradeoffs are being made. Those are some of the systems where the willingness to make tough changes is taking place, and we are seeing very, very good results in that type of structure.

Chairman GORDON. Thank you. Dr. McNerney is recognized for five minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman. You will be glad to know that your Members are getting exercise this morning running back and forth.

Thank you, Mr. Gates, for appearing this morning. I want to say that I appreciate your innovation, its effect on our nation and the world and your generosity both with education and with health. One of the things I really am concerned about how to inspire the next generation. What do you think the feds should do? I mean,

some earlier Members talked about the Russian satellite and Ms. Giffords asked about the next big thing. What do you think we can do as a fed to actually inspire kids to take advantage of what education is being offered?

Mr. GATES. I think with regard to the kids is to have teachers who, you know, have proven that they can make the subject engaging. You know, that is where you see the big difference, you know, does the subject really come to life in a very strong way. As you get up to our university systems, there the right things are happening, that is, these universities compete for talent vigorously with each other, they compete for federal research funding, they compete for students; and that is why the vibrancy of these top universities has really been incredible and such a big asset.

You don't have—in terms of measurement and that kind of competition, you don't have it in other levels of the system. And you know, so one of the tools that has been used in many states is charter type approaches where you can experiment and give teachers some more freedom in terms of how they do things and try out new approaches, and you know, that is really a lot of where the innovation is coming from, is those new types of schools. Still, I am amazed at how the numbers of science and engineering are going down, and that is not true in Asia. The numbers are going up in Asia, and they are going down everywhere else. There is no rich country, assuming you take Korea out of the picture that—Europe and the U.S. are experiencing the same phenomena of less and less students going into science and technology. So there is no simple government—given the variety of policies that are used, there is no simple policy thing that explains that decline.

Mr. MCNERNEY. I think there has to be some sort of social transformation in terms of the way we view engineering and science. Anything you can do to help us inspire that generation would be very deeply appreciated. I am especially interested in your foundation's work to establish STEM education at the secondary level. Could you describe the curricula at these schools, in particular, what subjects the STEM differs from normal schools?

Mr. GATES. Yeah, there are two things there. One is to take curriculum in normal schools and try and make it more approachable, and the other is then to actually have specific schools that are designed from the beginning to have STEM excellence. So there are a number of things. There is a program in Ohio, a program in Texas, a lot of these charter schools in different cities where they really thematically decide that they are going to bring the students into science by using projects and that the traditional boundaries of biology is different than chemistry is different than math, that they break across those boundaries to take some project activity to make it clear to the student why they should learn a little bit of math or a little bit of chemistry or biology to be able to achieve something very interesting. And in the best of these schools, the number of kids including women and minorities who show an interest in math and science, is more than double what we have in the traditional public schools. So there is some good data that says by changing the curriculum, you can start to take the drop-off in interest which is very pronounced at the high-school level and stem that to some degree. Now, there is further drop-off when you get up into

the university, and there are some universities where we are looking at how they do the curriculum, and I would say it is the same theme. It is more project-based and cutting across the boundaries that have existed between the different science subject areas.

Mr. MCNERNEY. Thank you. I yield back.

Chairman GORDON. Thank you, Dr. McNerney. And now we turn to Dr. Bartlett. You are recognized for five minutes.

Mr. BARTLETT. Thank you very much. In the education area, our society faces two huge challenges which you mention. One is the quality of education in our K through 12. As you know, our third-graders score about even with third-graders around the industrialized world, but the longer kids stay in our schools, the poorer they do. And so when they graduate from high school, they are at the bottom or near the bottom of any industrialized nation. And the other huge challenge we face is the challenge of getting more of our best and brightest to go into careers in science, math, and engineering. Increasingly as I talk to audiences and ask our kids what degrees they are going to pursue, they are pursuing what I tell them are potentially destructive pursuits. They are becoming lawyers and political scientists. We have got enough of both of each of those, thank you. I think, sir, that both of these maladies are the symptoms of a common disease, and that is that as a society gets what it appreciates. Our society just does not appreciate academic achievement, and as a society, we do not appreciate scientists, mathematicians, and engineers. I will believe that this culture is changing, and it needs to change, sir. Despite of the best efforts of organizations like yours, the culture really needs to change, and I will believe it is changing when the White House invites academic achievers and scientists, mathematicians, and engineers and slobbers all over them the way they do entertainers and sports figures. What can we do, sir, to change the culture out there?

Mr. GATES. I still think there is a strong element in the culture of this country that is very positive towards science and innovators. You know, if you look at the interest in Steve Jobs, the work he has done or the work that the guys creating Google have done or the work that I and my colleagues have done. There is a fascination with science and engineering, and you know, certainly the opportunities are pretty vivid. You know, even young people get a chance to play around with a Windows PC or the different technology advances that have been created. So I am not sure that we fail on that front. Yet somehow along the way, particularly for women and minorities, these science jobs just don't seem as interesting. And there is a lot of outreach we do to bring kids in and show them, you know, that these are very social jobs, they are very interesting jobs that the next several decades will be the most interesting. So there is a component of it even knowing that the curriculum should be a lot better. There is a component of it that is surprising to me. And we did see that during the late '90s we had an increase of people going in what some people call the Internet bubble, and then as that went away, the number of applicants went down quite a bit. If we smooth it out and ignore that bulge there, there is a decline that has continued. But if you look at the figures going only back to 2001, you get an even worse impression because there was an uptick right before that and then that

dropped off a bit. You know, maybe some of all the bright minds that are going into finance will now go into science and engineering with, you know, their bubble perhaps not being as big as it was in the past.

There is an element of this that I do find, you know, mysterious because I do think our culture still values innovation. Every student understands about the potential for breakthroughs in health and breakthroughs in energy and breakthroughs in information technology, and so, you know, it is surprising that these departments are not overcrowded.

Mr. BARTLETT. You mentioned half or more in all of these departments are foreign-born students.

Mr. GATES. That is right. If anything, the departments go overboard to try and keep that number low, but as they are bringing in the very best students, they end up with typically about 60 percent foreign-born in the top departments.

Mr. BARTLETT. During the decade that we spent putting a man on the moon, the imagination of the American people was captured and our young people were inspired to go into careers in science, math, and engineering. I remember a cartoon that showed a redheaded, freckled-faced, buck-toothed kid and he said six months ago he couldn't even spell engineer and now I are one. What do we need to do to capture the imagination of our people again to inspire our young people to go into those careers like then?

Mr. GATES. I think we need to celebrate the achievements that we have had. I mean, we are the envy of the world in terms of the science that has been done here. We are still far ahead. The relative share that we have is going down, but we are in a position of great strength. And the magic that we have had that other countries haven't achieved is a balance between private industry and the universities and funding basic research in the universities and then allowing the formation of companies, lots of which fail but some of which succeed spectacularly, to be well-rewarded, and well-thought of in this country. That idea of entrepreneurialism, starting new companies, having new venture capital, we are still the envy of the world. Having these incredible university departments that need NSF funding and various other government science-type funding to stay strong, you know, that is a magic formula that others are on the way to duplicating, but it is not something that can be done overnight.

And so if we renew our commitment to these things, whether it is research funding or the role models, letting the smartest people who want to come to this country continue to come here—there is no era in science where you would say that at least a third of what got done got done by foreign-born scientists from the creation of medical breakthroughs or the transistor or various things. Just think through in your mind who the great scientists are and you will realize in many cases, over half are foreign-born. So our willingness to let those scientists in has been an incredible thing. So I would say that one thing that is unique in this era is this idea that it is controversial to let smart people come to the country and stay and work here. That is really novel. There is no time in our history where we have been turning those people away.

Chairman GORDON. Thank you, Mr. Gates. Dr. Bartlett, your time has expired. Mr. Gates, for your information, this committee agrees with you in getting the bump in math and science in terms of minorities and women. We have passed a number of initiatives that do that. We want to continue, and that is the best way to grow I think new home grown. Ms. Richardson from California is recognized for five minutes.

Ms. RICHARDSON. Yes, thank you, Mr. Chairman. Good morning, Mr. Gates. I am in kind of a unique position in that I have only been in Congress about five months, so I am what they call a freshman, a newbie here. But I had an opportunity to work for Xerox Corporation for about 14 years, and I attribute a lot of the way I have been able to approach legislation to that. So I admire all the work that you have done.

I have a couple comments and one question. One, it is noted in our information here, your U.S. Libraries Program which I commend you for, however, I will tell you district I represent in California is Watts, Compton, Long Beach, some very challenging communities, and often times we have long waits in the library and all of that. And I would say that if we really want to reach out to all children, would you be interested in maybe considering expanding such a program to our parks? And the reason why I say that is a lot of kids tend to go to the library. They might be doing their homework or doing some research work, but if we want to encourage children to learn the innovative aspect side, the exciting side of science and engineering, I think that is really a missed opportunity, particularly in some of our under-served communities where you have some of these facilities and there is absolutely no resources there for children. So I wanted to get your thoughts on that.

Mr. GATES. You are saying the parks?

Ms. RICHARDSON. Yes, parks and recreation.

Mr. GATES. Well, I think we shouldn't miss any opportunity to expose kids to these things. What was done in the libraries, it is so impactful that the resources should be made available so that kids aren't waiting in line. Access to the Internet with a modern personal computer was added to one of the things you could think of having at the library. When Microsoft and the Foundation started that program, 25 percent of libraries had computers; and by the time we were done granting over 60,000 machines to 11,000 libraries, we got it up to over 95 percent. The goal is to make it so that any kid could go into the library and not have to wait too long. Funding for libraries and this kind of technologies often falls off the radar screen because libraries are locally funded, and even in that budget process, they don't get the attention that they deserve. That is a program that has had a huge effect.

There are things going on to expand it into other community centers like Boys and Girls Clubs, and you know, to the degree that you have got indoor facilities in the parks, that is another perfectly great place that you might have some of the equipment and the chance for people to get exposed. So I agree with you that we should be creative about finding the places where we can create the capacity there.

I also say, you know, Xerox traditionally did a lot of great research that Microsoft and many other companies benefited from that, and that is why things like R&D tax credits and things that encourage R&D have been great. You know, Xerox certainly did its fair share of great R&D contribution.

Ms. RICHARDSON. So, sir, I am just simply suggesting that as you go into your second career here that you consider the department of parks and recs as well.

Mr. GATES. Okay.

Ms. RICHARDSON. My second question to you is regarding scholarships. You know, there has been much effort of us saying for a student, for example, who decides to go into nursing or teaching, that we would consider having a program that would provide a full scholarship for those students. Have you had much thought about if we were to provide full scholarships to students who made a commitment to work in the science and engineering field or math, what would you think as a CEO and joining other CEOs to make a commitment to help fund such a program to provide full scholarships for students who would make a two-year, four-year, five-year, whatever commitment might be required to engage them to really take on these positions?

Mr. GATES. The Federal Government plays a very strong role in terms of helping students be able to afford going to universities. The Foundation also has a very significant program that is focused on minorities that funds both their undergraduate education and then their graduate education if they are in a number of these areas related to science, and today we have 14,000 students, all minority students, receiving those scholarships. So I do think when it comes to women and minorities that it is pretty important to have scholarship money available to increase the numbers and particularly if they saw more scholarship money in these fields, it might be the thing that would make the difference.

I would say overall that in terms of the total numbers in the field, it is partly the attractiveness of the field, you know, the motivation to go into the field. We also have to work on that. So scholarships I think can be helpful, but you know, I am not sure that alone would drive the kind of shift in attractiveness that we need to see here. I do think it can make a big difference in terms of the minority and women percentages in these fields.

Chairman GORDON. Thank you, Ms. Richardson, if it is——

Ms. RICHARDSON. If I could have a follow-up question?

Chairman GORDON. Certainly.

Ms. RICHARDSON. Sir, though, specifically what I am saying is it has been said that due to the visa situation, you know, corporations, you are spending money on recruitment costs, legal costs, administrative costs, et cetera. I would venture to say if corporations were willing to put that money into full scholarships to ensure that students who came out, they would have to have a commitment. It is very similar, for example, with the military and other positions. You know, yes, excitement is a part of it but pay is also another excitement; and I think if students had a guarantee that if I completed four years, got a degree, that I would be able to guarantee that I could get a job at X company. So I am not necessarily referring to just your foundation alone but your thoughts as a CEO. Do

you think other innovative companies would be interested in joining you in making a greater focus in that area?

Mr. GATES. Yeah, okay, but I think broadly, you can't help the number of people going into the field but anyone who graduates from the top universities with a computer science degree has five job offers. Now, the 60 percent that are foreign born can't accept their U.S. job offers. But there is just no shortage of jobs being offered to these top students in the field of computer science. They are, you know, highly, highly sought after. So I think in terms of aggregate numbers, the United States, to get its relative share, the big lever is not saying that the foreign-born students have to leave the country. As you get to the broader things, particularly minority and women, that is where I think some of these scholarship things can come in.

I don't think we have an issue where people get degrees in these fields and then they leave the field. So, you know, they would stay in the field so it is not like asking them to work in a rural area or you know, volunteer to be a teacher where you may need a commitment in order to make sure you are achieving your goal. People who are educated in these areas then once they graduate from college from these areas, they tend to stay in the areas. The drop-off is further down the line. Once we get them into the workforce, then we have no issue about them staying in the area.

Chairman GORDON. The gentlelady's time has expired. Ms. Biggert is recognized.

Ms. BIGGERT. Thank you, Mr. Chairman, and thank you, Mr. Gates, for being here because I agree with you on just about every point that you have made in your testimony, especially with respect to making the R&D tax credit permanent, strengthening the science, math, and technology education, and increasing the funds for basic research. I want to turn to just a little different issue.

Free trade agreements, such as NAFTA, have been the subject of much public debate as of late. Some Members of Congress, even some presidential candidates, believe that free trade agreements threaten U.S. jobs, domestic manufacturing, and U.S. competitiveness, and other Members believe that free trade agreements simply open foreign markets to U.S. goods and services by bringing down the tariff barriers on U.S. exports which leads to job creation, encourage companies to remain in the United States, and actually improve U.S. competitiveness. And just yesterday in the Chicago—Magazine the CEO of Caterpillar said curtailing U.S. free trade policies would be cataclysmically bad for the Nation's economy and would derail Caterpillar's ambitious sales outlook in the coming years.

So I would appreciate your opinion, how critical to job creation in our nation's competitiveness are free trade, free trade agreements, and the opening of foreign markets to the U.S. goods and services?

Mr. GATES. Microsoft is a gigantic net exporter, that is, we get the majority of our sales outside the United States, and we do the vast majority of all of our work inside the United States. And so the openness of markets is actually absolutely critical to us in terms of the people we employ. And we are expanding our employment in the United States at a very rapid rate. The only limit on

that is this supply of engineers. If the free trade system were not to continue to expand, then that would have a very serious effect on Microsoft and other businesses that are engaged in international trade. So you know, I am very concerned that people not think that free trade agreements on balance are a bad thing for this country. In my opinion, they are a very, very good thing for this country, and you know, I think we need to explain that to the voters because you know the biggest winner in the free trade system has been the United States and the companies that have been able to lead in having much bigger markets than ever before.

Ms. BIGGERT. Thank you. And then going back to the R&D tax credit, do you have any other ideas or suggestions for the private sector incentives to encourage research and development?

Mr. GATES. Well, economists have always known that companies have a hard time capturing the full benefit to society of the research work they have done, and so that is why some basic research needs to be funded by the government, that is why having a clear incentive system through patents where you are rewarded for the breakthroughs that you make, and some tax policies that give an extra incentive for doing research and development makes sense. And we see many countries putting big investments in making sure that this takes place.

Some of the trends in terms of research in the United States are a bit scary. We are still, compared to other countries, in the lead on this, and Microsoft is spending over $7 billion in R&D in the next year. We are one of the biggest R&D spenders, and we speak very openly about what a great investment that has been for us, even the risky research part of it and the way we have formed great relationships with the top universities so that we are helping to fund their work and to the degree they make breakthroughs, we are simply one way that they can make sure it gets out there.

Ms. BIGGERT. If I might ask then as far as you have mentioned the laws in your testimony and providing universities and other recipients federal funds, but I think that these laws have been very successful, except maybe not so much in the case of energy and energy technologies, and I wonder if you have any suggestions for us to help to move new advanced energy technologies out of the lab and into the market. Maybe your foundation will take up the issue of energy.

Mr. GATES. Well, the energy is a very exciting area, and there is starting to be a shift of a lot of bright people working on the energy field. There are some aspects of energy that you need that are so difficult and so long-term, you can't expect the private sector by itself to totally solve the problem. If you look at new approaches to nuclear, if you look at something like geothermal, some of these areas the private sector is not going to step in. We are in a fairly ironic situation right now with respect to the incentives. Many of the incentives are only short-term in nature. If you want big breakthroughs, the last thing you want is a short-term incentive. And so the way that some things are subsidized right now are probably not the most efficient use of dollars to cause these energy changes to take place, and that is a very urgent thing. I think we can get across the various possibilities of where a breakthrough can take

place. The United States can do a much better job spreading out the energy research dollars.

Ms. BIGGERT. Thank you. I yield back.

Chairman GORDON. The gentlelady's time has expired. Mr. Gates, one common denominator today has been talking about additional funding of R&D, so we are going to let you have a chance to talk directly with one of the check writers now, Mr. Rothman, a Member of the Appropriations Committee from New Jersey is recognized for five minutes.

Mr. ROTHMAN. Fortunately, it is not a personal checkbook. Those projects wouldn't go very far. I happen to serve on the Committee that writes the checks with the taxpayers' money.

Firstly, thank you, Mr. Gates, for being here. Secondly, thank you for creating a great American company. And finally, thank you for your work and your wife's work in the Foundation and being so conscientious in your philanthropy. You are a role model for anybody who has done reasonably well and for the rest of us as well.

For better or worse, Mr. Gates, it appears that the H–1B visa debate is part of the whole immigration debate in America, and so I would be interested in your thoughts as to whether, for example, there should be any limits on the numbers of H–1B visas issued or permanent resident status granted, any limits at all. And I am being a little bit facetious but I would love to just plumb the depths of your thinking on this, do we give them an IQ test before we cut them off and what about immigration limits as a whole? Do you have views for example as to whether there should be any quotas for anyone who wants to come into the United States from any country regardless of their IQ or educational achievement?

Mr. GATES. Well, first in terms of writing checks, you know, I have personally written over $5 billion of tax checks to the United States Government. So maybe that is one of the sources of——

Mr. ROTHMAN. I am glad you could afford to pay the tax.

Mr. GATES.—revenue but I don't begrudge it in any way. I am glad you are all working hard to make sure it is well-spent.

In terms of the H–1B visa issue, the key focus that Microsoft has here is on highly skilled people, and we are talking about jobs that, you know, the starting salary is if you include benefits over $100,000 a year. And the policy that Canada for example has says that if a company is offering somebody a job at that type of salary level, then they will facilitate the person coming into the country. I would also suggest that if somebody is educated in a U.S. university that because of the research funding that comes out of the government, you know, you have basically subsidized that education. I think that there should be a direct path to permanent residency for——

Mr. ROTHMAN. I don't have much time.

Mr. GATES. Sorry.

Mr. ROTHMAN. On my question though, sir, should there be any limits on H–1B visas and should there be limits on immigration from any country regardless of IQ or educational achievement by the applicant?

Mr. GATES. The position Microsoft takes is really focused on a very highly qualified set of people, but the numbers in total

wouldn't make a huge difference in terms of the overall immigration thing. And so Microsoft doesn't take a position on the broad issue. On the broad issue, you know, I happen to think that immigration has been a great thing for the country and that if you look at lots of rich countries, they are facing overall population declines. This country is one of the few that because of immigration, the population will grow. I don't know what it would be like if you didn't have limits. There may need to be limits. I am not an expert on that.

Mr. ROTHMAN. Forgive me. I apologize. I have one more question.

Mr. GATES. Yeah, go ahead.

Mr. ROTHMAN. I am a father of a bunch of teenagers, and I have to ask this question. I know that there is a different kind of socialization that occurs now on the web and with computers, and I understand the arguments about the value of them and there are great advances in that regard. Are there any cautionary tales for us from you—you are a father as well—about how best to get the best out of the Internet yet not have sacrificed something that is human or makes us human or enhances the best of our humanness?

Mr. GATES. Whenever new technologies come along, parents have a legitimate concern about how it is being used and the Internet would be high on the list there. My oldest is 11, so we haven't quite gotten into the toughest years in terms of having, you know, Facebook accounts and spending massive amounts of time instant messaging. But I am sure that is ahead. We have tended to keep our computers at home out in the open so that as the kids are doing things on the computer they know we are going to be walking by at any point, and by doing it that way we have avoided having to have much in the way of hard limits, either in terms of time or specific things. We are just all involved in seeing what is going on and talking about what those things are.

There definitely are things where parents need to stay involved in understanding how their kids are spending their time, including their time on the Internet. There are some amazing things out there in terms of courses and material, but I also think that there can be misuses in terms of how information is shared and how the kid is prioritizing their time. That is why I am going to always have an awareness of what my kids are doing using these tools.

Mr. ROTHMAN. Thank you, sir.

Chairman GORDON. The gentleman's time has expired. Mr. Gates, you are my test pilot. I hope your 11 year-old—you can figure it out there so you can tell us what to do with our seven-year-old when that time comes. Mr. Reichert from Washington State is recognized for five minutes.

Mr. REICHERT. Thank you, Mr. Chairman. One of the problems with being one of the last Members to ask a question is that a lot of the questions have already been asked. So I have a couple of follow-up questions, one, a follow-up to Ms. Biggert's question about the importance of the global economy, and our global markets that we compete in. What impact does our corporate tax rate have on American companies as they compete across the world?

Mr. GATES. It is important to look at how our tax policies are influencing corporate behavior. In the case of Microsoft, to the degree

we can hire engineers here, and we can still hire a lot, not enough, you know, over all on balance, we prefer to do our R&D here and that is despite the fact that there is very attractive tax advantages that are being offered in other places, that is, even though the taxes are higher here, they are still within the range of what is reasonable given the other benefits that are provided. On tax policy, R&D tax credit would be a very top priority to make sure that other countries aren't getting ahead of us too much in terms of the generosity they provide in that area.

So tax policy does make a difference, but you know, companies will—you won't immediately just go to a place that is more advantageous. You will make a comparison. The United States still has a lot of things that are very much in its favor.

Mr. REICHERT. Here may also be another follow-up question that I think has been touched on lightly as I bounced in and out of the hearing here. But you stated in your testimony the public and private sectors are no longer investing in basic research and development to the levels needed to drive long-term innovation. Why is the private sector no longer investing at the levels that it should be in your opinion?

Mr. GATES. Well, some of the investment that came out of the private sector came out of what I call the semiprivate sector, that is, AT&T through Bell Laboratories was a highly regulated business; and one of the things they sort of did in return was do a lot of research that they weren't receiving direct economic return for but it was one of their great contributions to the country and to the world, and as they became a more typical private company as it was broken up into various pieces, the liberty they had to take profits and fund research largely went away. So the net R&D spending coming out the antecedents of what was the Bell system, is quite a bit less than it was in the past. There are also cases of companies like Xerox who weren't quite as adept at taking their research work and themselves benefiting from it by productizing it the way that they had expected. And so that was a cautionary tale. And in fact, when Microsoft 15 years ago started really going into this peer research area, we wanted to make sure we were going to not only benefit society but also be able to get those products out. You know, I can say that that has worked extremely well for us and we are a big advocate when talking with private companies that there are ways of running a research budget that means that you get very, very high returns from that work. You know, just last week we had Tech Fest where our researchers show their work and all our engineers go and look at it, and that is really the most fun thing during the entire year is to see that new research work.

So there are methods, best practices, that the private sector needs to spread that will build the confidence that those investments are well worth making.

Mr. REICHERT. And you are one of those companies that have succeeded at that, and you are sharing your thoughts, ideas, and experience. Are there other companies doing the same thing, sharing that information with others?

Mr. GATES. Yes, well, another sector that has been incredibly R&D intensive is the drug industry, and you know, they are of course facing some challenges in terms of the number of break-

through new advances they have made. So now they are looking at the cost of R&D for their new products as being very, very high. And so hopefully we will get into a period that other advances and the encouragement they are giving will get them back into increasing their R&D budget. But if you look at the various sectors, a sector that has been huge which is that sector, that is at risk now because of a variety of things that don't make it look as attractive to them.

Chairman GORDON. The gentleman's time has expired. Mr. Neugebauer is acquiescing, and I am sure Mr. Hall will agree, what I would like to do is ask the next questioners to try to limit themselves to one question, so take your best shot so that everybody can be able to participate today.

Mr. Carnahan from Missouri is recognized for one question or statement.

Mr. CARNAHAN. Thank you again for being here on this 50th anniversary of the Committee. You really outlined well in your remarks talking about the last 50 years and the revolutionary advances that have been made and how we have built on those so well. I would like you to look ahead at the next 50 years when we have the 100th anniversary of this committee and our grandkids or kids being born today are sitting on this committee. What do you think are going to be some of the most profound changes in the way we live and work and how technology is going to affect that?

Mr. GATES. Well, 50 years is a long period of time in the world of technology, particularly given that we have an accelerating rate of innovation. So it is not just that we will take what we have done in the last 50 years and do the same. The world at large will do far more. And so you would find me quite optimistic that the breakthroughs that will allow us to have energy that is both cheaper and environmentally friendly, that those breakthroughs will come; and in fact, there are many approaches that already we can see there is a good chance that the advances will be there. Information technology, the ability to have computers that are very easy to work with and almost so pervasive we take them for granted would be quite phenomenal. The breakthroughs in diseases, you know, even in the next 20 years I would expect breakthroughs for the major killers around the world.

So, you know, this is an amazing time, the kind of spirit that got this committee started, people like Vanover Bush who talked about the endless frontier. I wouldn't go back and change anything that he wrote when he talked about the advances and how government encouraging science will be at the center of those. Fifty years from now the United States may not have the same relative share of innovation it has today, but with the right policies, we can have the leading share, even if you go out into a long timeframe like that, which is pretty phenomenal given that we have five percent of the world's population that, you know, we have, however you measure it, over 50 percent of the innovation that has taken place. I think if we renew our strengths that that same time of preeminent position is not impossible for us to maintain.

Chairman GORDON. Thank you, Mr. Carnahan. I suspect that the new 50 years will be 10 years, and many of us on this committee will be here and if we are going to be successful, we need to do our

part. Mr. Hall has assured us that he will be here. Dr. Gingrey, you are recognized.

Mr. GINGREY. Mr. Gates, thank you so much for being with us, and in the information that we receive from the Committee basically said that you were going to be here this morning to share your thoughts on efforts needed to further strengthen our country's competitiveness in the global marketplace. You spent the last hour-and-a-half I think doing a pretty good job of that, but I have concerns, and the entire Committee does about the lack of STEM education in our country. You see when you read a local newspaper, as I often do, I am a former public school board chairman in Marietta, Georgia, and every year they have the star students of all the high schools that have the best scores on the SAT and their respective teacher that they give most of the credit to. But when you look at those names, and we are talking about in maybe 30 high schools in that area, you see a lot of Asian and Indian names. And it seems like every year it is more and more, a greater percentage; and obviously, youngsters that look like me are not as I did going onto Georgia Tech and majoring in chemistry and pure science and becoming one of our great engineers working on the space program or whatever. So I have some real concerns about that. I don't know what to do about it, but maybe you can share your thoughts on that particular point.

But let me just cut right to the chase by asking this question regarding H–1B visas because we talked about that a lot this morning. Do you believe that an increase in the H–1B visa program, more, a greater number of them, increase in the volume then of foreign labor in STEM fields could have the unintended consequence of deterring American students in those same fields from pursuing STEM education and then ultimately getting those highly skilled jobs because that is exactly what the problem is as I see it. My friend from New Jersey brought that up in a more broad way in regard to overall immigration quotas. But we are talking now about H–1B and also the J–1 visa program when we bring college students from Serbia to play basketball or from Sweden to play tennis so that our college teams can win the NCAA championships and you cut out the little kids that look like me that have been taking tennis lessons all those years and are just one little step below in our ability level. So this is a real concern, if we expand this program so much, then do our youngsters say, you know, we don't have a grasp at the golden ring. Thank you.

Mr. GATES. Our youngsters are competing with these students, even if we turn them away from this country, that is, no policy related to H–1B will impact the percentage of foreign labor that works in computer science. All it will affect is what portion of that is done in the United States and where the surrounding jobs are created. So if the goal is to have a series of medals or awards that are just about the best in the United States, yes, you know, shut down immigration. You should have shut it down in 1900. I mean, immigrant families have been achieving very well in this country for a long, long, long time. That has always been a controversial thing, but computer science is not a game played only in the United States. It is not like a local competition. It is more like the Olympics where at the end of the day you are going to compete

with the best in the world, and the question is, you know, is that happening in the United States.

Chairman GORDON. Thank you. Mr. Chandler is recognized for one question.

Mr. CHANDLER. Thank you, Mr. Chairman. Mr. Gates, thank you for taking these incoming missiles. Also thank you very much for what you do and have done for our schools and what you are doing in particular for our high schools. I am a little bit ahead of both you and our Chairman. I have a 14-year-old daughter who is a freshman in high school, and I can tell you the issues are already there for me. So I will let you know.

Mr. GATES. Great.

Mr. CHANDLER. I have got a bill that calls for significant federal investment in the infrastructure, first the physical plants of our schools in this country, but also calls for significant investment in technology infrastructure and in training for technology. I would like to get your idea on where we need to go in that area. Do you have a sense of how much investment we need to make in our schools in this country in those areas and do you believe that the government needs to make a much more significant investment? Thank you.

Mr. GATES. Computers in schools and technology training, that is going up at a pretty rapid rate. And there are certainly some best practices that more funding would help spread more rapidly, and we are involved in a so-called School of the Future where a group in Philadelphia came to Microsoft and asked about some ideas of how technology could be used. And what they did was quite impressive. You know, we were just there in terms of providing advice, but I know a number of high schools around the country are looking at some of those same things. When you get a chance to do new infrastructure, you can do something quite spectacular as a result of that.

In terms of requirements in high school, you know, there is already a lot of controversy over a push that really is one of the foundations behind that that encourages states to move away from simply asking for two years of math to move up to three or four years of math. There actually has been good progress in that regard, and that is another contrast you will see between the United States and these countries that score well on the PISA exam is that all the ones that do well require four years of mathematics as part of the high school education. Some of the States push back on that because of the shortage of teachers and that then comes back into these issues of how do you measure teachers and particularly for the math and science shortage, how do you alleviate that problem that is coming along.

So I do think funding the teachers to get trained on technology and technology in the schools is a very important thing. I don't think we at this point need to add specific requirements for technology training because I think if we train the teachers the right way, they will be bringing that in to all the different subject matter that they teach.

Chairman GORDON. The gentleman's time has expired. One more nervous father. Mr. McCaul is recognized for what I am sorry to say will be our last question to meet our agreement.

Mr. MCCAUL. Thank you, Mr. Gates, for being here. I have five kids, three are triplets and they are six years old. It is great to have you here. Michael Dell is actually one of my constituents, probably my most famous constituent. I know you are good friends. Thank you for the work you do in education with him in his foundation. I also represent UT. I got a tour of the Pickle Center where the largest supercomputer was unveiled about two weeks ago through an NSF grant. So it is extraordinary technology.

I just wanted to focus on two areas I know we covered to some extent, but when I see the students at the University of Texas building the computer chips and other things, then when I found out after we invest and train in them we lose them and they go back to where they came from, usually China or Asia and work for our competitor. That seems to be a failed policy in my view, and that is one reason why I have cosponsored raising the cap on H–1B visas. We are looking at a bill to issue green cards to Ph.D.s, graduates with a Ph.D. Obviously, we would like to have more home-grown talent, but we are losing that as you have talked about. If you could, and this is a broad question, but in terms of prioritizing federal funding, that is what we have to do. We have limited federal dollars. Where do we need to be really focusing that money, both from an education standpoint and R&D standpoint?

Mr. GATES. Yeah, I appreciate your points on H–1B and your support on those issues. I just really highlight how urgent this issue is, whether it is short-term relief or long-term relief. This is making a big difference in terms of where jobs are created. And if you want to grow the pie, you know, how many taxpayer dollars to have, these are the types of people and jobs that really do add to that and ideally allow the virtual cycle, the government funds the universities, the universities train the great people that go out into companies and get money back to you that in some form gets to those universities. That is that magic cycle that we have had. I was just in Austin a couple weeks ago visiting and seeing the great work they do there, including some particularly good things to encourage Hispanics to come into computer science where they have done amongst the best.

Where do federal dollars have the biggest impact? I do think the NSF budget. It is not actually a very gigantic budget, but those dollars are very impactful and so if COMPETES was appropriated over these next seven years, we would get as a country a very good return on the increase that goes into that amount of money. I often think if you said, okay, take something like energy. So you fund you know currently using something that is not economic and so you subsidize it versus fund research to make it, and it won't be overnight but to make it over time economic, the benefit is so dramatically in favor of funding the research to make it economic versus subsidizing the consumption of the thing that is not economic. I mean, you could take you know, not even a huge percentage of those dollars and get some I think impactful research funding.

So the theme that research is where it is at and that has been successful for the United States, you looked at health and the exploding health costs, how do you deal with that, research. You look at energy and the challenges there, and you come back to research.

And fortunately the ability to funnel it through the universities that spend it very well, particularly if they have these talented people from all over the world engaged in their activities, that is I think the clearest use of federal dollars.

Chairman GORDON. Regretfully I have to say that the gentleman's time has expired. Let me also apologize to those Members that did not have a chance to directly ask a question today, but the record will continue to be open for statements or questions that you might like to have. I thank Mr. Gates, we very much appreciate you being here. I think your concluding statement is a summary for all of us, and that is, if you look at the major issues today before us, whether it is competitiveness, health, energy independence, we have to have a technological bump. You know, more of the same is not enough. Incremental change is not enough. We are going to have to invest in R&D and get that bump.

Thank you for being here, and this hearing is closed.

Mr. GATES. Thank you.

[Whereupon, at 12:05 p.m., the Committee was adjourned.]

○