

House Committee on Science, Space, and Technology
Before the Subcommittee on Research and Technology
Private-Sector Programs that Engage Students in STEM

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Chairman Bucshon, Ranking Member Lipinski, and Members of the Subcommittee, my name is Dean Kamen. I am an inventor, entrepreneur, and founder of a not-for-profit organization called *FIRST*[®], which stands for the *Foundation for Inspiration and Recognition of Science and Technology*. I want to thank the Subcommittee for inviting me to testify about the private sector's role in meeting a critical need in America today: specifically, the need to change our culture so that youth are inspired to become Science, Technology, Engineering, or Mathematics (STEM) majors in college and go on to rewarding STEM careers, thereby keeping the United States at the forefront of innovation. *FIRST* does exactly that. *FIRST* has already demonstrated that it works, by engaging young people in grades K through 12 in fun, hands-on, after-school programs and competitions that connect the concepts they study in the classroom to real-world experiences and applications.

I am not here today to ask for your financial support of the *FIRST* organization. *FIRST* is generously supported by more than 3,500 corporate sponsors, both through financial support and through more than 130,000 volunteers and technical mentors. However, I am here to ask you to support schools, especially underserved schools, to gain access to *FIRST*, so that every child in America can discover his or her passion for innovation, while meaningfully preparing to

contribute to the STEM economy and workforce. Specifically, by directing the fees collected through the H-1B visa program, we can inspire and fund a home-grown STEM workforce that will become the technical leaders and entrepreneurs of the future, keeping the U.S. innovation pipeline second to none.

Change the Culture, Change the Future...

Those of us who have witnessed firsthand the power of innovation and scientific research and development can offer a simple message to America and Congress: close the STEM-skills gap and you will help close the budget deficit. Innovation has been the lifeblood of our country's economy fueled by a long-term partnership between the federal government and our nation's scientists, technologists, and engineers. Since World War II, that partnership has accounted for significant technological breakthroughs and contributed in a very meaningful way to our economic success. It has been stated that innovation and technological change may be responsible for as much as three-quarters of our economic growth¹. I am here today to encourage you to 'pay it forward' for future U.S. innovators, the ones who will invent the things we have not yet conceived of or even imagined. We are in a heated competition for the hearts and minds of kids, fighting for their attention in a world that too often points them in the wrong direction. That is a loss for all of us because somewhere out there are kids who can potentially cure cancer, eliminate infectious diseases, or build an engine that does not pollute. They may not know it yet, but they are the future, and you can help inspire them to pursue those paths and provide them with the skills to seize those opportunities.

¹ L. Rafael Reif, *The innovation deficit*, The Boston Globe (December 29, 2013) at <http://www.bostonglobe.com/opinion/2013/12/29/the-innovation-deficit/SiURF7goy1MRsMG6314caN/story.html>; Arti Rai, Stuart Graham, and Mark Doms, Patent reform: Unleashing innovation, promoting economic growth & producing high-paying jobs (April 13, 2010), US Department of Commerce, at http://www.commerce.gov/sites/default/files/documents/migrated/Patent_Reform-paper.pdf

FIRST is all about changing our culture...for the better. More than 20 years ago, I saw a culture where celebrities and sports stars were celebrated and revered, and scientists and engineers were not. I believed then, and still believe now, that our collective future depends on getting more kids from every background and every part of the country interested in and turned onto STEM so that they might seek education and careers in these fields. When you walk into a high school, there are trophies for baseball, basketball, soccer and even cricket—but do you ever see a trophy case for a *Sport for the Mind*[™]? *FIRST* builds that trophy case in a few extremely fortunate schools —today it is full of medals, trophies, awards, and ‘bragging rights’—with the help of many of the country’s CEOs and leading technology and innovation companies. In fact, our sport is the only one where every kid can turn pro—there are jobs out there for each of these kids. Unfortunately, *FIRST* is still not available to millions of kids and many of the schools that most need this program.

What Is *FIRST*?

With the help of a few visionary corporate sponsors, *FIRST* was established in 1989 as a 501(c)(3) not-for-profit public charity with a mission to inspire young people to become science and technology leaders and innovators, by engaging them in exciting, mentor-guided, robotics and research programs that build science, engineering, and technology skills; inspire innovation; and foster self-confidence, team building, and leadership. By working directly with world-class volunteer scientists and engineers, each team of students engages in the process of designing and building real robots that compete in an exciting competition that is similar in many ways to the other sports that have proven so effective in capturing their time, attention, and passion for excellence. *FIRST*, however, develops skills that will enable these students to pursue exciting careers where millions of jobs await properly skilled professionals. Like the other exciting and

engaging high-school sports, the *FIRST* competition season includes local, regional, and a national championship which will once again this year be hosted in a 76,000-seat arena in St. Louis, Missouri.

While in-classroom STEM exposure is necessary, it is not sufficient to spur enough students' interest in these fields. The hands-on, after-school *FIRST* experience is engaging and highly effective in motivating students to become scientists and engineers. This after-school setting gives young people the unique opportunity to learn through solving real problems and hitting a few dead ends along the way, thereby creating an experience necessary for future research, experimentation, and innovation and developing the persistence that STEM fields require. Indeed, *FIRST* is effective: *FIRST* participants are 66% more likely than non-participants to attend college on a full-time basis and twice as likely to major in science or engineering; among women this number grows to four times more likely².

Igniting Young Minds...

As the world moves ever closer to a truly competitive global economy, the challenge to develop lasting interest in science and technology among the country's young people has never been more critical. These youth will propel our collective futures. And that is what *FIRST* is all about—giving kids the opportunity to develop the muscle between their ears; to gain experiences that will directly affect their futures and ours. But, *FIRST* is much more than a 'techie' competition. It's a cultural agent of change that brings all types of people together in a multi-generational, multi-talented way to make an impact on how kids perceive themselves and whom

² Alan Melchior, et al, *More than Robots: An Evaluation of the FIRST Robotics Competition Participant and Institutional Impacts* (2005). Waltham, MA: Center for Youth and Communities, Brandeis University.

they choose for role models. The skills they learn along the way guarantee them extraordinary career opportunities in a host of exciting fields.

Building Blocks to Innovation...

FIRST learning never stops. From ages 6 to 18, four *FIRST* programs help kids master skills and concepts they will use over and over as they progress from one level to the next, and into college and a career. The four *FIRST* programs include:

- Junior *FIRST*[®] LEGO[®] League (Jr.FLL[®]) for grades K-3
 - *Teams design and construct a model with motorized parts using LEGO elements, and present their research journey on a “Show Me” poster.*
- *FIRST*[®] LEGO[®] League (FLL[®]) for grades 4-8
 - *Teams build LEGO-based autonomous robots and develop research projects based on a real-world challenge that changes annually. (The 2014 Challenge topic involves preparing for, surviving, and recovering from natural disasters.)*
- *FIRST*[®] Tech Challenge (FTC[®]) for grades 7-12
 - *Students learn to think like engineers. Teams develop strategy, build robots using a reusable kit of parts, and compete in exciting, real-time head to head tournaments..*
- *FIRST*[®] Robotics Competition (FRC[®]) for grades 9-12
 - *Teams compete with 120-lb. robots in this varsity Sport for the Mind™, combining the excitement of sports with the rigors of science and technology. Teams have only six weeks to design, create, and build their robot, followed by seven weeks of gracious, but intense, competition.*

FIRST Impact...

Over the past 23 years, more than a million youth in this country, assisted by hundreds of thousands of adult volunteers and thousands of corporate sponsors, have discovered that they can be anything they want to be, and their life paths have been changed forever. Here are a few figures that show the meaningful scale and impact of *FIRST*:

- Approximately 12,750 schools in the U.S., or 10% of U.S. schools, currently participate in *FIRST* programs.
- Nearly 250,000 U.S. students are currently engaged across the four *FIRST* programs.
- More than 30% of all *FIRST* students are women and minorities.
- *FIRST* students are assisted by an ecosystem of more than 130,000 committed volunteers, mentors, and coaches, from both schools and corporate sponsors, who contribute more than eight million volunteer hours annually.
- *FIRST* and *FIRST* teams are supported by more than 3,500 corporate sponsors, large and small.
- A recent survey of *FIRST* alumni shows that 89.6% are either majoring in a STEM field in college or are working in a STEM profession³.
- In 2013 alone, more than \$18 million in college scholarships, up to and including full tuition, were available to *FIRST* participants from 156 providers, including 133 U.S. colleges and universities who actively recruit these students. The scholarship dollars and participating schools continue to grow annually.

³ Non-published report, *FIRST* Research & Evaluation, *FIRST* Alumni Study (2011).

More to do...

More than two decades of effort and investment by hundreds of thousands of adult volunteers, thousands of companies (*FIRST* is supported by two of every five Fortune 500 companies), sports and entertainment moguls, and federal and state government leaders have grown our organization into a national and global force for change. However, we are still far from reaching our goal to be available to every school across the country. Many more students and teachers deserve the opportunity to get involved and benefit from *FIRST*.

FIRST does not yet reflect our national demographics. Too few underserved schools are able to participate. While industry provides the volunteer mentors and most of the resources required to create and deliver these season-long exciting events, schools need to have at least the resources to leverage this great opportunity. Without resource such as a space to build, stipends for teacher coaches, and support for travel to competitions, schools are unable to participate.

The reality is that *FIRST* already reaches many suburban school districts—where money and engineering mentors are available. The biggest roadblock for making inroads in inner-city and rural communities is the lack of funds to pay teachers stipends to participate in after-school STEM programs.

FIRST has taken initial steps to target underserved communities by working with many great technology organizations, including one major government organization, NASA. Specifically, NASA has graciously provided mentors and funding, for which *FIRST* is extremely appreciative. One great example of NASA's support is the exuberant "Mohawk Guy" from the control room of the Mars "Curiosity" Rover landing. He is a *FIRST* mentor, and many *FIRST*

alumni have become NASA engineers. In addition, NASA has even adopted *FIRST's* six-week build process to address various challenges. This is already a great return on taxpayer dollars.

We believe the Federal government has a role to play and the unique ability to extend these types of programs so they are accessible to all students across the country. The federal government can provide additional STEM funding by establishing a grant program for schools in underserved communities so that students and teachers in those communities are able to participate in *FIRST*. Also, although we recognize the program is outside the Committee's jurisdiction, it would be helpful for continued support from the Committee to fund AmeriCorps VISTA's STEM program. This program helps fill the skills gap in disadvantaged school districts. *FIRST* is currently the lead partner for AmeriCorps VISTA's efforts to support after-school STEM resources. Unfortunately, this organization does not have the necessary funds to provide a comprehensive nationwide effort.

As I've already noted, *FIRST's* goal is to insure that every kid in America has access to a *FIRST* program at every school in the United States. In the near term, *FIRST* seeks to reach one million active student participants in the U.S., approximately four times the number of U.S. students currently involved in *FIRST* programs. Those one million students will go a long way to fill the STEM workforce pipeline. Call me the eternal optimist, but I know we can do it. We have the infrastructure in place, we have the passionate volunteers, we have the enlightened self-interest of the Fortune 500, and we have the drive to see this mission accomplished.

Congress Can Accelerate our Progress...

FIRST represents an exceptional opportunity for motivated individuals, educational institutions, and corporations to get involved in the promise of tomorrow. It takes an active and

engaged community to make these types of cultural changes. And that is where and how Congress can assist *FIRST* and ultimately our country's future trajectory. I have seen individual bills that are a laudable effort to solve pieces of the problem. However, I would like to see a comprehensive bipartisan bill that will truly have an impact on providing a pipeline of American-grown STEM workers and professionals.

Congress can and should help inspire our youth and leverage and support this private-sector led program. I have asked the *FIRST* Regional Directors across all 50 states to reach out to Members of this Committee, as well as other Members of Congress, to invite you to local and regional *FIRST* events. You can demonstrate your support for the achievements of young people and their families in your District by attending and speaking at these events. At these events, you will also witness firsthand the excitement, passion, and engagement of our youth in the application of STEM knowledge and innovation.

We also need your support to insure that schools and students everywhere have access and resources to participate in *FIRST*. To overcome the roadblock for making private-sector STEM programs available in inner-city and rural communities, we strongly encourage Congress to pass legislation that directs H-1B visa fees to enable underserved inner-city and rural schools to participate in *FIRST*.

Every year this country imports more than 100,000 workers under the H-1B visa program from countries around the world because the U.S. does not produce enough American-born STEM graduates. Corporations are willing to pay enormous sums of money to gain access to those educated workers, amounting to more than one billion dollars spent annually to overcome this issue. Incidentally, as the economies of emerging countries, such as India, Russia, Brazil,

and China, continue to grow, our ability to solve our domestic STEM shortage by importing workers will decline, as foreign engineers and innovators see better opportunities for growth and wealth in their home countries.

I would like to ask for the Subcommittee's support to direct a portion of those dollars collected from corporations for H-1B visa fees and invest them in home-grown STEM workers, to fuel the next generation of U.S. entrepreneurs and innovators with local youth. Specifically, these fees should support efforts to enable underserved inner-city and rural schools to participate in *FIRST*.

With strong support from generous corporate partners, we will continue to pursue our mission to make *FIRST* programs available and accessible to every student who wants to participate. However, support from this Subcommittee and other leaders in Washington will enable us to reach our goal more quickly and more specifically impact students in underserved inner-city and rural areas.

As I noted, our Regional Directors will be reaching out to your staff, and we would be honored for each of you to come to our events in your state or region to demonstrate the importance Congress places on STEM education. Our *FIRST* "March Madness" season will have more than 90 events throughout the country. Each of you is also invited to attend the *FIRST* World Championship and Festival that will be held in St. Louis, Missouri from April 24th through 26th, 2014 at the Edward Jones Dome.

These competitions are a unique experience, which I am certain you will enjoy. I am also confident that you will be moved and inspired by the intelligence, creativity, passion, and professionalism of our youth. You will see firsthand that the economic and innovative future of

America is incredibly bright, especially if we can engage and inspire kids from all backgrounds and geographies.

I thank you for your time, your attention, and your support in maintaining the United States' leadership in innovation for the next 200 years.