

Testimony of

Patricia Sullivan

Education Solutions Executive

“Innovation in Education through Business and Education  
STEM Partnerships”

House Education and Labor Committee

U.S. House of Representatives

Tuesday, July 22, 2008

Chairman Miller and members of the House Education and Labor Committee, my name is Patricia Sullivan and I am Education Solutions Executive within the Global Education Industry at IBM. IBM appreciates the opportunity to participate in this hearing to highlight the many initiatives the business community is doing to promote STEM (Science, Technology, Engineering and Mathematics) education among our nation's youth.

IBM, like many US-headquartered companies, has become a globally integrated enterprise. As our economy becomes more globally integrated and competition becomes more intense for management and employees, there is growing recognition that innovation is the key to being able to effectively compete. Localities, states and nations are striving to become places where knowledge is generated and transformed into new commercial and societal value. They recognize that an innovative, knowledge-based society creates jobs, raises living standards and generates growth that competitors can't duplicate rapidly.

The question we face is what needs to be done to create an environment that will foster innovation? An important criterion will be the quality of education in order to equip students with the needed skills for the 21<sup>st</sup> century workforce. STEM education is a critical skill in this equation.

A report recently released by the U.S. Department of Labor suggests that over the next 10 years, the need for technical people in this country is going to grow not by 30 percent, but 50 percent! While the demand for these jobs is increasing, the supply of talented workers isn't keeping pace. A skilled and talented workforce is a fundamental requirement to attract investment, foster real wealth creation and spur innovation in this country. It is critical for our continued competitiveness.

We are firm believers in the need to build the base of scientists and engineers and prepare the next generation of innovators. It is clear that if we are going to have a constant flow of talent in science and engineering, we need to raise the standards and expectations for what knowledge and skills students need to acquire earlier in the K-12 pipeline. We also must ensure that students, from elementary school all the way through graduate school, are having the experiences that will generate enthusiasm about math and science and their ability to solve problems. They also must complete a rigorous and relevant curriculum so that they have the option of pursuing scientific, technical and multidisciplinary degrees in college or being adequately prepared to enter the 21<sup>st</sup> century workforce.

What needs to happen to prepare students to participate in a knowledge-based economy?

- First, our children need to be prepared to discover new things every day using a focused, coherent progression of math and science learning;

- Schools should implement a STEM curriculum in grades pre-K through 8 that is rigorous and streamlined, with an emphasis on proficiency of key concepts;
- Students need reinforcement that achievement in math and science comes from effort and isn't a skill that only results from an inherent talent.

Education is a part of IBM's DNA. We consistently play an active role in promoting and boosting education efforts at both national and local levels. For many decades, IBM has been one of the leading corporate contributors of funding, technology, and talent to non-profit organizations and educational institutions across the U.S. and around the world. We are committed to applying our skill and ability as an innovator against the challenges that exist in communities, addressing both educational and societal concerns, and doing so in a fundamental and systemic way.

Why does IBM believe this is such a critical issue? The number of students taking advanced math and science classes and choosing engineering or technical careers is declining, yet the U.S. needs to grow its population of qualified, technically proficient workers in order to remain competitive.

This is a tall order and goes well beyond mastery of math and science skills and knowledge. Fundamentally, this requires a cadre of incredible math and science teachers in our schools, teachers who have the content expertise, the real world experience, an understanding of problem-based learning and the pedagogic practice to launch the next generation of innovators.

Did you know that nearly three quarters of our middle school children in this country are taught math and science by teachers who have never graduated with a math degree or who have never been certified in teaching math? It is no wonder we have trouble promoting careers in engineering and science.

Studies have shown that over the next 10 years we need 2 million more K-12 teachers in this country; and, in addition, we need a quarter of a million math and science teachers in the next two years. Nearly 80 million baby boomers are going to leave the workforce some time soon. That's a huge problem for the U.S. In addition, over 40 percent of the same population of teachers are 50 years or older. This underscores the importance of this issue and the fact that our country must invest in improving and enhancing our teacher recruitment, education and professional development.

Classroom teachers with strong knowledge about math and science have a central role in education. We agree that rigorously evaluated initiatives for attracting and appropriately preparing prospective teachers and evaluating and retaining teachers are critical to our students' success. The math and science

preparation of elementary and middle school teachers must be strengthened to improve teachers' effectiveness in the classroom. This includes: pre-service teacher education, early career mentoring and professional development.

## IBM INITIATIVES

IBM's leadership in school reform has grown steadily since we first launched Reinventing Education in 1994, a global program, working with more than 100,000 teachers. Our most recent partnerships with school districts focus almost exclusively on professional development because if we want great schools, we must have great teachers. In 2006, IBM announced **Transition to Teaching**, our initiative to address the K-12 STEM teacher pipeline issue to help encourage young people to enter science and engineering careers.

We established the Transition to Teaching initiative by leveraging our greatest asset – **IBM employees**. Of course, most IBMers have backgrounds in math and science, whether they are currently working in software development, research, consulting or management. IBMers are also great volunteers; more than 115,000 have signed up for volunteer assignments through our On Demand Community, contributing about 5 million hours of service. Moreover, the majority of IBMers who volunteer do so in a school, whether as: one of the legions visiting schools for e-Week (engineering Week); showcasing IBM's new 3D internet multi-player game, Power Up, focused on solving problems related to energy and the environment; as one of our 8,000 eMentors providing online academic assistance to students; or one of those working with children in a Head Start or daycare program that has a KidSmart program. They also lead after-school programs for middle school students and coach high school students for science fairs and robotics competitions through TryScience.org.

These IBMers tell us repeatedly that they have a passion for education, young people and for giving back to the community. Recognizing that there is a national teacher shortage in math and science and that there is large group of IBM employees who are eager to continue being productive and contributing to their communities, we created the Transition to Teaching program. Transition to Teaching specifically targets our mature workers who are interested in a second career in teaching, by providing guidance, support and funding to help them transition into teaching as their next career move.

Specifically, IBM provides each participant with up to \$15,000 for tuition reimbursement and stipends during their time gaining practice teaching experience in the classroom. Each participant chooses his or her own teacher certification model, but we encourage colleges of education to develop flexible programming, involving both online course work and more traditional courses with flexible scheduling. The IBMers also participate in online mentoring, both while they are still working and going to school, and once they graduate and

begin teaching. We have a special social networking site for them at [www.ibm.com](http://www.ibm.com) to enable them to share and learn from their experiences. Finally, we have designed a special leave of absence program that provides each participant to conduct up to a year of student teaching while they maintain their benefits.

Today, there are 100 IBMers participating in Transition to Teaching. IBM designed the Transition to Teaching program after a careful review of the research, the experience of second career teachers, best practices in teacher preparation and our own focus groups with IBMers. We have a few program essentials.

First, teachers must have a strong, in-depth background in the subject area. Our criteria focus on IBMers who already have a Bachelors degree or higher in a math or science discipline.

Second, we believe that IBMers need to learn the craft and skill of teaching, classroom management, and instructional practice to be effective. Thus, we are reimbursing their tuition costs for education preparation.

Finally, we believe that it is absolutely essential for an individual to have practical K-12 classroom experience, observe good teaching and then practice good teaching BEFORE taking responsibility for a class of children. Therefore, we provide support for them to do student or practice teaching. We know there is a huge gap between mastery of a subject and the ability to teach that subject to others. We owe it to our IBMers and to our students to give them all the preparation they need, and we have designed Transition to Teaching to meet that standard.

Transition to Teaching and similar efforts are not a panacea, but they are part of a unique and real solution to the math and science teacher shortage. IBM is proud to demonstrate our corporate commitment to implementing solutions to the math/science teacher challenges in our country, and we are working with other companies to encourage them to adopt a similar model for their transitioning workforce.

On May 5-6, 2008, IBM held a successful summit titled "America's Competitiveness: Hispanic Participation in STEM Careers," which focused on developing an action plan that would encourage more Hispanic students to consider careers in STEM. We had more than 130 leaders in education, business, government and not-for-profit organizations attend this summit, which featured Sen. Bob Menendez (D-NJ) and New York State Secretary Lorraine Cortes-Vasquez as speakers.

In response to the need to provide mentors for Hispanic students, IBM commits to expanding the MentorPlace program to focus on school districts in the U.S.

with a significant number of Hispanic students, and matching them with IBM employees who can serve as their online mentors.

- Additionally, IBM will expand its cascade mentoring program - currently at the University of Arizona at Tucson - to at least 3 universities in California, New York and Texas.
- The cascading mentoring program is an internet based system that enables professional mentors, university students, and K-12 students to engage in a three-way mentoring relationship through secure online discussions. These discussions focus on past academic experiences and exploration of what could be in terms of future goals and opportunities.
- This program completed its third year in Tucson, Arizona and involved IBM employees, the University of Arizona SHPE (Society for Hispanic Professional Engineers) Student Chapter, and students from two high schools.

In addition, IBM is making further commitments aimed at bolstering early education resources with innovative technology tools for the classroom:

- IBM also will make a donation of 1,000 KidSmart units at early childhood centers in Chicago, Dallas, Los Angeles, Miami and New York - in neighborhoods that support the Hispanic community.
- IBM commits to expanding the Reading Companion grant program - a web-based, voice recognition technology that helps adults and children gain literacy skills - to any school district in the U.S. that is interested, with a special focus on school districts with a significant number of Hispanics.

Addressing the challenge of investing in math and science education, preparing teachers and exciting students are responsibilities not only of parents and businesses, but also of government. With the overwhelming passage of the America COMPETES Act last year and its enactment into law, Congress demonstrated a *partial* commitment to the principles of advancing math and science education, as well as basic research in the physical sciences. The unfortunate reality is that the authorized programs in the COMPETES Act were not funded. This is a critical issue that must be addressed as soon as possible. We strongly encourage Congress to fulfill the promise of the COMPETES Act by appropriating the funding necessary to support both education and research. We need tangible results. Funding these programs will enable us to: train math and science teachers; provide scholarships to keep students in these fields; enable graduates to seed our economy and push the frontiers of knowledge through university research; and promote diversity in STEM fields.

Lastly, it is important to note that with the challenges facing the US to meet the needs of the STEM skills for the 21st century workforce, education must become more open, providing more access to learning across age groups, economic

levels, abilities and personal history. The tools and resources available to teachers and students for STEM education is evolving rapidly and provides new opportunities and resources for innovation in learning. Coursework from traditional textbook providers is being enhanced through supplementary materials and resources on the Web, informal learning programs through museums and institutes and, outreach programs from universities and corporations, among others. The wealth of STEM material available enables the creation of a more student-centric learning environment, where a child's learning style, preference and ability are aligned with the desired proficiency outcomes.

The challenge created by the abundance of learning materials is that many of these resources are independent, stand-alone and require the student, teacher or parent to be the point of integration. We believe that through common, open source learning systems built on open standards, these programs, curricula, and tools can become interoperable - allowing access to resources at every level of a student's academic experience.

**Open Standards and Open Source Applications** - IBM is an active participant and contributor to the open standard and open source application communities in the US and abroad for learning. We are active participants in the Instructional Management Systems (IMS) standards setting body, which has defined standards for on-line learning objects - such as Common Course Cartridge, Content Packaging, and Question and Test Interoperability (QTI). We have made contributions to the Sharable Content Object Reference Model (SCORM), which has defined a collection of standards and specifications for web-based e-learning. IBM is also actively working with open source development communities who are creating the collaborative and learning management systems. We are members of the Sakai community, which provides a no-charge, collaborative and learning system which provides the tool for teachers and students to take advantage of emerging technologies, knowledge and resources.

**Community Collaboration** - In the area of STEM education, information about the latest discoveries in science help to make the information more vibrant and tangible for students. Open source learning systems help foster greater collaboration between educators and learners, and provide the opportunity for the latest information, techniques and insights to be integrated into the curriculum on a real time basis. Emerging on-line tools - such as social networking, virtual worlds, and gaming technologies - provide new avenues for people to connect, irrespective of space and time. Exciting new tools allow teachers to access the latest knowledge through reference to open, digital sources, such as Wikipedia, within learning modules.

To become more student-centric, schools must provide teachers with a variety of alternatives for STEM education. We believe open source teaching and learning systems provide a compelling platform for addressing the long term challenges of

STEM education in the United States, and we are committed to working with the open source community in a collaborative way.

In conclusion, we believe that a national dialogue among math and science education stakeholders needs to remain an important priority. Public and private sector representatives, parents and teachers have to be increasingly focused on developing stronger, rigorous, relevant academic preparation for K-12 students to get them ready for STEM courses in college or to enter a knowledge based workforce, focusing on improving teacher quality, curriculum quality and offering tutoring and mentoring services to students. Unless we capture more minds, more hearts, more souls and more passion for math, science and other STEM disciplines, the innovation leadership and global competitiveness of the United States will be extremely challenged, if not threatened, in the foreseeable future.