

TESTIMONY OF  
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Before the House Subcommittee on Early Childhood,  
Elementary, and Secondary Education

July 24, 2012

Chairman Hunter, Ranking Member Kildee and committee members, I am Maura Banta from the IBM Corporation. Thank you for inviting me to testify about IBM's Transition to Teaching Program. I helped to design the program and have managed it since its inception in 2006. My plan is to share with you our experiences and, more importantly, why we think Transition to Teaching is a model that many companies could use to help students develop science, math, engineering and technology skills.

I want to thank the Committee for taking the time to engage in thoughtful discussion about how we might attract more experienced professionals to move into the classroom to share their applied knowledge and experiences with students.

Over the last 20 years, IBM has been one of the leading corporate contributors of cash, technology and information technology services to non-profit organizations and educational institutions across the U.S. and around the world. We have learned that our most effective grants and partnerships are those that focus on IBM's unique offerings – not only our software, hardware and technical services, but the talent of IBMers. We are most successful when we design initiatives to bring the skills and experience of our employees into the classroom so they can interact directly with students, teachers and administrators to provide what we call “smarter education.”

I don't need to review the growing body of research that shows the disconnect between twenty-first century labor market needs and employment

opportunities and the shortage of high school graduates prepared for STEM careers. We all know that the U.S. is falling well behind other countries in the number and proportion of high school graduates who intend to pursue STEM careers. The relatively small number of students who eventually complete their post-secondary education in STEM fields further increases our competitive disadvantage in a global economy.

Clearly, our continued economic growth will require a base of scientists, engineers, and the next generation of innovators. To have the pipeline of science and engineering talent that we will need, we must focus on STEM education beginning at the elementary school level. Then, we must ensure that students in middle and high school are exposed to educational experiences that will stoke their enthusiasm for math, science, and problem solving. We also must maintain high academic standards, and provide students with the rigorous training they will need for the successful pursuit of scientific and technical degrees in college.

Beyond basic math and science, students also will need a range of workplace competencies – including the social skills to work in diverse, multi-disciplinary and global teams; the communication skills to work with customers, clients and co-workers; the ability to be inquisitive and analytical, and to recognize patterns when confronted with large amounts of information; and the adaptability to cope with ambiguity as leaders and innovators.

This is a very tall order. And while there are many components to effective school improvement, one critical factor is staffing our schools with excellent math and science teachers – teachers who have the content expertise, real-world experience, and working understanding of problem-based learning and the pedagogic practice to launch the next generation of innovators.

In 2006 IBM launched **Transition to Teaching**, our own initiative to address the K-12 STEM pipeline issues by facilitating retiring IBMers' moving into science and math education as a way of helping to encourage young people to enter STEM careers. This is just part of our portfolio of education initiatives including those aimed at bolstering early childhood education, strengthening middle school math skills, and designing an innovative grades 9-14 school model that confers both the high school diploma and a no-cost Associate's degree in Technology.

For the IBM Transition to Teaching program, we decided to leverage our greatest asset – IBM employees. Of course, many IBMers have backgrounds in math and science, whether they are currently working in software development, research, consulting or management. IBMers also are great volunteers.

Our research shows that most IBMers volunteer in schools – whether teaching hands-on science classes during National Engineers Week, serving as one of our 6,000 eMentors who provide online academic assistance to students, leading after-school programs for middle school students, or discussing STEM opportunities on Career Days. IBMers also run EX.I.T.E. camps – which stands for Exploring Interests in Technology and Engineering – for middle school girls to encourage them to pursue math and science careers. These IBMers tell us repeatedly that they have a passion for education, for helping young people, and for giving back to their communities.

At the same time that we are seeing a national decline in math, science and engineering education and competency, we also are witnessing another trend – the graying of the American labor force. With a large number of employees approaching the traditional age for retirement, but eager to continue contributing in their communities, IBM is reaching out to mature, experienced members of our workforce who are interested in a second career in teaching.

Many long-term IBM employees are already thinking about teaching as a second career. Others have the exact background and skills needed to strengthen STEM education in our schools, and we want to introduce them to the idea of teaching. We want to encourage all IBMers who are ready for their next challenge to help address the national teacher shortage in math and science.

More than 120 of our most experienced employees have participated in the Transition to Teaching program. Each person chosen for the program is a math or science professional with at least one degree in a STEM field. The applicants are mature accomplished professionals with a variety of IBM experiences. Most program participants have engineering backgrounds, but participants come from all parts of IBM's business. These IBMers also have extensive experience working with children, volunteering in one of IBM's many after-school programs, and with weekend and summer programs in

their communities. As part of Transition to Teaching, they participate in a range of teacher certification programs – depending on their expertise, prior course work, and the specific licensing requirements and available graduate programs in their states.

Transition to Teaching is based on a number of proven methods and protocols. Teachers must have strong, in-depth backgrounds in their subject areas. We focus on IBMers who have Bachelor's degrees or higher in a math or science discipline. Because we believe that IBMers need to learn the craft and skill of teaching, classroom management, and instructional practice to be effective educators, we reimburse their tuition costs for education preparation. IBM provides stipends of up to \$15,000 so those who are transitioning to teaching can take leaves of absence – while maintaining their benefits – to do student or practice teaching for up to one year. It is absolutely essential for individuals to have real-life K-12 classroom experience – to observe good teaching, and then practice good teaching, before taking responsibility for a class of children.

In our experience, at least three challenges must be addressed in order to attract math and science professionals to education, and prepare them to become exemplary teachers. We would encourage policy leaders to focus on:

- 1) The development of standards for the pedagogic and instructional skills and knowledge required and focus only on those education courses that are necessary for teacher certification.
- 2) Assurances that teaching candidates are placed in supportive practice environments under qualified instructors.
- 3) Systems that will provide new teachers with mentoring and peer support during their first two years to ensure that they are able to provide the highest quality education to their students.

Many degree programs in education still do not meet these criteria. First, too many programs include coursework that is neither relevant nor helpful to new teachers, while not providing enough practical, hands-on experience. Degree programs do not always give credit for career-acquired competencies, and often treat experienced professionals the same way they treat first-year college students. We clearly need to develop streamlined

programs that provide second-career teachers with efficient and effective means for entering the profession.

IBM's Transition to Teaching is one such effort. Thus far, 31 IBMers have completed the program, left the company as fully certified teachers, and taken math and science teaching positions throughout the nation. The retention rate for these second-career STEM teachers is very high. They tell us that they love being able to help math and science come alive in the classroom through real-life applications. But we know that a single Transition to Teaching program cannot compensate for the national shortage of STEM teachers.

If an additional 25 large companies established programs similar to Transition Teaching, their combined efforts could provide a substantial number of new math and science teachers. In parallel with addressing the STEM teacher shortage, broader corporate participation in teacher transition programs could help raise the reputation of teaching as a desirable career. However, the private sector alone cannot solve this problem. It will take improvements in teacher training and professional development programs in every school district. In addition, school districts will have to change the way they recruit, place and supervise teachers to retain the best professionals.

In the meantime, both new teachers and their principals are commenting on the success of the IBM Transition to Teaching program:

“This is my dream! To become a math teacher.” – Gary, who teaches 8<sup>th</sup> grade math in New York

And from a principal who supervises a Transition to Teaching graduate: “Jennifer has had an outstanding beginning as a teacher. Her experience as a mother and a former manager has enabled [her] to nurture and advance middle school students at this critical crossroad. She is exuberant and enthusiastic about math, and makes it come alive for her students. Undoubtedly, her professionalism comes from her IBM background, and her enthusiasm is contagious. I am very grateful that IBM's Transition to Teaching Program helped to add Jen to our team.”

Transition to Teaching participants achieve their career aspirations while making significant contributions. IBM's preparation, financing, and benefits support smoothes the transition. The program also benefits IBM by enhancing the company's ability to recruit and retain top talent, and by reinforcing IBM's reputation for outstanding corporate citizenship. And in the long term, IBM's investment in Transition to Teaching strengthens our nation's economic competitiveness by helping to ensure a full pipeline of emerging STEM professionals.

IBM has shared the Transition to Teaching model with several companies that have replicated its principles. We also have worked with the State of California EnCorps STEM teacher transition and training program to share our best practices. Meanwhile, IBM continues to seek opportunities to influence other companies to embrace and deploy the Transition to Teaching model.

To attract new talent to the teaching profession, we must take steps to open it to qualified persons at all stages of their working lives. This will require public-private partnerships that enable the recruitment of new members of the profession throughout their careers. We should give professionals in many industries the opportunity to develop transferrable skills as part of their preparation to become teachers. Only in this way will we facilitate faster movement into the profession for those with the training, dedication and expertise that America desperately needs in its classrooms.

Thank you for the opportunity to provide testimony about the IBM Transition to Teaching model. I look forward to fielding questions on this important topic.



## IBM AND STEM EDUCATION

Improving public schools around the world continues to be one of IBM's top social priorities. Through strategic initiatives, we're helping solve education's toughest problems with solutions that draw on advanced information technologies and the best minds IBM can apply. Because our efforts are focused on preparing the next generation of leaders and workers who will lead in the Innovation economy, a number of our projects focus on science, technology, engineering and math education.

### Transition to Teaching

IBM's Transition to Teaching program is helping address the critical shortage of math and science teachers by leveraging the brains and backgrounds of some of its most experienced employees. Through Transition to Teaching, IBM is enabling its employees to become fully accredited teachers in their local communities when they choose to leave the company, providing tuition reimbursements up to \$15,000, stipends during student teaching, and online mentoring and other support services in conjunction with colleges, universities and school districts. Transition to Teaching has 104 participants with 28 teachers at 24 sites.

### Teachers TryScience ([www.teacherstryscience.org](http://www.teacherstryscience.org))

Teachers TryScience, a collaboration between the New York Hall of Science, [teachengineering.org](http://teachengineering.org), and IBM, is a site for teachers. Through Teachers TryScience, middle school teachers can improve their instruction of project-based learning, with a focus on engineering/design. Teachers are able to search for standards-based lessons that are linked to online professional development resources that will help them effectively implement lessons in the classroom. The site also provides social networking tools to enable educators to comment on and rate the lessons and professional development resources; submit their own teaching materials; and engage in focused discussions on relevant topics.

### TryScience ([www.tryscience.org](http://www.tryscience.org))

TryScience, a collaboration of the New York Hall of Science, IBM, and the more than 600 member institutions of the Association of Science-Technology Centers, opens a world of science and discovery to students, who otherwise would have no access to the best museums around the globe. The site, which is available in nine languages, provides interactive exhibits, multimedia adventures, and live camera "field trips." TryScience also provides hands-on science projects that children, parents, and teachers can do at home or in school. A special view for teachers, compiled by the National Science Teachers Association Webwatchers' Team, correlates many of the TryScience experiments with National Science Education Standards and SciLinks codes.

### MentorPlace ([www.mentorplace.org](http://www.mentorplace.org))

Through MentorPlace, IBM employees around the world are providing students with online academic assistance and career counseling, while letting them know that adults do care about their issues and concerns. The program provides a meaningful and convenient way for IBM employees to volunteer their time and talents in schools. IBM works with teachers to determine what activities they would like their students to work on with their mentors. Activities cover all core academic areas, including science, engineering and math. Traditional mentoring



conversations also take place. More than 6,000 IBMers in more than 35 countries are currently participating in the program.

### On Demand Community

On Demand Community is a first-of-its kind initiative to encourage and sustain corporate philanthropy through volunteerism by arming employees and retirees with a rich set of IBM technology tools targeted for schools and nonprofit organizations. It sets a new standard for corporate volunteerism by combining the strengths and skills of our people with the power of innovative technologies and solutions. Participating members are able to magnify the impact of their volunteerism through IBM Community Grants, a new global program that provides cash and equipment grant awards to the schools and not-for-profit organizations where they volunteer.

On Demand Community offers IBMers with volunteer solutions that enable them to share their enthusiasm for math and science with students and introduce them to the range of exciting, profitable careers in engineering and IT. Presentations include: Encourage math and science education; Preparing for an IT career, Game Tomorrow, and Lego Robotics.

### IBM Technology Camps

IBM's Technology Camps around the world are designed to foster a new generation of scientists and engineers and encourage the thousands of young people who have participated in these programs to pursue careers in math, science and engineering. There number of jobs requiring math is exploding and is a tremendous opportunity for future careers. From video games and virtual worlds to electronic healthcare records and congestion traffic systems, math is making them go. From May – November, programs are held across the United States, Asia, Latin America, Europe and Africa for middle school age girls taking part in IBM's EX.I.T.E. (EXploring Interests in Technology and Engineering) Camps; boys and girls involved in the company's IGN.I.T.E. (IGNiting Interesting in Technology and Engineering) programs, and People with Disabilities participating in IBM's S.T.E.M. (Science, Technology, Engineering and Math) Entry Point workshops.

### Under the Microscope

IBM has designed a dynamic social networking site for the Feminist Press called [Under the Microscope \(underthemicroscope.com\)](http://underthemicroscope.com) to encourage women and girls' interest in science, math and technology. The site: collects stories and lessons from technical women, highlighting those experiences that were turning points for success and helpful advice for the difficult times; encourages teenagers to share their stories, concerns and ideas with their peers and mentors; enables technical women to network with one another; feature blogs from experts and successful career women on topics such as the environment, alternative fuel resources, nutrition/health, career development, events, medical discoveries; and publishes noteworthy and interesting news from around the world.

### Computer Science Curriculum ([www.ibm.com/university](http://www.ibm.com/university)) and ([csta.acm.org](http://csta.acm.org))

IBM and the Computer Science Teachers Association are providing free access to computer science resources for high school teachers. Resources include basic programming and web design principles that teachers can incorporate into computer science, math and science classes.



The resources also include a professional development module focused on project-based learning that is designed to help teachers improve their own instructional strategies.

TryEngineering ([www.tryscience.org](http://www.tryscience.org))

IBM is the technology partner of TryEngineering, a web site owned by IEEE. Designed to appeal to a wide range of audiences, TryEngineering.org, aims to inform teachers, school counselors, parents, and students about engineering and what engineers do through a web site that combines interactive activities with valuable information on careers in engineering.

## **Pathways in Technology Early College High School (P-TECH)**

In September 2011, the New York City Department of Education, The City University of New York (CUNY), New York City College of Technology (“City Tech”) and the IBM Corporation opened Pathways in Technology Early College High School (P-TECH) – an innovative public school spanning grades 9-14. P-TECH’s mission is to provide students with a personalized pathway towards mastery of the skills and knowledge that they will need to make the transition from education to industry. P-TECH students will graduate with a no-cost associate degree, and will be positioned to secure entry-level positions in the highly competitive Information Technology field(s) and/or complete their studies in a four-year higher education institution.

P-TECH opened in Brooklyn, New York with 104 students in the ninth grade, and will add a grade each year for six years. Students come from all boroughs of the city, but predominantly from the surrounding neighborhoods. They were not screened for admission, and no tests were required. However, students did have to demonstrate their interest in P-TECH by attending a school fair or a parent meeting. P-TECH is 67 percent male and 33 percent female, and many of the students will be the first in their families to earn a postsecondary degree.

P-TECH was never planned as a single or charter school serving a small number of fortunate students. The broader goal always has been to apply the knowledge and experiences developed in this pilot school to serve as a model for use by other traditional high schools in New York City, nationally and globally. P-TECH is designed to be the first in a series of similar institutions, and an exemplar of how K-12 schools, higher education institutions and public/private partnerships can substantially raise graduation rates, prepare greater numbers of students to fill good paying jobs in the IT or other fields, and enable more students to successfully pursue postsecondary education.

### **Components of the P-TECH Program**

P-TECH provides students with a school-college-career continuum that helps them understand the direct links between what they are learning today and the worlds of college and work. The school’s rigorous program is designed to inspire students to focus and strive. While P-TECH is a comprehensive school with a number of significant elements, the following provides a brief overview of the core components of the program.

Focus on Early College: Student learning is focused from grade nine on, through a six-year scope and sequence of high school and college coursework to ensure that students will earn an Associate in Applied Science degree in either Computer Science Technology or Electromechanical Engineering Technology, awarded by New York City College of Technology at CUNY, the school’s lead college partner. The curriculum is also aligned with the Common Core standards as the foundation for learning in college, particularly higher education institutions

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*Created in collaboration with the New York City Department of Education, New York City College of Technology, City University of New York and the IBM Corporation.*

with strong math, science and engineering programs. As part of creating the early college culture, students immediately participate in other aspects of the college environment, engaging with college faculty and students.

Focus on Careers: Students participate in an ongoing, sequenced Workplace Learning curriculum informed by current and future industry standards that includes career goals, mentoring, guest speakers, workplace visits and internships. Minimum requirements for entry-level IT jobs, as provided by IBM and other industry partners, have been mapped to the curriculum and are serving as academic benchmarks and targets. A coalition of industry advisors is assuring that the program aligns with industry needs as the IT field evolves. To serve as an added incentive to students, IBM also is making graduates first in line for entry-level jobs – thereby strengthening the continuum from school to college and career.

Focus on Personal Pathways: Each student moves through a personalized academic pathway that is closely monitored by his or her teachers and advisors, based on their individual needs and performance. While the school meets all state mandates for regents and courses, the pace at which the student moves through the high school and associate degree requirements is personalized, and the requirements sequences are intricately intertwined. While all students are expected to meet high school requirements and earn their associate degree in six years, some may proceed at an accelerated pace to earn their associate degree in a shorter time.

Extended Learning Time: In addition to extending college level coursework into what has conventionally been the high school years, the school day and year also are being extended beyond the traditional schedule to include even more individual support for students.

Specialized Staffing: In order to ensure that the model is adequately supported, both the college and industry partners have provided a full-time position to the school: an Early College Liaison and an Industry Liaison. These positions work directly with the leadership, staff and students. In this way the model is continually monitored to ensure effective practice.

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