DIGITS Annual Report
2010 – 2011 Program Year

DIGITS is a sixth-grade classroom program that pairs STEM professionals – individuals who work in science, technology, engineering and math-based companies – with sixth-grade classes throughout the state **to increase students' interest in math and science subjects and careers**.

The primary program message is that if students study/learn math and science, they will have many exciting career opportunities available to them. Students are encouraged to view math and science in a positive context, to see these subjects as the foundation for and gateway to a better future, and to recognize that many important things around them – from prescription medications to electronic and digital devices – are all based on math and science.

This annual report highlights the program's activities and accomplishments during the second year of implementation, 2010 – 2011.

1. Key Results: Increase in Student Participation and Expanded Geographic Reach

- **DIGITS reached 12, 237 sixth-grade students across the state (a 22% increase over last year, exceeding the project goal of 20%) visiting 110 schools in 63 cities and towns** in the Central, Northeast, Greater Boston, (including Boston), and Southeast regions of Massachusetts from October 2010 through June 2011. Of the 110 schools that participated, **42% hosted the program for the second time this year and 75% were Title I schools serving at-risk students**. Also, 14 communities served have populations with more than 50% eligible for free lunch and 13 communities have over 10% population with limited English proficiency.

  TWO-YEAR TOTAL - 22,269 students in 182 schools in 90 cities and towns *participated over the first two years of the program (2009-2011).*

- **DIGITS recruited, trained, and deployed 141 volunteers from 43 companies/state agencies/organizations to deliver the program in the classroom.** Volunteers came from key innovation sectors including information technology, life sciences, engineering and marine sciences. **Nineteen per cent of our volunteers participated for the second time** this year. **Each volunteer saw an average of 87 students**. Also, this year, a state employees union called MOSES – Massachusetts Organization of State Engineers and Scientists – provided 10% of our volunteers, who came from a variety of state agencies.

TWO-YEAR TOTAL - 295 volunteers from* 69 *different companies/state agencies/organizations *were deployed over the first two years of the program.*

- **Volunteer demographics demonstrated the diversity of the group: 42% were female, 25% were from diverse ethnic backgrounds, and 56% had advanced degrees.**

  Demographics for the two years were almost the same, differing by only 1 percentage point.

- **DIGITS extended the reach of the program by opening up two new geographic areas to participation in 2011.** We successfully launched the program in the **Boston Public Schools** (with 13 schools participating), having laid the groundwork last year for accomplishing this important goal. We also began our work in **Western Massachusetts** by implementing the program in 3 schools. Next year, we plan to expand the scope of the program in Western Massachusetts and to begin the process of implementation in Berkshire County.

- **DIGITS achieved greater penetration in participating schools by assigning more than one volunteer to schools with large numbers of sixth graders to try to reach as many students as possible.** In the first year of the project, we assigned only one volunteer per school; this year we tried to match the number of volunteers more closely to the number of sixth-grade students. Our increase in the total number of students reached this year was in large part attributable to this strategy. And, the evaluator reported that "infusing the program in many classrooms in a grade level can contribute to a change in the culture at the school level."

- **Widespread educator support for the program was obtained from seminal organizations in the academic arena** including the Department of Elementary and Secondary Education, Massachusetts Association of School Superintendents, Massachusetts Elementary School Principals Association, and the Massachusetts Secondary School Administrators' Association.

2. Evaluation Highlights: Proven Effectiveness and Positive Evaluations from Teachers, Students, and Volunteers

The findings, collected and analyzed by the independent evaluator, Judy Storeygard, of TERC, Inc. include the impact of the project on participating classroom teachers, students, and volunteers. In sum, **DIGITS received positive evaluations from STEM Ambassadors, teachers, and students, and students continued to show increased interest in STEM subjects and careers as a result of the DIGITS program.**

A. Important teacher outcomes include:

- 95% rated the overall DIGITS experience as very good or good.
- 96% strongly agreed or agreed that the Ambassador's presentation was engaging and informative.
- 97% would recommend the visits to others.

Teachers also appreciated the opportunity to expose their students to information about STEM careers. They found that having an outside speaker talk about STEM validated the importance of learning STEM subjects – math and science – in school.

B. Important STEM Ambassador outcomes include:

- 95% felt very prepared or prepared to do their session.
- 96% judged the quality of materials as very good or good.
- 97% rated the quality of the training as very good or good.

Volunteers were very enthusiastic about their participation in the DIGITS program. The words "engaged" and "fun" came up frequently in their comments. Most were pleased that students seemed genuinely interested in their careers and asked many questions.

C. Important student outcomes include:

- Statistically significant difference from comparison group in students' ability to identify careers that require knowledge of STEM.
- Statistically significant difference from comparison group in awareness of benefits of STEM careers (requiring creativity and teamwork and providing opportunities for travel and good pay).
- Students significantly more likely to choose to participate in the Math Club than the comparison group.

(*Evaluation methodologies differed over the first two years of the program. The first year's evaluation was based on pre- and post-testing of students. The second year's evaluation measured students who participated in the DIGITS program vs. a comparison group who had not. Both years showed statistically significant increases/differences.)*

3. Recognition: Raising Visibility for DIGITS

The program has been able to garner recognition on a number of levels, resulting in increased visibility for the program. Of particular note:

- The DIGITS **logo** was awarded a bronze prize by the Advertising Club of Boston.

- DIGITS was selected to be one of 4 non-profits **featured at the Mass High Tech newspaper "Tech Citizenship" event.**

- The Department of Higher Education evaluated 14 student interest programs they funded. **DIGITS was one of the five found to have measureable (positive) results** and was cited as **reaching more students than any other STEM Pipeline-funded program**.

- Lt. Governor Tim Murray announced in August 2011, at a National Governors Association STEM meeting in Boston that DIGITS was one of six programs that the

state has **endorsed through its @Scale Project**. The six programs were recognized for their success and potential to scale.

- The Project was recently contacted by the author of a **graphic design textbook who would like to include the DIGITS alphabet** in the next edition.

- Organizations from other states and regions of the country **have contacted the program** about the concept, partnerships, results, and evaluation process.

In addition, DIGITS produced school assemblies in various geographic areas of the state. The format for these sixth-grade assemblies included a brief introduction, a career presentation by volunteer Jim Toepel, a former NASA engineer and currently a video game designer for Harmonix, and a performance of the DIGITS theme song/music video by the recording artist Tezz Yancey.

A special feature of these assemblies was the involvement of public officials, who were briefed about the STEM challenge – the shortage of workers in the STEM Pipeline – and the DIGITS solution – increasing student interest in STEM subjects and careers. Last year, DIGITS did an assembly with **Congressman John Tierney** in the northeastern part of the state and **Massachusetts Senate President Therese Murray participated in one in the fall of 2011** in her senatorial district in southeastern Massachusetts. Over this past academic year, we conducted assemblies in the following areas of the state:

- Central Massachusetts assembly featuring **Congressman Jim McGovern** and **Worcester Schools Superintendent Melinda Boone**

- Boston Public Schools assembly featuring **Mayor Thomas Menino, Superintendent Carol Johnson,** and **Secretary of Education Paul Reville**

- Greater Boston assembly in Newton featuring **Commissioner of Higher Education Richard Freeland** and **Newton Schools Superintendent David Fleishman**

According to the evaluator, "Research has shown that programs are more likely to be sustainable if district leaders and other key stakeholders are involved."

Finally, the program extended efforts to enable sponsors, company executives, volunteers, and teachers to stay connected to DIGITS through social media with the development of a DIGITS Facebook page, the creation of a DIGITS blog, and the use of a Twitter account (@digitsproject). Going forward, our focus will continue to be on community building.

4. Funding: Sponsors support DIGITS

The DIGITS Project is an independent project that is affiliated with The Engineering Center Education Trust (TECET), a 501c (3) organization dedicated to STEM education. TECET serves as the host organization and fiscal agent for The DIGITS Project.

Originally funded by the Massachusetts Department of Higher Education STEM Pipeline Fund and the Massachusetts Technology Leadership Council, 2010-2011 DIGITS activities were supported by funding from 11 organizations. This funding made it possible to provide the program free to schools over this past academic year.

- *Lead Sponsor –* ***The MathWorks***
- *Gold Sponsors –* ***Akamai Technologies****,* ***Analog Devices***
- *Silver Sponsors –* ***Mass Life Sciences Center****,* ***SolidWorks****,* ***Verizon****,* ***Cisco, Meditech, PTC, IBM*** *and* ***EMD Serono***

5. Participating Entities 2010 - 2011

CITIES AND TOWNS – (at least one school from the following cities/towns) Andover, Arlington, Attleboro, Avon, Bernardston, Berlin, Billerica, Bolton, Boston, Brookline, Bourne, Chelmsford, Chelsea, Cohasset, Dracut, Everett, Fall River, Fitchburg, Gardner, Grafton, Hamilton, Harwich, Haverhill, Holbrook, Holliston, Lancaster, Lawrence, Leominster, Leydon, Lowell, Lynn, Malden, Marshfield, Mashpee, Medford, Medway, Methuen, Milford, Milton, Natick, New Bedford, Newbury, Newton, Norfolk, Pembroke, Quincy, Rutland, Salem, Sandwich, Shrewsbury, Somerset, Somerville, Southbridge, Spencer, Springfield, Taunton, Tyngsboro, Wakefield, West Boylston, Westborough, Winchendon, Winchester, and Worcester.

COMPANIES/ ORGANIZATIONS/STATE AGENCIES - Abbott Labs, Acme Packet, Akamai, Amman & Whitney, Analog Devices, Avaya, BETA Group, Broadcom, CDM, Comcast, EMC, EMD Serono, IBM, ITA Software, Jacobs Engineering, Litle & Company, MathWorks, Meditech, Millennium, Millipore/Merck, Mott McDonald, ORM, PTC, Pare Corporation, Parsons Brinckerhoff, Raytheon, SEA Consultants, Shire, SolidWorks, Symantec, University of Massachusetts IT Department, VHB, Verizon, Vertex, Woods Hole Oceanographic Institute, and a consulting engineer; Massachusetts Departments of Conservation and Recreation, Environmental Protection, Public Health, Fisheries and Wildlife, Mental Health, Public Safety, and Occupational Safety.

6. Acknowledgements

DIGITS is very grateful to our sponsors, partners, volunteers, principals, and teachers for their involvement in the success of the DIGITS program. Initially developed by a coalition of STEM trade associations – Mass Technology Leadership Council (MassTLC), Mass Network Communications Council (now a part of the Mass TLC), The Engineering Center, Mass Biotech Education Foundation, Mass Medical Device Council and the New England Clean Energy Council, DIGITS was created in 2008, with creative input from advertising agency Arnold Worldwide, and first implemented in classrooms around the state during the 2009-2010 academic year.

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Quotes from Evaluations – 2010-2011

Quotes from Students:
He inspired me. I never thought that being an engineer could be so amazing, fun, or cool. I can't even describe it. The whole presentation was interesting.

It was really really really really fun. If there was any other rating beyond great…like magnificent… I would choose that.

It was really fun and I learned a lot too. Also he showed us things instead of telling us.

DIGITS made math and science fun and showed us without both math and science we wouldn't have half of the technology we have today.

I told my family we learned from a scientist who tested water.

The presentation taught me a lot of different things and I am thinking differently about math.

I learned how a car's airbags come out and how that is the same motion technology for the Wii.

I learned that you need math to make cell phones, computers and video games.

It was fun and exciting. We learned about awesome jobs and about new technology. On a scale of 1 to 10, I would give it an 11.

Quotes from Teachers:
It brought the real world into the classroom.

Using alphabet stickers with students making their names was a good start to interest students …in math and science as all could take an active part, including a highly special needs group whom I invited to participate.

I liked the enthusiasm of the Ambassador. It was evident she loved her career choice and did a good job at explaining that there were many ways (jobs) where she could apply her skills.

One Ambassador brought in a temperature probe and sprayed compressed air on it so the students could see it lowering the temperature. He elicited how compressed air works by asking students to think about a refrigerator. Then students took turns using the probe to measure their hand temperature.

An Ambassador from Mexico was able to make a special connection with the Spanish-speaking students in the class.

It was inspirational and got kids wanting to work hard so they can get good jobs when they grow up.

After realizing from his first session that students were familiar with and curious about diabetes, an Ambassador who works in the pharmaceutical industry described how insulin is produced.

Students were engaged and inspired by our Ambassador. His words were meaningful, relevant, and the students are now telling me that they want to get better at science and math because their future in their field of interest depends on it.

The students need to hear how important STEM subjects are for success in school and future jobs. They hear this from their teachers, but the excitement of having a class visitor with the message makes more of an impact.

Quotes from Ambassadors:
The response from students and teachers exceeded my expectations.

I received a thank-you card signed by students that attended and even by some who missed that day – but heard about it – indicating that a "buzz" was created.

I showed some agar plates with micro-organisms. The students were thrilled with the agar plates and were amazed to know that companies such as mine make life-saving pharmaceuticals using living cells.

I received a lot of great questions from the students, which leads me to believe they were interested and excited about what I had to say.

Some of the kids commented "that was the best science class ever". The teacher was very impressed and wants me back again. The principal also listened in for part of one of the classes and a para-professional was also in one of the classes, and they too thought the presentation was great.