

## **Case Study 1: STEM Education Program of the Urban League of Greater Chattanooga**

### Challenges Targeted by the Program

When broadband is used to drive new business activity and economic growth, then it will create jobs. The challenge is to ensure that there is a pool of properly skilled labor in communities hard-hit by job losses to take those jobs. Having that pool of labor in itself will boost economic activity and job creation because businesses, both domestic and foreign, are likely to invest where there is a ready supply of labor with skills to match their needs.

The workforce in construction and retail that was created in abundance during the boom was relatively low skilled in technology, leaving the economy with a shortage of technologically skilled workers. For example, in Nevada between 1997 and 2007, which was a period that included the extraordinary boom in construction, high school graduation rates declined by a record 23.9 percentage points (to be the nation's lowest ranked state at 41.8 percent) while the national high school graduation rate increased by 3.1 percentage points in that time.<sup>1</sup> Although there are no studies that establish a positive statistical correlation between the boom in construction and the increased high school dropout rate and while acknowledging that other factors impact on graduation rates, we believe that the boom in construction drove some individuals who would have pursued further skills to obtain easily available construction jobs.

Another indicator that the current workforce has inadequate technology and related skills is the fact that, in 2007, only 16 percent of bachelor's degrees in the U.S. were awarded in STEM, compared to 28 percent in Germany.<sup>2</sup> The appropriate comparisons for the U.S. in this regard are other wealthy, industrialized countries like Germany and not developing countries like China because low-starting bases and social factors in developing countries push students into STEM fields, but this growth slows down when those economies reach more maturity.

### Research Underlying the Program Design

There is work to be done over the medium to long term to create a labor force that has the skills suitable for jobs created in broadband and related technology sectors. The STEM Academy of the Urban League of Greater Chattanooga ("**ULGC**") is founded on a medium- to

long-term strategy to build a labor force among African Americans and other under-represented urban communities for broadband jobs and businesses.

STEM Academy of the ULGC is focused on African Americans and other under-represented minorities because of their underrepresentation in STEM studies and STEM careers:

- *Low college STEM graduation rates:* 20.8 percent of all African American high school students who entered college between 1995–96 and 2001 entered STEM fields, which is nearly comparable to white American students (at 21.5 percent).<sup>3</sup> Of these students, 31.7 percent of the African American students graduated with a degree or certificate in STEM related fields, compared to white American students (at 43.9 percent).<sup>4</sup>
- *Gaps in STEM start to emerge in early years:* In early elementary school, African-American students already lag behind in mathematics and science proficiency. For example, in California, 47 percent of African American 2<sup>nd</sup> graders achieved proficiency in mathematics, compared to 76 percent of white American students, which amounts to a 29 percentage point gap.<sup>5</sup> By 6<sup>th</sup> grade, proficiency rates have decreased and the gaps have grown -- 32 percentage points separate African American and white American 6<sup>th</sup> graders in mathematics proficiency.<sup>6</sup>
- *Inadequate access to effective STEM education:* Approximately 3,000 schools serving about 500,000 high school students don't offer Algebra II classes and more than 2 million students in 7,300 schools didn't have access to calculus courses in the 2009-2010 school year.<sup>7</sup> At schools where the majority of students are African-American, teachers are twice as likely to have only one or two years of experience teaching as compared to schools within the same district that have a majority- white student body.<sup>8</sup>

Rectifying these disparities is essential for equal opportunity. It is also an efficient way to grow a skilled labor force for broadband jobs because the low starting base of these communities in STEM means that there is scope for fast and substantial increases.

Research indicates that solid preparation from an early age, hands-on experience, school-based learning in the workplace, exposure to role models in the fields, and access to peers who share

these interests is critical to promoting interest in STEM.<sup>9</sup> STEM Academy of the ULGC's focus on early immersion in STEM for middle school students was driven by this research and also its track record on the ground. ULGC also leverages greater adoption of broadband and related activities like social networking in these communities, as discussed earlier in this report, and leverages them to build interest in STEM studies.

### Solution

STEM Academy of the UL of Greater Chattanooga was launched in 2007. It provides a research-based, hands-on math and science approach to learning and student engagement. The STEM Academy was established to improve state standardized test (TCAP) scores in math and science and to introduce students to a variety of careers in STEM.

When launched in the summer of 2007, the STEM Academy was aimed at 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> graders, though it was concluded after evaluation of the first year that it was best suited for middle school children in grades 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup>. Several observations led to this decision:

- UL of Greater Chattanooga's ability to influence high school class selection which in turn can impact their career choices
- VEX Robotics Program which is an integral part of the STEM Academy was too complicated for younger children

Currently the STEM Academy impacts five middle schools and takes place after school on 2 to 3 days a week, giving participants an additional 6-9 hours of hands-on instruction in mathematics and science each week. The STEM Academy extends from October until March (after standardized testing). It includes a STEM summer camp component held in June four days a week from 9am – 4pm, intended to build on skills learned throughout the academic year.

The curriculum of the STEM Academy is aligned with Tennessee State Curriculum Requirements and includes opportunities to increase reading and writing proficiency. Children who apply to the STEM Academy and STEM summer camp are chosen based on their interest in STEM careers or their desire to learn more about science and engineering.

## Overview of the Program

The STEM Academy of the ULGC is offered during the school year as an after school program and then in the summer as a summer camp.

The school year program is held over a 20 week period from November to April on Monday through Thursday between 3:00 pm to 5:30pm. The program was started at the premises of the ULGC but was later expanded to schools in partnership with the Chattanooga School District. Chattanooga School District also feeds students into the program. The program uses highly-qualified teachers and adheres to the Society for Automotive Engineers' *A World in Motion* and Carnegie Mellon University's *VEX Robotics* curricula.

The summer program lasts for five weeks and is from 9am to 4pm on Monday through Thursday, with Thursday being the field trip day where students visit a variety of science and technology destinations in the Chattanooga area including AT&T facilities, the University of Tennessee – Chattanooga (UTC) SIM Center, and River Gorge Explorer. It is in these instances that students are provided one-on-one contact with professionals in STEM careers.

The program also incorporates a parental component by providing an orientation at the start of the program and then monthly reports to keep parents engaged with the progress of their children.

## Evaluation of the Program

More than 615 students have participated in the STEM Academy since its inception in 2007. The average student gain in Reading/Language Arts is 31.65 percent and in mathematics is 31.92 percent. Students reported a 20 percent increase in their knowledge of STEM Careers and their desire to learn more about careers in science and technology. Evaluation for the STEM Academy includes a "pre" and "post" survey; and, at this time, the STEM Academy does not track students through High School. However, additional evaluation tools are being reviewed to track students after their completion of the program.

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<sup>1</sup> Diplomas Count, *Progress on Graduation Rate Stalls: 1.3 Million Students Fail to Earn Diplomas; Report Identifies Epicenters of the Dropout Crisis*, *Education Week*, June 10, 2010 (see at [http://www.edweek.org/media/ew/dc/2010/DC10\\_PressKit\\_FINAL.pdf](http://www.edweek.org/media/ew/dc/2010/DC10_PressKit_FINAL.pdf)).

<sup>2</sup> National Science Foundation, *Science & Engineering Indicators 2010*, Appendix Table 1.1.

<sup>3</sup> National Center for Educational Statistics, *Stats in Brief – July 2009*, U.S. Department of Education, p.15.

<sup>4</sup> *Ibid.*, at p.15 (see at <http://nces.ed.gov/pubs2009/2009161.pdf>).

<sup>5</sup> Allison Scott, *Dissecting the Data: The STEM Education Opportunity Gap in California*, Level Playing Field Institute, November, 2010, p.6.

<sup>6</sup> *Ibid.*, 7.

<sup>7</sup> Office of Civil Rights, *Civil Rights Data Collection – June 2011*, U.S. Department of Education.

<sup>8</sup> *Ibid.*

<sup>9</sup> Linda Brody, *Measuring the Effectiveness of STEM Talent Initiatives for Middle and High School Students*, Johns Hopkins University, 2006.