

# The Case for STEM Education and Career Development

## Why are STEM education and career exploration important?

Our modern society is built on science and technology. In order to be educated and engaged citizens of the world in the 21<sup>st</sup> century, everyone needs to know and understand the basics of science, technology, engineering, and mathematics (STEM).

For our nation, and our region, to remain economically and environmentally strong and sustainable, we must recruit from among an informed citizenry the next generation of scientists, technologists, engineers, and mathematicians who will solve the complex problems of our times. This is important for many reasons: economic growth, environmental protection, and decision-making on health and energy issues. Our nation's future hinges on our ability to prepare our next generation to be innovators in science, technology, engineering, and math.

Addressing the urgent need for a well prepared technology workforce, as well as a scientifically and technically literate populace, requires coordination among the key stakeholders who can have a meaningful impact in this area—higher education, schools, business, and parents. These coordinated efforts must lead directly to student programming and experiences in STEM fields in order to make a difference.

In 2007, the National Academies of Science published *Rising Above the Gathering Storm*, a major report on the status of science and technology in the United States, and the implications for our economic prosperity in the 21st century. The report committee concluded that a primary driver of the future economy and concomitant creation of jobs will be *innovation*, largely derived from advances in science and engineering. While only four percent of the nation's work force is composed of scientists and engineers, this group disproportionately creates jobs for the other 96 percent.

## Important statistics:

Student Achievement:<sup>1,2,3</sup>

- 3 out of ten Americans say they are bad at math. Among 18- to 24-year olds, it's almost 4 in ten.
- In 2009, just 34 percent of U.S. eighth-graders were rated proficient or higher in a national math assessment, and more than one in four scored below the basic level.
- In an international exam given in 2006, U.S. high school students ranked 21<sup>st</sup> in science and 25<sup>th</sup> in math out of 30 industrialized nations.
- Only 43 percent of U.S. high school graduates in 2010 were ready for college-level math, and only 29 percent were ready in science.

#### Teacher Qualifications<sup>4</sup>:

- The World Economic Forum ranks the United States 48<sup>th</sup> in the quality of math and science education.
- Sixty-nine percent of United States public school students in fifth through eighth grade are taught mathematics by a teacher without a degree or certificate in mathematics.
- Ninety-three percent of United States public school students in fifth through eighth grade are taught the physical sciences by a teacher without a degree or certificate in the physical sciences.

#### U.S. Competitiveness<sup>1,4</sup>:

- In 2009, 51 percent of United States patents were awarded to non-United States companies.
- In 2009, only four of the top 10 companies receiving United States patents were United States companies.
- In 2000 the number of foreign students studying the physical sciences and engineering in U.S. graduate schools surpassed the number of American students.
- China has now replaced the United States as the world's number one high-technology exporter.
- The United States ranks 27<sup>th</sup> among developed nations in the proportion of college students receiving undergraduate degrees in science or engineering.
- In 2009, the largest number of students receiving STEM related PhDs in the United States were Chinese nationals.

#### Work Force Demands<sup>1,4</sup>:

- For individuals in 21<sup>st</sup> century America, skills in math and science will be ever more important for self-sufficiency, because a technology-driven economy increasingly demands an educated and globally competitive workforce. The fastest growing economic clusters include biotechnology (biomedicine), information technology, environmental technology, and advanced manufacturing.
- According to the U.S. Bureau of Labor Statistics, of the 10 fastest growing occupations nationally, eight are related to science, math, or technology.
- The labor force needed to support STEM industries is in short supply, both nationally and regionally. As of 2010, national jobs in science and engineering had increased by 2.2 million.
- Almost one-third of U.S. manufacturing companies responding to a recent survey say they are suffering from some level of skills shortages.

In the Pittsburgh Region:

- Approximately 11,600 green energy jobs will be added by 2015. (Pennsylvania Department of Labor and Industry, 2010)
- More than 100,000 manufacturing employees needed just to replace the existing retiring workforce.
- More than 2,000 STEM positions remain unfilled locally. (Pittsburgh Technology Council Job Postings, 2010)
- Large numbers of STEM employees in health care (nurses, medical technicians, medical researchers, scientists, and doctors) are retiring.
- Growing technology sectors in alternative energy, biotechnology, entertainment technology and IT, robotics, and more require a skilled workforce. (Pittsburgh Technology Council, 2010)

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