

# Preparing WIA Youth for the STEM Workforce

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## What Is STEM and Why Is It Important?

STEM fields – Science, Technology, Engineering, and Mathematics – are the foundation of both the current economy and the knowledge-based, innovative global economy that is expected to provide the high-quality jobs of the future. Therefore, there is a growing consensus that the majority of workers must have a solid foundation in STEM to be productive.

Knowledge of STEM fields is also valuable in everyday life – for making good decisions about issues such as medical choices, recycling, energy use, and climate change. For youth in Workforce Investment Act (WIA) programs to be successful employees and citizens, they will need STEM skills and knowledge.

## The STEM Economy

The U.S. has benefited greatly from its leadership in science and technology. Some economists have estimated that more than 50 percent of economic growth in the U.S. since World War II has been due to scientific and technological innovation. Future economic growth is also likely to rely on advancements in STEM-related occupations.

- The Bureau of Labor Statistics has forecast that through 2012, employment in science and engineering occupations will grow about 70 percent faster than employment in other occupations; by 2014, employers expect to hire 2.5 million new STEM workers.
- Occupations in STEM fields generally provide good salaries, benefits, and opportunities to advance.
  - The average wage or salary for STEM occupations in May 2005 was \$64,560; the average for all occupations was \$38,870.
  - Average earnings in 2005 for the highest-paid group – engineers – was \$74,670; the average for the lowest-paid group – life, natural, or social sciences technicians – was \$39,920.

However, business and governmental leaders have become concerned that the United States is losing its status as a preeminent scientific and technological innovator.

- In 1970, half of all people who held science and engineering doctorates in the world were Americans; by 2010, the percentage is projected to be 15 percent.
- The world average of all bachelor's degrees received that are earned in natural sciences or engineering is 23 percent; the U.S. average in 2000 was 11 percent.
- U.S. youth in 4th, 8th, and 12th grades score substantially below their international peers in science and mathematics; levels of secondary school graduation and higher education attainment in the U.S. have also fallen relative to other countries.
- The U.S. ranks 12th among Organisation for Economic Cooperation and Development (OECD) members in broadband computer connections per 100 inhabitants.
- The international competitiveness ranking of the U.S. fell from first to sixth in 2006-2007.
- Foreign-owned companies and foreign-born inventors now account for nearly half of all patents granted in the U.S.
- According to a 2005 survey of 800 U.S. manufacturers, more than 80 percent reported experiencing a shortage of qualified workers.

- Manufacturers and other businesses in the fastest growing sectors of the U.S. economy expect a shortage of 12 million qualified workers with STEM skills; Ohio manufacturers also anticipate a need for more and better-qualified workers in high-skill manufacturing.

Four trends have negatively affected the STEM workforce in the U.S.

- Increasing numbers of high school graduates lack the academic background to pursue a STEM degree in college.
- Enrollment in STEM studies is down in postsecondary education, including 2- and 4-year colleges, graduate schools, and postgraduate science and engineering.
- More than 50 percent of the current science and engineering workforce is nearing retirement age; 25 percent will reach it by 2010.
- Fewer foreign-born STEM professionals are staying in the U.S. to live and work.

## Understanding STEM

All youth (and adults) need to understand how the physical world works and to be able to apply knowledge across the STEM fields to solve problems and make decisions.

- **Science.** Knowledge of the scientific process in the fields of physics, chemistry, biological sciences, and earth and space sciences in order to understand the natural world and participate in decisions that affect life and health, earth and environment, and technology
- **Technology.** Ability to use, manage, understand, and assess technology to satisfy perceived human needs and wants through innovation, change, or modification of the natural environment
- **Engineering.** Understanding of the design process that systematically and creatively applies science and mathematics to develop practical outcomes such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems
- **Mathematics.** Ability to pose, formulate, solve, interpret, and communicate solutions to mathematical problems in a variety of situations

STEM knowledge is becoming essential whether workers are on the factory floor or in the executive suite. A recent study found that employers want both entry-level and managerial workers to have the types of problem-solving and teamwork skills that the study of STEM can develop. The innovative workforce of the future will collaborate to create new products, services, and industries and will ideally exhibit the following 3 characteristics.

- **Expertise.** A deep understanding of a discipline
- **Breadth.** Ability to work across disciplines to form teams and collaborate effectively
- **Diversity.** Willingness to incorporate multiple perspectives from an intellectually and demographically diverse population

## The Role of WIA Youth Programs

As part of the workforce development system, WIA youth programs have a role to play in developing STEM talent. WIA programs are well positioned to work with the secondary and postsecondary education systems, community and faith-based organizations, employers, and other governmental agencies to expand the STEM pipeline beyond the traditional STEM employee base (largely white or Asian males). Here are some strategies that WIA youth programs can follow.

- Support the education of youth in STEM.
  - Offer high-quality tutoring in mathematics and science.
  - Provide mentors from STEM fields.
  - Recruit mentors from minority professional organizations.
    - Women in Technology
    - Building Engineering and Science Talent (BEST)
    - National Society of Black Engineers (NSBE)
    - Society of Hispanic Professional Engineers (SHPE)
  - Encourage participation in summer or out-of-school enrichment activities.
  - Become knowledgeable about alternative educational pathways that can lead to competence in STEM, such as apprenticeships, on-the-job-training, online or part-time educational options, and nonacademic training courses.

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  - o Offer support and guidance as youth transition from high school to a 2- or 4-year college or advanced training.
- Support youth’s career aspirations in STEM.
  - o Encourage youth to see themselves in STEM jobs.
    - Invite speakers who work with STEM to speak at job fairs.
    - Provide descriptions of STEM jobs at a variety of educational levels. (See *InDemand* [<http://www.careervoyages.gov/indemandmagazine-stem.cfm>] for examples.)
    - Counter stereotypes and assumptions about STEM workers, such as “You have to be really smart or nerdy or have a doctorate to work in STEM.”
  - o Develop strategies that encourage women, underrepresented minorities, and youth with disabilities to consider STEM careers.
  - o Organize job shadowing, work experiences, summer employment opportunities, and internships in STEM industries and companies.
  - o Provide work readiness activities to youth.
  - o Use career pathways or career lattice models that provide intermediate educational and professional steps to a STEM career when developing Individual Service Strategies (ISSs) for youth.
- Support regional economic development and employment in STEM.
  - o Participate in efforts to align local and regional business needs and workforce preparation.
    - Gather data on the growth and expansion of local and regional STEM-related companies and industry sectors.
    - Analyze the skill needs of industry and the availability of the necessary skills and education within the community.
  - o Collaborate with business, educational institutions, and community organizations to offer appropriate education, training, and other services to youth.

National initiatives to develop the STEM workforce can be valuable resources.

- **The President’s High Growth Job Training Initiative** engages business and education with the workforce development system in 14 industries expected to add new jobs, many STEM related.
  - o Advanced manufacturing
  - o Aerospace
  - o Automotive
  - o Biotechnology
  - o Construction
  - o Energy
  - o Financial services
  - o Geospatial technology
  - o Health care
  - o Homeland security
  - o Hospitality
  - o Information technology
  - o Retail
  - o Transportation
- **Community-Based Job Training Grants** improve the capacity of community colleges to train workers in regionally needed skills.
- **Workforce Innovation in Regional Economic Development (WIRED)** focuses on talent development as an economic driver in broad, often multijurisdictional, regional areas, especially in regions that have been hurt by global trade or natural disasters.

These and other initiatives are designed to provide skilled and capable employees to industry and good-paying, high-quality jobs to workers. WIA programs can help youth to be part of an innovative STEM workforce that will be critical to the economic health of Ohio and the nation.

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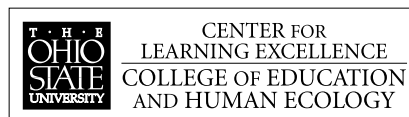
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