The Community College Role in STEM Workforce Education

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Community College STEM Education

- Transfer preparation in STEM – associate degree and transfer, or transfer without degree

- Workforce preparation for STEM occupations – associate degrees, long-term and short-term certificates

- Continuing education in STEM occupations – typically noncredit courses and certificates

Definitions of Community College STEM Fields

- Typical definitions of STEM include technicians in computer and mathematical sciences, architecture and engineering, and life and physical sciences

- Based on this definition, 23% of STEM workers have an associate degree or some college (Department of Commerce, 2011)

- Recent Brookings report proposes an expanded definition of STEM that includes blue-collar jobs requiring postsecondary training, raises questions about typical definitions.

- Based on this definition, 36% of STEM workers have a postsecondary certificate or associate degree (Rothwell, 2013)

Technician Work and Education

- Barley (1996) - technician work contains use of complex technology, contextual knowledge and skill, abstract representations of phenomena, community of practice.
- Hull (2011) - technicians understand technology, solve problems, have strong hands-on skills, spatial abilities, operate equipment
- NSF's Advanced Technological Education (ATE) program includes the following fields in community college technician education:
  - Agricultural technology and biotechnology
  - Chemical and process technology
  - Engineering technology
  - Environmental technology
  - Information technology
  - Manufacturing technology and nanotechnology

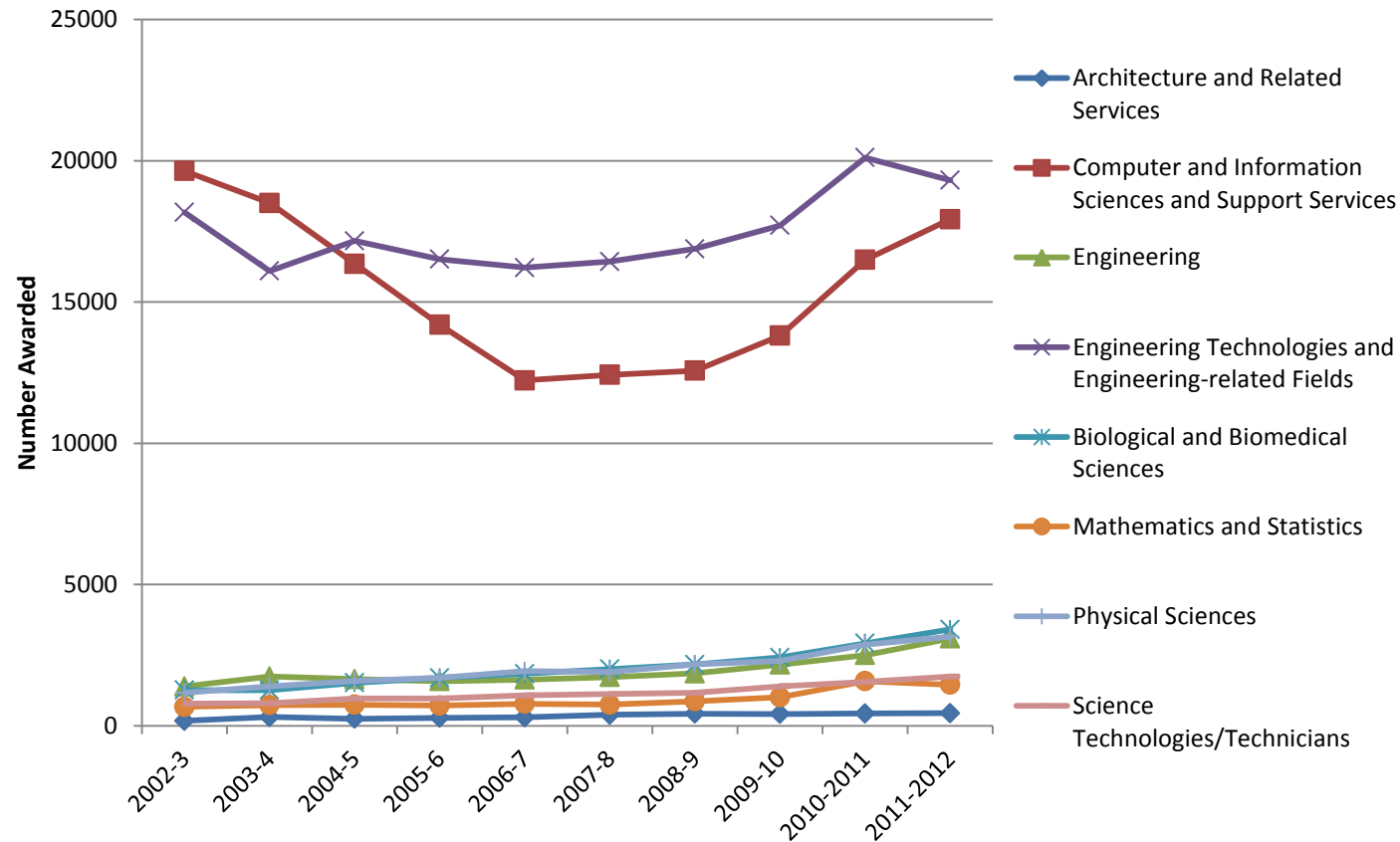# Community College STEM Fields, Function and Definition

Broad CIP Code Categories	Primarily transfer	Primarily workforce	Typical definitions	ATE definition	Brookings definition
Architecture and related services	x		x	x	x
Computer and Information Sciences and Support Services	x	x	x	x	x
Engineering	x		x	x	x
Engineering Technologies and Engineering-related Fields		x	x	x	x
Biological and Biomedical Sciences	x		x	x	x
Mathematics and Statistic s	x		x	x	x
Physical Sciences	x		x	x	x
Science Technologies/Technicians		x	x	x	x
Military Technologies and Applied Sciences		x	x	x	x
Precision Production*		x		x	x
Agriculture, Agriculture Operations, and Related Sciences*		x		x	x
Natural Resources and Conservation*		x		x	x
Communication Technologies/Technicians and Support Services*		x		x	x
Mechanic and Repair Technologies/Technicians*		x			x

* Only some of the more detailed CIP codes are included in definitions.

Number of Community College Graduates in STEM Fields in 2012

	Total	Associate Degrees	Long-term Certificates	Short-term Certificates
Engineering Technologies and Engineering-related Fields	36,833	19,313	11,024	6,496
Computer and Information Sciences and Support Services	34,470	17,929	12,056	4,485
Biological and Biomedical Sciences	3,526	3,412	57	57
Engineering	3,446	3,091	227	128
Physical Sciences	3,197	3,157	23	17
Science Technologies/Technicians	2,596	1,741	417	438
Mathematics and Statistics	1,477	1,452	15	10
Military Technologies and Applied Sciences	913	883	27	3
Architecture and related services	680	443	144	93

Associate Degrees in STEM Fields at Community Colleges, 2002-2012

Source: U.S. Department of Education, NCES, 2002-12 IPEDS

Community College STEM Workforce Programs

- Most are highly structured
- Often have on-going industry involvement in advisory panels
- Vary in emphasis on transfer
  - Some have articulation agreements with four-year schools
  - Applied Baccalaureate is growing, and common in STEM fields

Challenges for Community College STEM Workforce Programs

- Student recruitment

- Retention and completion

- Labor market alignment
  - Link between credentials and local labor market
  - Cultivating strong relationships with employers
  - Variation in labor market dynamics by field

- Balancing employer needs with student needs, particularly w/r/t advancement, transfer

ATE Program

- $64 million in FY2012 funding
- Approximately 180 projects, 43 centers, and 7 targeted research projects
- Reforms include: curriculum development, professional development, partnerships with high schools (i.e. dual enrollment, outreach and recruitment), connections with 4-year colleges and universities (i.e. articulation), relationships with industry

Trade Adjustment Assistance Community College and Career Training Grants (TAACCCT)

- Three rounds of funding to community colleges to improve workforce programs

- $1.5 billion investment

- Many focus on programs in STEM fields

- Reforms include: career pathways development, transfer/articulation, employer partnerships, work-based leaning, online and technology based instruction, tracking labor market outcomes

Issues Facing Community College STEM Workforce Programs

- Definition of CC STEM workforce is not clear

- Regardless of definition, CC STEM workforce programs are common

- CC STEM workforce programs share similar challenges as other CC STEM programs

- Additional challenges include articulation, career pathways development, balancing employer needs and student goals