

# **The NSF Advanced Technological Education Program**

## **Educating and Preparing the Emerging Technology Workforce**

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# Disclaimer

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## **Middle Skill Occupations\***

- **Although there is unemployment many jobs go unfilled**
- **45% of job openings need middle skills**
- **Not well advertised**
- **Jobs are both destinations and stepping stones**
- **Require some post secondary education**

[\\*http://www.insidehighered.com/news/2009/02/27/brookings](http://www.insidehighered.com/news/2009/02/27/brookings)

# Middle Skill Occupations

- **Science and Engineering Technicians**
- **First Line Supervisors**
- **Inspectors**
- **Machinists and Industrial Maintenance**
- **Welders**
- **Policemen and Firemen**
- **Medical Technicians**



# Job Prospects

**The Center on Education and the Workforce at Georgetown University\* estimates between now and 2018**

- **approximately 7,000,000 middle-skill job openings**
- **will be filled by workers with an associate's degree or occupational certificate.**
- **Average income about \$46,000 for employees with certificates (more than 27% of BA holders).**

\*Google Pathways to Prosperity.





# Community Colleges are the Answer

- **Maintain open access to postsecondary education**
- **Prepare students for transfer to four year colleges and universities - teachers**
- **Prepare students for the workplace – 21<sup>st</sup> Century Skills**
- **Provide non-credit courses – English as a second language, remedial mathematics, skills upgrading, enrichment programs.**

# 21<sup>st</sup> Century Skills

- **NAS studies on 21<sup>st</sup> century skills**
  - ✓ what they are
  - ✓ teaching them in STEM
  - ✓ assessing them
    - Need to do formative testing
- **Consensus study on Deeper Learning**



# National Nanotechnology Infrastructure Network (NNIN)

- An integrated national network of user facilities providing researchers open independent hands-on access to resources, instrumentation and expertise in all domains of nanoscale science, engineering and technology
- \$17 M per year to 14 universities around the US
- Facilities for 25% of experimental Ph.D. students
- Areas include electronics, optics, materials, MEMS, physics, chemistry, life sciences medicine, Earth sciences.





## NNIN (2)

- 330 small companies (740 users) many of whom from 5 -10 years ago are transitioning into public companies
- 180 users from medium and large companies
- Call in, get response from site user staff, consultation, two page proposal, scheduling and training
- Connections for technician employment and facilities for companies
- [www.nnin.org](http://www.nnin.org)



# NGA Center for Best Practices Report

- A Sharper Focus on Technical Workers – How to Educate and Train for the Global Economy
- <http://www.nga.org/Files/pdf/1007Technicalworkers.pdf>
- Advanced Manufacturing Technical Education Collaborative (AMTEC)
  - Maintenance technicians
  - Kentucky Community and Technical College System
  - 30 Community Colleges in 12 states
  - 34 auto-related plants – GM, Toyota, Ford, suppliers
  - connected to other ATE Centers – CARCAM and CAAT - Others



# Recommendations

- Champion technician education
- Focus on sectors that have major economic impact
- Use state funds to encourage CC collaboration and innovation
- Develop multi-state partnerships focused on high-quality, industry-valued education
- Require comprehensive outcome data to assess student outcomes and inform policymakers



# ADVANCED TECHNOLOGICAL EDUCATION

The ATE program promotes improvement in the education of science and engineering technicians at the undergraduate and secondary school level and the educators who prepare them, focusing on technicians for high-technology fields that drive the nation's economy. The program, in its 18<sup>th</sup> year, focuses on two-year colleges and expects two-year colleges to have a leadership role in all projects.



# TECHNICIAN OCCUPATIONS



- **Bio-Related: BioTech, Agriculture, Environment**
- **Energy Related: Alternative Fuels, Sustainability, Processes**
- **Electronics: Nanotech, MEMS, Optics**
- **Engineering Technologies: Maritime**
- **Information Systems: GIS/GPS, Cyber Security, Telecommunications**
- **Manufacturing: Automotive, Machining, Mechatronics, Medical Devices**
- **Teacher Preparation**
- **Research and Evaluation**

# ATE Program Budget

## ➤ Funding

- \$51.6 million FY 2009

  - 70% goes to community colleges

- \$64.0 million in FY 10 and FY 11

## ➤ Receive

- 275 Proposals - Fund about 25-30%

In the future, it is expected that there will be more emphasis on community colleges in other programs.



# ATE Impact: Annual Survey



- **Western Michigan Evaluation Center**
- **Mainly monitoring; Over 95% completion**
- **60,000 students – 25 % Female; 45% minority**
- **46,000 faculty - 30% secondary**
- **900 articulation agreements with secondary schools and 550 with four year schools**
- **Develop or modify 450 courses per year**
- **Partnerships with 4900 businesses and industries, public institutions, and other educational institutions provides intellectual contributions and an additional \$20 million in monetary support**

# ATE TRACKS



## **1. Centers: 40% of funding**

**National 9**

**Resource 11**

**Regional 18**

## **2. Projects including small projects 220 - 42 %**

## **3. Targeted Educational Research 6 - 4%**

## **4. SBIR Phase II supplements**



# **ATE National Resource Centers**



- **Articulate a vision for technological education in the future in a specific field**
- **Provide a vision for how to reach and sustain it**
- **Provides leadership and mentorship for all of the projects and regional centers in the field based on prior work**
- **Act as clearinghouse for educational materials and methods**
- **Form partnerships with two-year colleges, four year colleges and universities, high schools, industries, government and professional societies**
- **Evaluate the effectiveness of their activities**
- **Professional development, etc. would be a project.**

# Bio-Link



- [www.bio-link.org](http://www.bio-link.org)
- Established as a National in 1998, became a Resource Center in 2005, re-established as National Center in 2009 as a result of a national meeting on biotechnology
- Coordinates regional centers in Washington, Texas, Wisconsin, North Carolina and Pennsylvania that emphasize different aspects of biotechnology
- Works with centers funded by the Department of Labor

# Bio-Link



- **Provides professional development, improves curriculum, creates a system that promotes sharing of information**
- **Educates instructors and principal investigators of other projects and centers**
- **Established close relations with local and national biotechnology industries, other two- year colleges, four-year colleges and universities and high schools**

## Biotechnology Education, Organizations, and Industry

Click on the Map for extended view of biotech in your region!



Bio-Link Centers



## **Regional Centers**

**Regional focus – serves the needs of industry in a region**

- **Collaboration among colleges and secondary schools**
- **Activities include curriculum adaptation, faculty and teacher development, establishment of partnerships, and recruitment and retention strategies, all directed toward regional workforce needs**
- **Clear, measurable impacts on quantity and quality of students for the workforce**
- **Sustained partnership with regional industry after funding ends**

# Northeast Biomanufacturing Center



- [www.biomanufacturing.org](http://www.biomanufacturing.org)
- Builds and sustains local and regional partnerships among industry, educational institutions and government to create sustainable learning communities around biomanufacturing and educate and sustain a qualified workforce in use of bio-production methods
- 22 industry partners, and 14 educational partners from 10 states

# Projects

[www.ateprojectimpact.org](http://www.ateprojectimpact.org)

Projects can focus on one or more aspects of:

- Program Improvement;
- Professional Development for Educators;
- Curriculum and Educational Materials Development;
- Teacher Preparation  
([http://www.aacc.nche.edu/Resources/aaccprograms/ate/Documents/teacherprep\\_stem.pdf](http://www.aacc.nche.edu/Resources/aaccprograms/ate/Documents/teacherprep_stem.pdf))
- Research on Technician Education; or
- Institution-Level Reform of Technician Education



# Working with Industry

- **Focus on the competencies that industry requires of technicians**
- **Get decision makers from industry involved**
- **Provide flexible pathways for students**
- **Help industry see that two-year colleges can educate their workers (CAPT, NWCET)**
- **T-shaped technicians - depth in one area but broad understanding of job.**





# Technical Competency

- **Link companies and colleges in education of technicians**
- **Backward Design**
  - **Establish learning goal**
  - **What will students know and be able to do**  
- **assessment**
  - **Then, and only then, develop activities**
- **DACUMS - Developing a Curriculum – with technicians in industry**
- **Validation by industry**



# 21<sup>st</sup> Century Skills



- **Work in teams**
- **Communications – oral and written**
- **Non-routine problem solving**
- **Adaptability**
- **Entrepreneurial – sees what needs to be done and does it as well as understanding business**

**At least as important as technical skills.  
Industry cannot teach these skills.**

# Problem Based Learning

- **Industry non-mission critical problem about which you build a course or part of a course; a solved problem is a case**
- **Brings the workplace into the classroom**
- **Teaches 21<sup>st</sup> century skills**
- **Not typical instruction – hard for faculty**
- **Not traditional learning – hard for students**



# Resources

- [www.nsf.gov/ate](http://www.nsf.gov/ate)
- [www.atecentral.net](http://www.atecentral.net)
- [www.atecenters.org](http://www.atecenters.org)
- [www.ateprojectimpact.org](http://www.ateprojectimpact.org)
- [www.teachingtechnicians.org](http://www.teachingtechnicians.org)
- [www.evaluate-ate.org](http://www.evaluate-ate.org)



# Thank you

## Contact information

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