

Manufacturing ENGINEERING

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Focus on the Workforce

Manufacturing Career Pathways

Marilyn Barger
Executive Director
Florida Advanced
Technological
Education Center
Tampa, FL

Richard Gilbert, PhD
Professor Chemical
and Biomedical
Engineering
University of South
Florida
Tampa, FL

Mark Snyder
VP Manufacturing
Linvatec
Largo, FL

Hi, "we're from the government and we're here to help"! This has to be a dangerous lead sentence for a *Focus on the Workforce* column. However, since we hold licensed patents in reverse osmosis or biomedical device technologies, given that Marilyn is a licensed engineer in Florida and Richard is a professor and former chair of a Chemical Engineering Department, and Mark is a vice president of manufacturing we hope that you will stick it out a little longer. We can emphatically say that the National Science Foundation's Advanced Technological Education (NSF-ATE) program does want to help manufacturers and encourage manufacturing in the US.

What is the NSF-ATE program? What can NSF-ATE do to help manufacturing in the United States? How can you get involved?

First of all, fundamentally the ATE grant program endeavors to produce more technicians and technologists with skills that

are vitally important to the nation's prosperity and security. Systemically, the ATE program's aim is to strengthen technician workplace skills in advanced and emerging technologies. Individually and collectively, the centers and projects of the ATE program:

- Save employers time and money by delivering well-qualified technicians to the workforce.
- Improve the science, technology, engineering, and mathematics (STEM) curricula at secondary and postsecondary institutions,
- Invigorate teaching in many disciplines,
- Recruit students for STEM career and education pathways, and
- Create efficient and effective career pathways for students to progress from college to careers in advanced technology fields.

During the 2008 fiscal year, 263 ATE grants represented a \$51.32 million investment in creating a trained, educated workforce. ATE grants provide funding to enable engineering and technology faculty to create, test, and implement ways to improve the technical skills and the general STEM preparation of technicians based on specific inputs from industry partners.

The NSF-ATE program has established 36 Advanced Technological Education (ATE) centers that undertake broad national or geographic-specific initiatives in high-technology fields that drive the economy in technology sectors of strategic importance to the nation. All ATE centers serve as leaders in their various technical fields. Each pursues a distinct vision of technological education that it carries out in cooperation with two-year and four-year colleges and universities, secondary schools, business, industry, and government. In addition to the centers, the ATE program supports projects that target particular technological education issues, typically with a local or regional focus. In all ATE centers and projects, colleges with two-year technical-degree programs or four-year BS technology programs have a leadership role, and work directly with industry partners and other project stakeholders. The goal is to produce skilled and educated technical workers who meet employers' workforce needs.

There are three types of ATE centers. National centers of excellence focus on comprehensive reform of technological education in fields that are key to the nation's economic competitiveness. Regional centers of excellence engage multiple community colleges, and focus their efforts on academic initiatives that address the technician-workforce needs of employers in the specific region. Resource centers are highly visible, national sources of educational materials, ideas, contacts, and mentoring for other educators. All ATE initiatives broaden opportunities, and enable US citizens to participate more fully in the knowledge economy.

To achieve their goals, ATE centers devote significant time and resources to collaboration with industry and technical experts working as educators to create technically relevant educational materials, advance the technical knowledge of college faculty, and improve technological education programs. ATE initiatives bring industry experts into direct contact with the technical education system; advance faculty technical skills to match the technologies being embedded in today's manufacturing environment; and enable students in high schools, community colleges, and universities to transfer expeditiously from one level of education to another as they gain industry-relevant knowledge, skills, and work experiences.

The ATE program has been successful for three significant reasons. First, it is the National Science Foundation's policy that every grant proposal be subjected to merit review. This ensures that all proposals submitted to the ATE program are technically motivated, peer driven, and peer-reviewed. This means that only the best ideas with well-designed project objectives and measurable results are funded. Second, ATE-funded workforce centers have industry advisory boards; have industry employees helping with curriculum development and even teaching courses in center partner colleges; support faculty and students doing internships in industry; and employ student performance-assessment tools based on a list of competencies developed by industry and faculty. Finally, the instrumentation and equipment used to educate students is compliant with current industry expectations.

What can NSF-ATE do to help manufacturing in the US?

The onset of the 21st century marked a major setback for the American automotive manufacturing sector. The virtual demise of the automotive production sector was a sobering experience.

Part of the path back is the total restructuring of the automotive workforce. Traditionally, the automotive sector trained its own engineers, via its own automotive institutes or specific industry-supported engineering college programs, and developed technical workers via in-house training programs and union apprenticeship pathways. Today, NSF-ATE is becoming a major component of this mix.

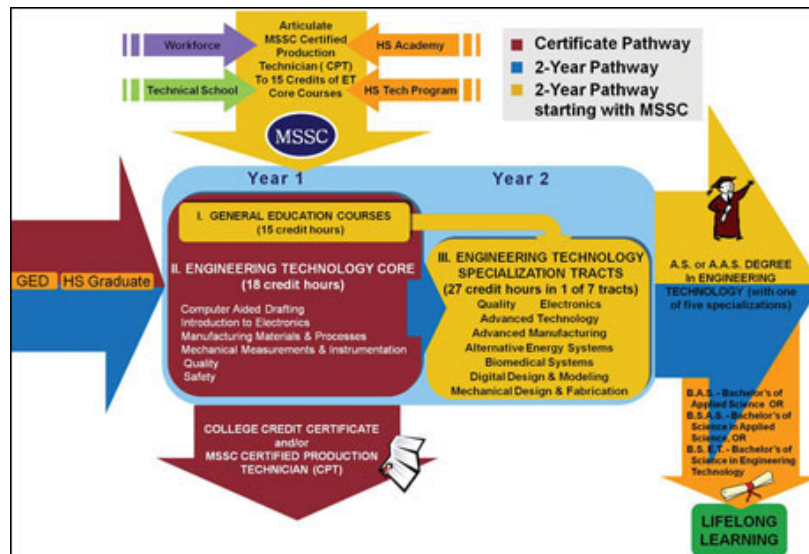
Two ATE Centers, CARCAM and AMTEC, are devoting many resources to the restructuring of the American automotive workforce. Both have a huge partner co-investment by vehicle manufacturers. The Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM) designs curricula to match the needs of the regional auto manufacturers. The specific focus of CARCAM is to integrate the region's supplier manufacturing workforce to match the quality expectations of their automotive manufacturing partners. The Automotive Manufacturing Technical Education Collaborative

(AMTEC) is a national center with partner industries and colleges in several states, including Kentucky, Michigan, California, and others. One big challenge is to help the industry reduce the number of independently identified skill sets from over 200 to fewer than 20. This is not only an impressive reduction of classifications, but reflective of a paradigm shift in how the future automotive workforce will be prepared.

Helping a specific major manufacturing sector is the mission of many centers. Some examples include MATEC, the Maricopa Advanced Technology Education Center, which works with manufacturers of semiconductors. RapidTech is deeply committed to digital manufacturing technologies, and NBC2, the Northeast Biomanufacturing Center and Collaborative, focuses on bio-manufacturing. But what about the "mom and pops"?

Think Florida and everyone envisions oranges, sun, and fun. True enough but Florida's manufacturing sector is alive and well. Florida is home to more than 16,000 manufacturers that employ approximately 400,000 people with a mean wage 20% higher than the state's average. However, 80% of these people work in companies that have fewer than 100 employees. Florida manufacturing represents \$36 billion of the state's gross domestic product. This strength lies in the OEM sector, which has its own set of workforce issues.

The Florida Advanced Technological Education Center (FLATE) was developed to address these issues. FLATE was needed because many of the technician education programs were outdated, unfocused, and duplicative, and industry was not communicating with educators on these issues. It became clear that new educational and career pathways were needed that involved high schools, two and four-year degree programs, and technical training to produce the skilled and educated multiskilled workforce necessary to work with the integrated systems found in today's manufacturing facilities.



FLATE education/career pathway. (Click on image to enlarge)

FLATE partnered with the Florida Department of Education's (FLDOE) Career and Adult Education Div., the Manufacturing Association of Florida, the Workforce Florida Manufacturing Banner Center, the Florida State College system, and manufacturers across Florida to tackle these issues. The results are impressive. Florida now has an AS Engineering Technology degree with a unified course structure and skill expectations that is offered by 11 colleges. Included in this state-wide degree is a technical core that leads to the MSSC (Manufacturing Skill Sets Council) competencies for the Certified Production Technician (CPT) certificate, a part of NAM's endorsed Skills Certification System. The second year of study focuses on specific technical disciplines, including advanced manufacturing. Several others also support targeted technologies and processes needed by specific manufacturing sectors. The objective is to create a "troubleshooting" focused workforce that can work in a team structure to maximize product quality, minimize production waste, and optimize manufacturing operations. The accompanying figure indicates the detail structure of this degree.

How can you get involved? Every ATE Center wants, needs, and welcomes input from industry experts. The manufacturing-focused ATE centers would embrace any SME participation. FLATE, for example, profits greatly from working with Tina Brudnicki, our SME Member & Industry Relations Manager, who has been a member of our Industrial Advisory Committee for six-years. She provides a national perspective on manufacturing, as well as specific input about the needs of OEMs. Chapter 159 in the Tampa Bay area participates in and supports many of FLATE's "Made in Florida" outreach and educational activities. FLATE also looks forward to engaging the newly reorganized chapter in south Florida.

In summary, there are many ways SME and its members can work with ATE to help manufacturing prepare the future workforce. Publications that provide specific examples of this type of effort, and the impact of ATE centers and projects, is found at the Association for American Community College Web site <http://www.atecenters.org/>. You can also join the ATE Centers at the centersponsored High Impact Technology Exchange Conference in Orlando, FL this summer where

attendees will be able to observe the latest and greatest in advanced technological education.

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