ATE CENTERS

PARTNERS WITH INDUSTRY FOR A NEW AMERICAN WORKFORCE

IMPACT 2014

ADVANCED TECHNOLOGICAL EDUCATION CENTERS

MARICOPA COMMUNITY COLLEGES®

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For information about the ATE program, visit www.nsf.gov/ate. For additional information about the ATE centers and projects, visit www.atecenters.org and www.aacc.nche.edu/ateprogram.

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The cover design is a mosaic representing all 42 ATE centers and is inspired by a photo submitted by Weld-Ed (7).

ATE CENTERS

IMPACT 2014

National Science Foundation

Highlighting the Advanced Technological Education (ATE) centers sponsored by the National Science Foundation (NSF)

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IN THE NATIONAL SPOTLIGHT

THE WHITE HOUSE

WASHINGTON

A proud tradition of ingenuity has fueled our Nation's progress for more than two centuries. This spirit of American innovation has helped our country lead the world in answering big questions and solving tough problems. And to keep America on the cutting edge, we must ensure our students and employees have the tools they need to reach their full potential and excel in the jobs of today and tomorrow.

For over 20 years, the National Science Foundation's Advanced Technological Education (ATE) program has committed to this important task. By building strong partnerships in education and industry, government and the non-profit sector, this program helps prepare students for their careers. And by building our technical workforce, it contributes to our Nation's security and our economic competitiveness.

In a dynamic economy, technology is constantly changing. Community and technical college faculty are key to ATE centers, training students for today's high-tech jobs and emerging technologies. Through this program, educators are developing innovative initiatives to attract more young people and adults to careers in science, technology, engineering, and mathematics.

ATE Centers Impact 2014 highlights the tremendous potential community and technical colleges have to shape our Nation's students and our shared future. I applaud the National Science Foundation and all those dedicated to the ATE program, and I wish you all the best as you continue to do your part to foster American innovation in the years to come.

PRESIDENT BARACK OBAMA

"In a dynamic economy, technology is constantly changing. Community and technical college faculty are key to ATE centers, training students for today's high-tech jobs and emerging technologies."

President of the United States **Barack Obama**

ATE WELCOME

The National Science Foundation's Advanced Technological Education (ATE) program improves the education of technicians who work in advanced technology industries that are important to the nation's economy and security.

ATE accomplishes this by providing support to test innovations for teaching science, technology, engineering, and mathematics (STEM) to undergraduates and secondary school students, and the educators who teach them.

ATE Centers Impact 2014 highlights the accomplishments of ATE centers and explains the centers' efforts to build a world-class technical workforce.

This book features the work of the three types of ATE centers that have received competitive grant funds to tackle the biggest technical workforce challenges.

- **National centers** lead nationwide, industry-specific reforms.
- **Regional centers** focus on a particular industry within a specific geographic area.
- **Resource centers** promote the leadership capacity of educators in one or more technological area.

ATE also supports projects (noted on chapter maps) that focus on particular program or curriculum improvements, professional development efforts, faculty leadership capacity building, or research.

ATE principal investigators' collaborative relationships with industry keep them informed of technology trends and employers' needs. This means graduates of ATE-affiliated programs have the complex skills they need today and the capacity to learn as their technical fields evolve.

ATE evaluators' collection of quantitative and qualitative data introduced a culture of evidence at many two-year colleges during the past 20 years. And ATE innovations continue to complement other data-focused education reform efforts.

ATE's efforts to increase the diversity of the STEM workforce has generated numerous models for recruiting and retaining women and students from underrepresented populations—Hispanic, American Indian, Alaska Native, Black, Native Hawaiian, and residents of other Pacific Islands. Women made up 52% of the students in ATE-supported biotechnology programs in 2012. Underrepresented populations made up more than 40% of enrollments in ATE-supported electronics, marine, biotech, optics, and cybersecurity technology programs in 2012.

Due to their leadership role in ATE, two-year colleges have gained recognition during the past 20 years as important sources of STEM education for technicians, teachers, and the general population.

ATE BY THE NUMBERS

In 2012, NSF-ATE centers and projects

Educated **96,460** students at
2,240 educational institutions
52% at two-year colleges
40% at secondary schools
42% minority
23% female

Served **72,840** educators
44% at two-year colleges
33% at secondary schools

Developed **2,760** curriculum materials

Facilitated **1,570*** articulation agreements
that assisted the matriculation of
1,460 students from high school to two-year colleges
2,410 students from two-year to four-year colleges
*25% of these agreements were developed in 2012

Collaborated with **16,920** groups that provided
$16 million in monetary contributions
$13 million of in-kind support

Source: EvaluATE

VOICES OF INDUSTRY

"Through the use of ATE programs, specifically CSEC, we were able to illustrate to our employees the importance of both cyber and physical security. The classes brought an awareness to our employees that their actions are vital in helping to secure our networks."

Edith Coen
Director of Environmental, Health, Safety & Security
SemGroup Corporation

"We are currently actively involved with two ATE centers, AMTEC and CA2VES, to advance the recruiting and development of highly skilled manufacturing and automotive technicians. The availability of a skilled workforce was one of the key considerations for BMW to locate our manufacturing plant in South Carolina. Twenty years later, it has been a key driver in our success."

Werner Eikenbusch
Head of Talent Management
Corporate Human Resources, Americas
BMW Manufacturing Co., LLC

"Tropicana Products has a strong legacy of forging partnerships that strengthen the communities where we do business. We also have an ever-growing need for highly skilled manufacturing technicians. Our involvement with FLATE supports our desire to help build strong technical education and certification programs in communities across Florida."

Lillian Elliot
Director of Supply Chain Quality & Organization Capability
Tropicana Products, Inc.

"I have been actively involved in the Business and Industry Leadership team for the Convergence Technology Center for over 10 years, and students graduating from that program are exceptionally prepared to secure jobs in the workforce because they have skills that business needs."

Tu Huynh
Vice President of
Infrastructure Technology Services
Comerica Bank

"The NSF ATE program and its graduates from the North Seattle Community College Nanotechnology Program have been invaluable to establishing our company and developing a disruptive technology from the ground up. As the research and technology field becomes more competitive we look to fill positions with well-qualified, well-trained individuals who have a strong background in science and nanotechnology."

Leah Riley
Director of Research & Development
EnerG2 Technologies, Inc.

"The National Science Foundation is not only about the technical information. It's also about how people learn, how they comprehend, and how they are able to put it to use. And to take best practices where NSF can do the studying associated with that, and then distribute it across the broad group of the community and technical colleges, I think is invaluable for our long-term competitiveness."

Rick Stephens
Chairman of
Illinois Business Roundtable

V ATE SPIRALS OF SUCCESS

ATE Centers' interconnected activities generate momentum that often helps the centers accomplish even more than their intended outcomes.

Charles Henderson and a group of Western Michigan University researchers documented this phenomenon in a case study of three national centers. This study focused on the centers' impact on the institutions that host them and confirmed effects that previous research on ATE centers had also identified.

"Collectively, these direct impacts can produce what we call a **spiral of success**. This spiral occurs when the center directly improves the overall quality of the technology program by creating new curricula, providing professional development for faculty, and having up-to-date equipment.

"Because of the increased quality of the specific technology program, its external reputation with other institutions, industry, students, and funders improves. Due to its enhanced reputation, the program can increase its resources (e.g., more and stronger industry partnerships, more students, and more external funding), which in turn continues to enhance the targeted technology program. Therefore, although we primarily described each direct local impact individually, they are typically related to one another," Henderson wrote for *Community College Review*.

Source: Charles Henderson, et al., "Identifying the Local Impacts of National ATE Centers on Their Host Institutions: An Exploratory Study," Community College Review 40 (2012).

ATE Develops Educators' Intellectual Capital

1994
Sinclair Community College Professors Fred Thomas and Robert A. Chaney serve as "cluster captains" for the National Center for Advanced Manufacturing.

1999
Work on ATE interdisciplinary instructional modules inspires their development of simple math machines to help students manipulate algebraic concepts.

2002
They secure ATE project grants and other external support to develop curricula and faculty development workshops for math machines.

2007
Fred Thomas leads the non-profit company he and Chaney form to share their ATE-supported innovations with other educators.

2013
Robert A. Chaney selected as US Community College Professor of the Year by the Carnegie Foundation and Council for Advancement and Support of Education (CASE).

Source: *ATE@20* Blog

Successful ATE Centers generate positive, overlapping trajectories of outcomes by

- Improving the quality of programs in the targeted technology field.
- Creating partnerships with industry and/or professional societies.
- Providing faculty professional development.
- Aiding in acquiring additional external funding.
- Increasing the number of students.
- Improving instructional technology.
- Assisting in transfer arrangements with four-year institutions.
- Producing high quality curricular materials.
- Improving the external reputation of programs.

Successful ATE Centers make an impact in their host institutions by

- Contributing to the institution's ability to obtain other grants.
- Increasing the prestige of the host institution and enhancing its reputation.
- Making a positive impact on non-technical curricula.
- Enhancing non-technical programs' ability to network and create relationships with outside groups.
- Changing institutional policies to make it easier for other similar "soft money" centers to operate.

A Glimpse of What's Inside ...

01 Industry partnerships for the **360° Center**'s Seamless Career Pathway boost manufacturing program recruitment efforts throughout Minnesota.

10 **VESTA**'s online viticulture and enology program leads to a thriving on-campus program at Highland Community College-Wamego.

25 **GeoTech Center** mentoring helps Kaskaskia College develop a certificate program and obtain NSF support to start a degree program to meet Central Illinois employers' needs for technicians with geospatial skills.

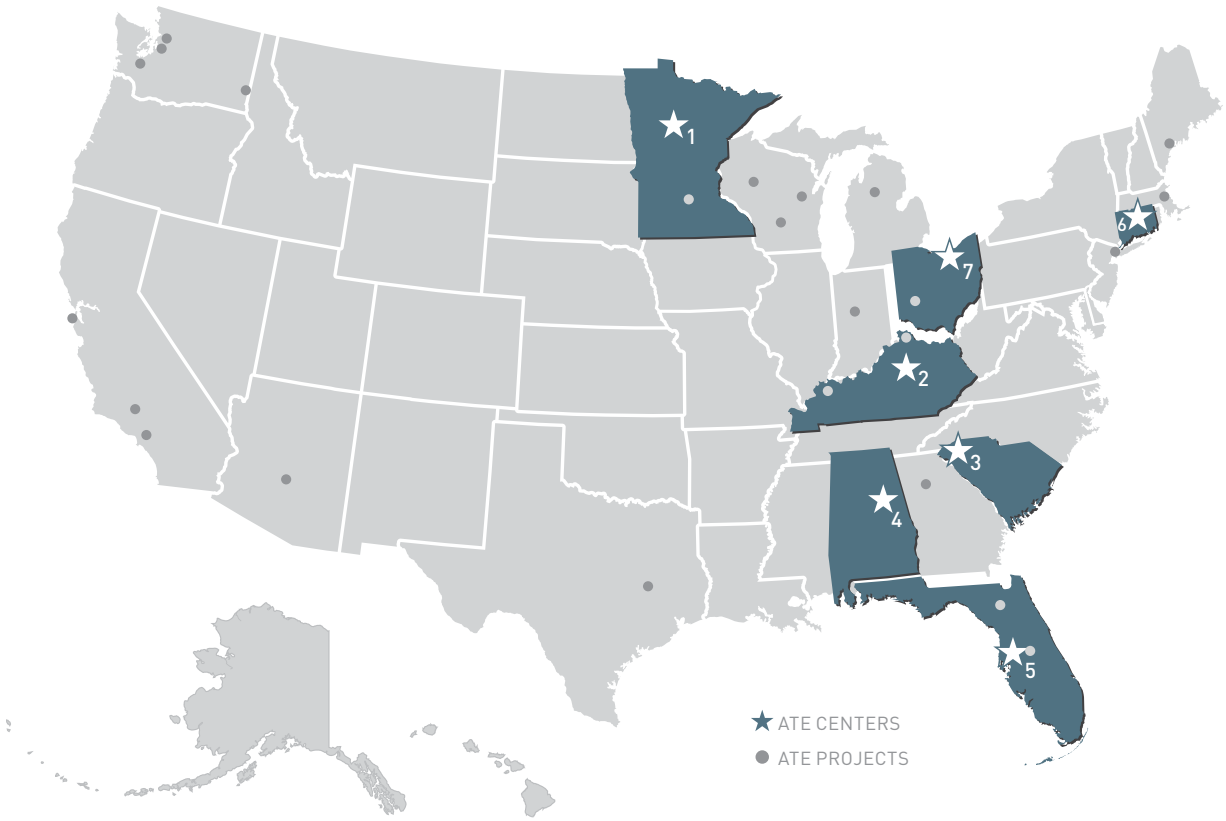
33 The **NACK Network** provides students across the country with remote access to nanoscience tools.

39 Professional development by **CSEC** cultivates expertise among faculty who now lead specialized cybersecurity programs for manufacturing and energy technicians.

ADVANCED MANUFACTURING TECHNOLOGIES

ADVANCED MANUFACTURING TECHNOLOGIES
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS



01 **360°**
Manufacturing and Applied Engineering
ATE Regional Center of Excellence
Bemidji State University
Bemidji, MN
www.360mn.org

02 **AMTEC**
Automotive Manufacturing Technical Education Collaborative
Kentucky Community and Technical College System
Versailles, KY
www.autoworkforce.org

03 **CA²VES**
Center for Aviation and Automotive Technology Education
Using Virtual E-Schools
Clemson University
Clemson, SC
www.clemson.edu/ca2ves

04 **CARCAM**
Consortium for Alabama Regional Center for
Automotive Manufacturing
Gadsden State Community College
Gadsden, AL
www.carcam.org

05 **FLATE**
Florida Advanced Technological Education
Center of Excellence
Hillsborough Community College
Tampa, FL
www.fl-ate.org

06 **RCNGM**
Regional Center for Next Generation Manufacturing
Tunxis Community College
Farmington, CT
www.nextgenmfg.org

07 **Weld-Ed**
National Center for Welding Education and Training
Lorain County Community College
Elyria, OH
www.weld-ed.org

ADVANCED MANUFACTURING TECHNOLOGIES

360°

Manufacturing and Applied Engineering
ATE Regional Center of Excellence

www.360mn.org

BEMIDJI STATE UNIVERSITY
BEMIDJI, MN

KEY ACTIVITIES

- Designs a 21st century education system that prepares individuals for rewarding careers in advanced manufacturing.
- Meets the needs of the region's manufacturing employers through an enhanced pipeline, industry-driven curricula, and authentic assessment.
- Increases the quantity, quality, and diversity of skilled and knowledgeable talent in the field of manufacturing.

Students study plastics processing in a high-temperature lab.

360° Offers an Array of Credentials

In academic year 2012, the 360° consortium led by Bemidji State University (BSU) with nine technical and community college partners awarded 466 degrees to students. The postsecondary credentials awarded range from certificate-level to master-level with the following breakdown:

- Certificate: 101
- Diploma: 192
- Associate: 115
- Bachelor: 57
- Master: 1

360° impacts affiliated programs by providing program improvement funds for new equipment; participating in joint program development for online and blended programs; assisting with recruitment through youth outreach programs; offering faculty opportunities to gain professional development to learn about emerging technologies, to network, and to learn from one another throughout the state of Minnesota; providing learning modules to enhance curricula; and gathering feedback for faculty from student and employer surveys.

> "Receiving a technical degree from a 360° partner college transforms people's lives. They are sought after by the best employers, they receive excellent pay and benefits; they get to do challenging, fun, and rewarding work."

Dan Conroy - Vice President
of Human Resources & Talent Management
Nexen Group, Inc.

An engineering lab technician inspects equipment.

360° Develops Future Workforce by Partnering with Minnesota Manufacturers

360° works closely with manufacturing businesses throughout Minnesota to promote the advanced manufacturing industry in order to change perceptions and improve the image of the industry.

360° leads the Dream !t Do !t recruitment program. The statewide partnership has more than 30 manufacturing businesses and three major manufacturing associations in Minnesota. The video profiles of more than 18 Minnesota manufacturing businesses on the Dream !t Do !t's website have been viewed more than 5,000 times in just one year.

With the support of its manufacturing business partners, 360° is the premier organizer and sponsor of the VEX Robotics Competition in Minnesota. Approximately 500 youths between the ages of 13 and 18 participate annually in the VEX Robotics Competition in Minnesota. In a survey, 97% of the participants reported that they felt more confident in STEM subjects, and 75% said they were more interested in manufacturing careers as a result of their involvement in VEX competitions.

360° also coordinates the annual Minnesota Statewide Tour of Manufacturing when more than 50 manufacturers open their doors for public tours. Of the 3,000 individuals who toured a manufacturing facility in 2012, 80% said they had a more positive view of manufacturing careers after the event, and 41% said they learned about a new manufacturing career. The 2013 event was even larger with 4,000 people touring 65 manufacturing facilities.

EDUCATION & DEGREE EARNED

- High School / College Credit
- Common Skills & Knowledge: Certificate & Diploma
- Specializations: Diploma with General Liberal Education A.A.S., A.S.
- Four-Year Degrees: B.S., B.A.S.

360°'s Seamless Career Pathway allows students to transition smoothly from pre-engineering curriculum in K-12 through two-year technical college programs and on to four-year degree programs.

AMTEC

Automotive Manufacturing
Technical Education Collaborative

www.autoworkforce.org

KENTUCKY COMMUNITY AND
TECHNICAL COLLEGE SYSTEM
VERSAILLES, KY

AMTEC
Ignite. Educate. Accelerate.

KEY ACTIVITIES

- Implements industry-led curricula with college partners to increase students' critical-thinking and problem-solving skills.
- Institutionalizes the AMTEC Career Pathway model with colleges, secondary schools, and industry partners.
- Expands the AMTEC instructional and industry-endorsed collaborative model.
- Fosters evidence-based decision making to sustain improvements.

AMTEC Builds Career Pathways for Students

AMTEC's robust use of industry examples and up-to-date equipment teaches students what it takes to be successful in the automotive industry and other advanced technological workplaces.

AMTEC's curriculum, which many partner colleges begin at the secondary level with manufacturing academies and dual-enrollment programs, utilizes the center's research on effective practices for developing multi-skilled automotive manufacturing technicians, also known as mechatronics technicians.

AMTEC focuses on these hallmarks of strong, sustainable career pathways.

- Institutional and instructional transformations that develop clear linkages and easy transitions between education and workforce training.
- "Wrap around" student support services such as counseling, academic preparation, internships, and financial aid.
- Partnerships that utilize data for planning and implementation.
- Employer involvement in all phases of the career pathways process.
- Continuous improvement.
- Institutional commitment to sustaining programs.

Industrial Maintenance Technology graduates can program robots, weld, and wire electrical equipment.

AMTEC's Partnerships Strengthen the Automotive Workforce

While AMTEC's outreach is primarily focused on community college students, its educational partners include four-year institutions and secondary technical schools. Through its 37 educational partners AMTEC reaches students in 12 states. Its 23 manufacturing associates encompass the automotive industry and municipalities where automakers and suppliers are located. AMTEC's 2013 Fall Academy had attendees from 16 states.

The high level of engagement by educational partners and manufacturing associates led to AMTEC's development of maintenance certification assessments; college curricula aligned with industry skill standards; model instructional programs; and flexible career pathways that fit the unique needs of students, employed technicians, and employers.

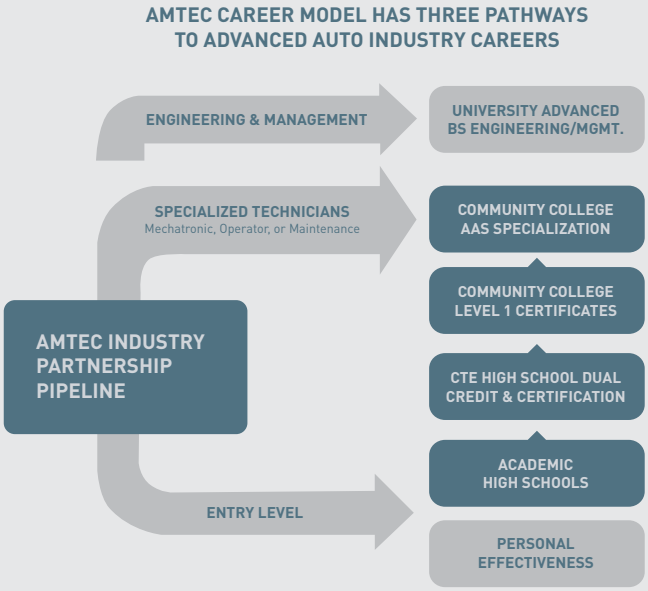
With AMTEC's leadership, the automotive collaboration has slowly transformed into an advanced manufacturing group. Consequently,

Advanced manufacturing requires technicians to make frequent quality control checks.

AMTEC curriculum content is now used for employee training programs at automotive manufacturers, their suppliers, tool manufacturers, aerospace companies, and municipal utilities.

The new AMTEC Career Pathways Model is expected to help students by facilitating college-to-industry transitions. To increase students' interest in manufacturing, the pathway has been structured to improve perceptions of manufacturing careers with tours of elite manufacturing facilities to give secondary school students and their families exposure to modern work environments. Student recruitment programs also point out the multiple entry and exit points of the career pathways model.

The AMTEC Careers Pathway model aligns advanced manufacturing education and technical training requirements to career planning. All three pathways may be accessed through rigorous secondary school programs and community colleges.



> "The AMTEC Advanced Manufacturing System Simulator effectively introduces components, sensors, and overall integration found on the factory floor."

Joe Welgan - Senior Manager of Maintenance & Facilities
Nissan North America, Inc.

CA²VES

Center for Aviation and Automotive Technology Education using Virtual E-Schools

www.clemson.edu/ca2ves

CLEMSON UNIVERSITY
CLEMSON, SC

KEY ACTIVITIES

- Develops state-of-the-art virtual e-schools and virtual reality simulations to improve learning, capacity, and access.
- Creates a network to increase diversity and to support recruitment in advanced manufacturing.
- Disseminates digital learning curricula and cutting-edge research to enhance technician education.
- Fosters a sustainable workforce through industry partnerships and system-wide support.

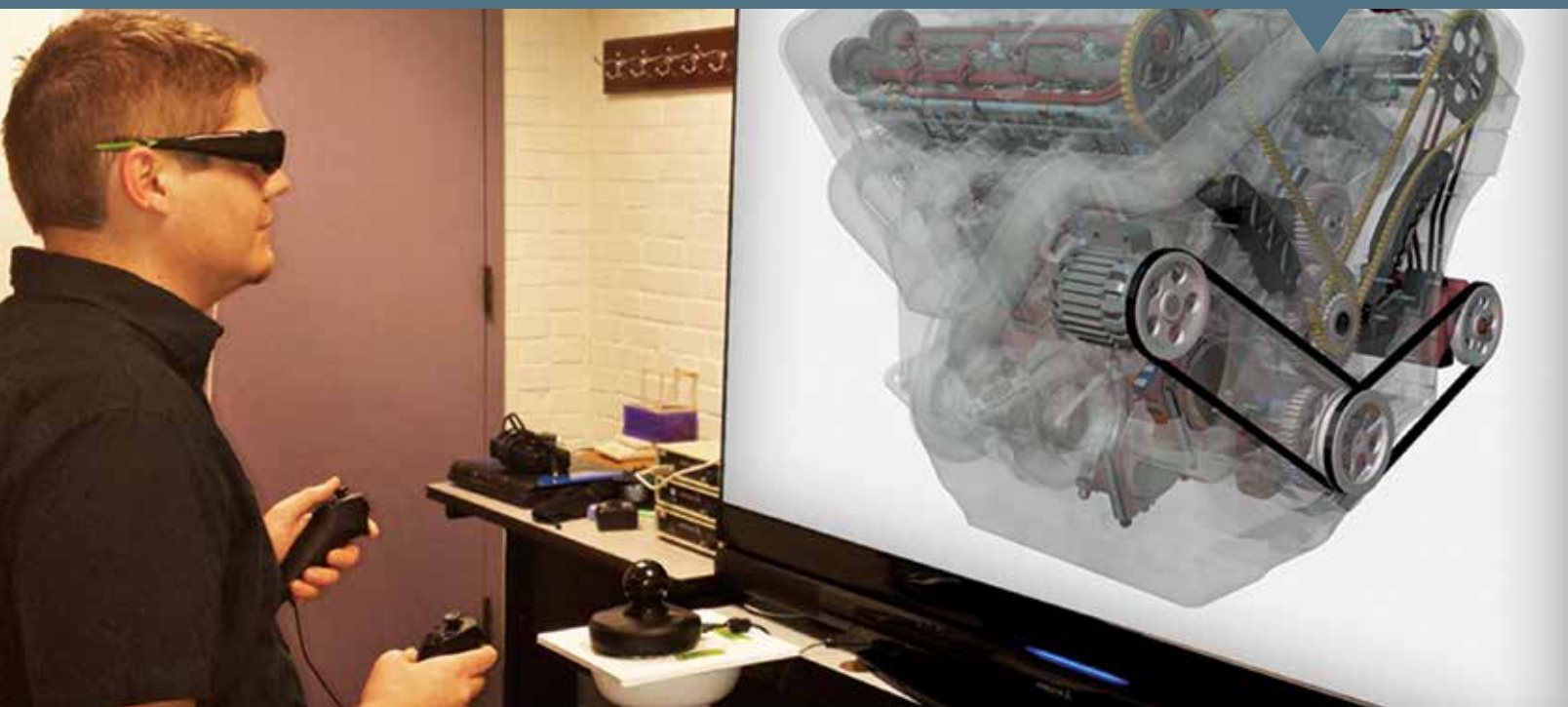
Virtual E-Schools Deliver Next Generation Technician Education

CA²VES advances aviation, automotive, and manufacturing technician education to support workforce preparedness and economic development with its creation of cutting-edge digital learning curricula. CA²VES offers virtual reality tools, immersive virtual reality environments, and more than 50 online learning modules. These resources enable students in aviation, automotive, and manufacturing technology programs to learn fundamental inspection principles through virtual reality simulations.

Virtual reality simulations developed by CA²VES allow South Carolina technical colleges to diversify students' learning through customizable and new, industry-specified scenarios. The virtual reality simulations provide opportunities for students to use equipment that would otherwise be cost-prohibitive for schools and colleges to provide.

In a recent controlled study, students who utilized the CA²VES virtual tools received similar scores on a skill-based assessment as students who had face-to-face instruction. This shows promising results for virtual reality simulations.

Virtual reality simulations support students' learning by increasing their access to high-tech equipment.



Virtual Reality Simulations & Digital Learning Align with Nationally Recognized Certifications

The center's use of innovative technology and its focus on workforce development increase the capacity of South Carolina's technical colleges to meet the advanced technology workforce needs of the state's aviation and automotive manufacturing industry and its suppliers. During 2013, South Carolina manufacturers had more than 7,000 job openings. However, not all these jobs, with family-sustaining wages, could be filled due to a lack of skills in the workforce.

With more than 30 industry partners, CA²VES strives to develop digital learning curricula that are current, relevant, and applicable to manufacturing in several industries. Industry partners also participate in STEM education programs and promote advanced technology careers with students in all levels of education.

Through partnerships with all 16 technical colleges in South Carolina and multiple ATE centers, CA²VES is well positioned to provide maximum workforce impact in the region. As a regional center, CA²VES aims to develop digital learning curricula and immersive virtual reality simulations that align with nationally recognized certifications. Educational partners benefit from cutting-edge educational resources that provide students with clear career pathways in high-demand fields.

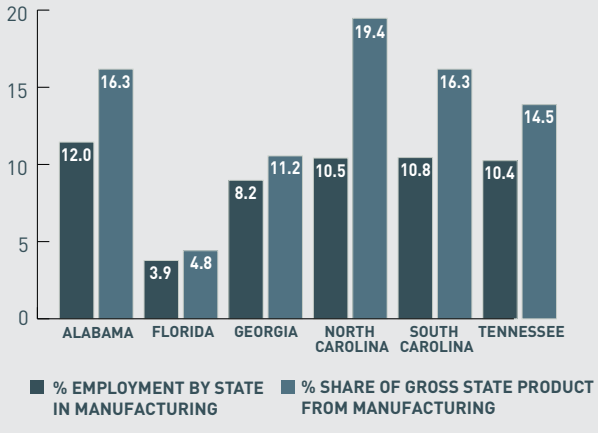
CA²VES develops digital learning curricula that are current, relevant, and applicable to industry through close partnerships with industry clusters.

CA²VES initiatives support institution and industry development of talent to meet the workforce needs of manufacturing, which provides a significant portion of the Southeast's employment and gross state product.

> "Educators and manufacturers working together have numerous opportunities to close the growing manufacturing skills gap. New technologies such as modeling and simulation, virtual work environments, and additive manufacturing can dramatically reduce the capital expenditures required and accommodate more students working in collaborative environments."

Bryan Dods - Executive Manufacturing Technology Leader
GE Power & Water

MANUFACTURING & TRADE DATA FOR THE SOUTHEAST



Source: National Association of Manufacturers

CARCAM

Consortium for Alabama Regional Center for Automotive Manufacturing

www.carcam.org

GADSDEN STATE COMMUNITY COLLEGE
GADSDEN, AL

KEY ACTIVITIES

- Serves as the industry liaison with Alabama education agencies.
- Promotes seamless career pathways encompassing a modern, statewide, holistic approach to skills and knowledge development.
- Enriches multi-system technician education with an innovative and flexible approach to stackable credentials that meet evolving industry and economic needs.
- Delivers professional development that addresses emerging technologies, advanced manufacturing, and current workforce trends.

CARCAM Drives Education for Automotive & Advanced Manufacturing Technicians

CARCAM colleges partner with industry to offer 155 cooperative, internship, and apprenticeship programs for students.

CARCAM has been instrumental in changing the course of Alabama's economic future by responding to rapid, regional growth of the advanced manufacturing sector. It has grown into a network of 11 community and technical colleges working with industry throughout Alabama. It has also expanded into emerging fields such as clean energy, aviation, and lean manufacturing as the center supports current technologies and industries.

At CARCAM colleges, more than 5,000 students are currently enrolled in automotive and advanced manufacturing-related programs. During 2012-13, 612 students graduated with an automotive manufacturing technology-related degree. Currently, 42% of the program completers are employed in automotive-related manufacturing.

Students apply robotic programming skills in a college lab.

A maintenance technician troubleshoots a process control system.

CARCAM Provides Workforce Development Solutions

Industry is demanding highly-skilled technicians with work-readiness education. As the regional ATE center for comprehensive, industry-recognized workforce development and STEM learning, CARCAM assists Alabama's community colleges in designing successful workforce development solutions.

More than 400 individuals have participated in CARCAM professional development opportunities. The outcomes of workshops for secondary and postsecondary educators include implementation of new teaching techniques in classrooms and labs. CARCAM also offers programs for incumbent technicians to update their skills, which helps their employers compete globally.

> "Automotive manufacturing plants have never been more highly automated, yet the plants of the future will have automation not currently invented. With this rate of development and change, companies require highly educated technicians taught a continually updated curriculum by professional faculty whose development is also continually updated."

Don Leu - Senior Application Engineer
Systems & Solutions Business
Rockwell Automation

CARCAM Ensures Programs Meet Industry Needs with CGA

To support the continuous improvement of manufacturing curriculum, CARCAM created an industry-supported curriculum gap analysis (CGA) survey model. The CGA ensures that program content meets current industry standards by updating course modules via feedback from regional industry representatives. CARCAM staff have reviewed and improved 116 individual courses, developed 22 new courses, and standardized 94 manufacturing-related courses statewide.
Based on CGA feedback, CARCAM developed a troubleshooting course titled Automated Systems Diagnosis and Troubleshooting, which brings real-world problems into the classroom to promote the development of student problem-solving and critical-thinking skills.

CARCAM Engages Veterans in Manufacturing Career Opportunities

CARCAM's outreach to veterans includes participation in the National Guard Yellow Ribbon Reintegration Program. CARCAM helps National Guard members and their families connect with community resources before, during, and after a deployment. It informs service members and their families about educational and career opportunities, benefits, financial counseling, and more.

CARCAM used its curriculum gap analysis to improve 116 courses, develop 22 new courses, and standardize 94 manufacturing-related courses in Alabama.

GAP ANALYSIS PROCESS

1. Select Courses and Develop Survey Documents
2. Distribute Survey to Select Companies
3. Review Survey Responses and Input Data into Plan of Instruction for Analysis
4. Make Curriculum Changes if Required
5. Notify Industry of Curriculum Updates/Changes

RESULTS

IMPROVE 116 COURSES	STANDARDIZE 94 MANUFACTURING RELATED COURSES	DEVELOP 22 NEW COURSES

FLATE

Florida Advanced Technological Education Center of Excellence

www.fl-ate.org

HILLSBOROUGH COMMUNITY COLLEGE
TAMPA, FL

14 Florida Colleges Offer ET Degree

The Engineering Technology (ET) degree—offered at half of Florida's public, two-year colleges—includes 10 specializations and 18 stackable certificates. Between 2008 and 2013, 2,907 students enrolled in ET degree programs, and 173 students completed ET degrees.

Mercedes Heredia, 2014 ET graduate of Hillsborough Community College (HCC), calls the ET program "amazing" and says it "gives students hands-on knowledge and experience about the latest technologies used in high-tech industries."

KEY ACTIVITIES

- The "Made in Florida" campaign is a nationally-recognized, industry-focused manufacturing outreach and recruiting effort.
- Offers Engineering Technology (ET) associate in science degree with accelerated pathways that align with and articulate to industry credentials.
- Practices the Malcolm Baldrige-based organizational performance and evaluation processes.
- Develops and disseminates exemplary STEM technical educator professional development products.
- Supports and strengthens state and national industry, and ATE center partnerships.

Andrew Sink, 2012 ET graduate of State College of Florida, says, "The ET program has given me the skills and training I needed to get my current job."

Kelly Andino, an anticipated 2014 graduate of Eastern Florida State College shares, "With the knowledge and experience gained in the program, I have grown as a person and as a student. I feel more confident in my career."

Engineering technology students at HCC's high tech ET lab troubleshoot programmable logic controllers.

FLATE's Leadership on ET Degree Changes Manufacturing Landscape in Florida

FLATE's impact on the workforce is seen in the way it changed current and future technician education in Florida. Historically, Florida's manufacturing sector has not benefited from a uniform and focused technician education process. Florida's dependence on tourism and agriculture attenuated the ability to create manufacturing-centric cities as seen in Ohio and other manufacturing powerhouse states. When such manufacturing focus did develop, locations were great distances apart within autonomous technician education systems. Thus, community colleges did not produce manufacturing and engineering technicians with the same skill sets. This left manufacturers frustrated with the community college system because they incurred new technician training costs and had to adjust work assignments for newly hired Florida-educated technicians.

To address this situation FLATE designed, crafted, and implemented a singular ET degree program that the Florida Education Department manages. The ET degree has changed the manufacturing education landscape in Florida.

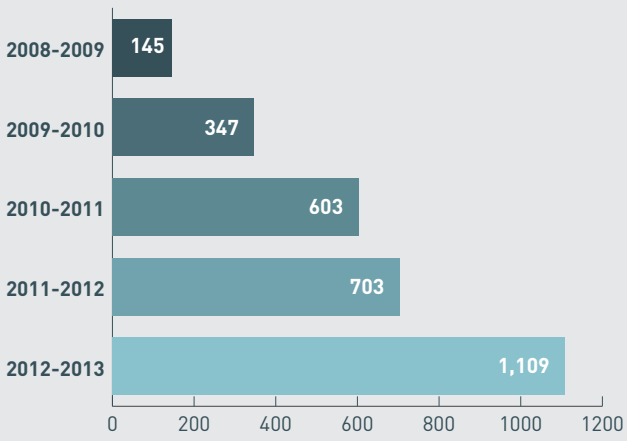
Currently, 14 Florida colleges offer ET degree programs; most of the colleges were charter members on the Manufacturing Institute's "M-List." As a result of the ET degree, manufacturers now recruit graduates from these Florida colleges knowing that the new technicians bring high quality skills to the workplace. The ET degree has eliminated much of employers' training expenses to bring new technicians up to speed. The ET degree's alignment to National Association of Manufacturers-endorsed industry certifications assures the quality of the skills developed and maximizes incumbent worker career path advancement.

> "Harris values the ET degree program graduates. The knowledge they gain from classes and the experience they gain in the lab gives them a thorough understanding of the subject matter."
>
> **Michael Ennis** - Manufacturing Engineer
> Harris Corporation

A technician at Heat Pipe Technology, Inc. tests cooling pipes.

Half of Florida's 28 public, two-year colleges offer the ET degree, with additional colleges on board with implementation plans.

ET ENROLLMENTS GROW



RCNGM

Regional Center for
Next Generation Manufacturing

www.nextgenmfg.org

TUNXIS COMMUNITY COLLEGE
FARMINGTON, CT

KEY ACTIVITIES

- Offers learning symposiums and workshops to showcase advanced manufacturing.
- Provides manufacturing career materials and activities for guidance counselors, educators, and students.
- Facilitates faculty development with summer industry externships.
- Supports National Association of Manufacturers-endorsed skills certification system and Society of Manufacturing Engineers' initiative for veterans.
- Provides leadership for implementation of promising practices in New England.

RCNGM Symposiums Spotlight Connecticut Manufacturing Careers

RCNGM sponsors symposiums to expose students to manufacturing career possibilities with demonstrations of advanced manufacturing processes, workshops, and hands-on exhibits presented by Connecticut companies.

Since the center's creation in 2004, more than 65,000 students and 3,000 teachers have attended its symposiums. As a result, STEM program enrollments have seen impressive growth, with a 15% increase from 3,913 students in 2009 to 4,482 students in 2012. There was an associated 38% gain in enrollment of Asian, Black, Hispanic, and Native American students from 1,096 to 1,514 students.

Student persistence rates received a tremendous boost from 270 industry-sponsored scholarships, 600 student internships, and 24 student design competitions. Connecticut Community Colleges' Gamma Phi Chapter is the first community college statewide chapter of Epsilon Pi Tau, an international honor society. More than 1,000 students and faculty have been inducted.

Student interns manage chemical process control under the supervision of a technician.

Industry Influences RCNGM Curriculum & Outreach

Industry plays a critical role advising RCNGM's curriculum development. Advanced manufacturers also provide educators with externships that inform their teaching, and students with internships and scholarships.

RCNGM maximizes industrial input by collaborating with the Connecticut Business and Industry Association (CBIA) and other professional societies that focus on underrepresented populations in STEM fields.

In order to assess the true state of Connecticut manufacturers, RCNGM through its business partner CBIA, surveyed manufacturers about their workforce needs. The survey responses helped frame the creation of more than 20 new certificates and options within the College of Technology (COT). COT is a statewide initiative that provides career pathways for students to earn certificates, and associate and bachelor degrees in engineering and technology disciplines.

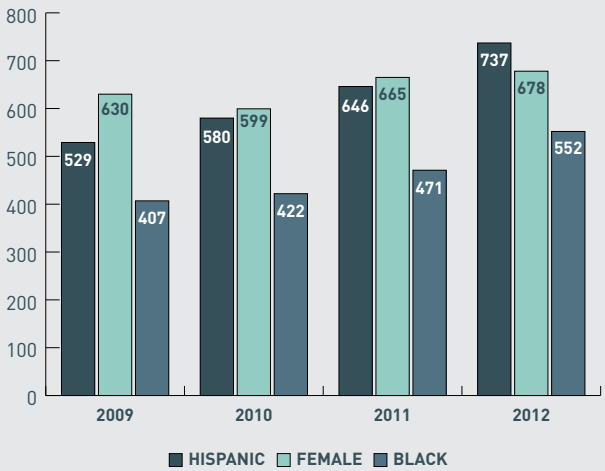
RCNGM produced *Manufacture Your Future 2.0* and *You Belong: Women in Manufacturing*. These two notable videos enlighten educators and direct students toward advanced manufacturing careers. Each DVD includes "day-in-the-life" scenarios of employees who represent different roles in a variety of manufacturing jobs in Connecticut. More than 8,000 copies have been distributed. During the 2013 National Engineers Week, the National Society for Manufacturing Engineers (SME) distributed more than 5,000 copies of the RCNGM's *Manufacture Your Future* DVD for distribution to high schools across the United States.

A technician inspects for accuracy on a machine control.

Connecticut manufacturing employers have hosted 158 high school, community college, and university instructors for industry-based summer externships. RCNGM also offers professional development workshops and seminars that more than 6,000 educators have attended.

More women and underrepresented minority students are enrolling in RCNGM's College of Technology STEM programs.

ENROLLMENT OF THREE UNDERREPRESENTED POPULATIONS INCREASES



"To hear verbatim what Connecticut industry is looking for in a future worker provided motivation to my engineering students. When the students can define their responsibilities and expectations, they have an easier time in focusing their energy."

Eric Flynn - Program Coordinator,
Electrical Engineering Technology Program
Gateway Community College
Teacher Extern, Hamilton Sundstrand

Weld-Ed

National Center for
Welding Education and Training

www.weld-ed.org

Weld-Ed

LORAIN COUNTY COMMUNITY COLLEGE
ELYRIA, OH

KEY ACTIVITIES

- Strengthens quality, diversity, and quantity of welding technicians to meet workforce demands through recruitment initiatives.
- Improves the quality of education offered to students in welding technology through curriculum development and enhancement.
- Designs and delivers professional development for welding educators.
- Provides data on education and employment trends in welding.

A welding technology student adjusts welding parameters on an automated orbital welder.

Weld-Ed Strengthens Students & Educator Programs; Informs Public with Mobile, Virtual Reality Welding Exhibit

In six years, Weld-Ed's partner institutions have graduated more than 2,500 students. Weld-Ed has helped 10 partner institutions strengthen their 21 certificate, diploma, associate, bachelor, master, and PhD welding technology and engineering programs through curriculum development and enhancement. Weld-Ed also led the first effort by a community college to host a Society of Women Engineers Collegiate Interest Group, which it established with student leadership at Lorain County Community College.

Nearly 600 welding instructors have participated in Weld-Ed professional development modules. Through these programs, Weld-Ed has influenced the learning of more than 30,000 students in 40 states, including Alaska and Hawaii.

The Careers-In-Welding mobile exhibit with virtual reality welding stations was featured at 23 recruitment events in 2012. In this first year, the exhibit was on display in 13 states for 83 days, where it informed approximately 37,000 people about the excellent career opportunities available to individuals with modern welding skills. In 2013, approximately 30,000 people in 14 states viewed the exhibit.

Weld-Ed Shapes the Welding Workforce

In addition to strengthening the curriculum that has delivered 2,500 highly skilled welding technician graduates to the workforce, Weld-Ed influences the development of the future workforce with its *Welding Industry Roundtable Report* and Women of Gases & Welding initiative.

The *Welding Industry Roundtable Report* is the result of a 2011 meeting where both industry and education leaders participated in panel discussions and small group discussions with 70 audience participants. The report, available as a free download on the Weld-Ed website, suggests specific plans to augment or add strategies to build enthusiasm for welding careers and expand industry-education collaborations. Its recommendations include

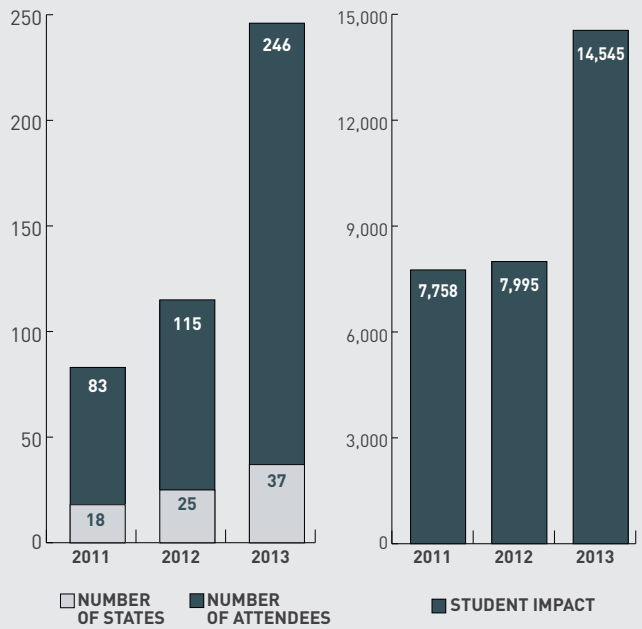
- Incorporating welding applications in STEM lessons for elementary and middle school students.
- Inviting parents and students to American Welding Society showcases and competitions, as well as tours of manufacturing facilities.
- Recruiting guidance counselors to welding career events.
- Working with manufacturers to give students access to the latest technologies.
- Developing opportunities for employed welders to learn new skills.
- Implementing Welding Ambassador programs.

A technician performs gas tungsten arc welding.

The Women of Gases & Welding, an initiative launched in 2012 with American Welding Society (AWS) and the Gas and Welding Distributors Association (GAWDA), strives to enhance the success of women in the gases and welding industries. It has a three-year strategic plan and has established a presence on social media to attract new members and communicate with existing members.

The number of Weld-Ed module attendees and states reached has nearly tripled since 2011. The number of students impacted by the modules has nearly doubled since 2012.

MODULE TRAINING IMPACT: 2011-2013



> "I would like to thank you and your staff for putting on a great workshop. In 30 years in the education business, this was by far the best workshop that I have ever attended. You really seemed to understand educators and are truly an asset to the education field as well as the welding field."

Kenneth Barnett - Agriculture Science Teacher & FFA Advisor
Copperas Cove High School

AGRICULTURAL & BIO TECHNOLOGIES

AGRICULTURE & BIO TECHNOLOGIES
CENTERS & PROJECTS

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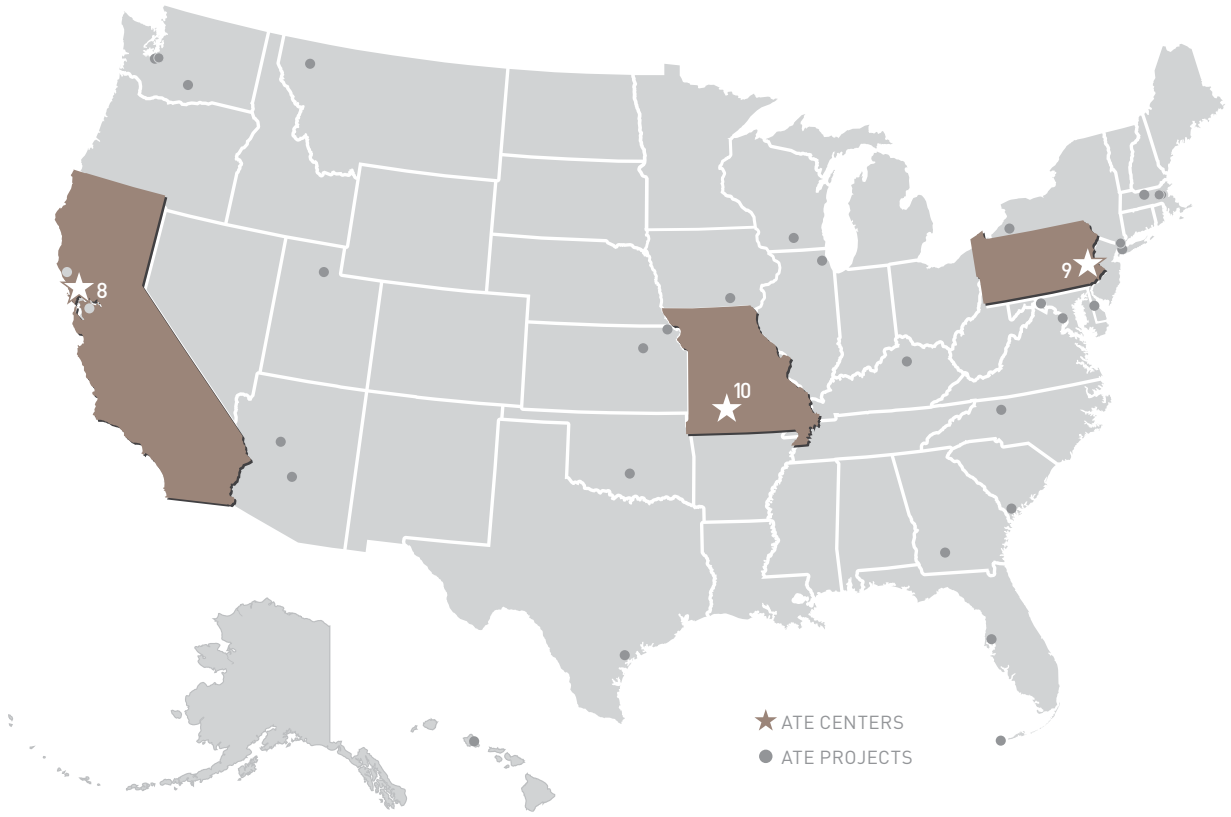


08 **Bio-Link**
Next Generation National ATE Center for Biotechnology and Life Sciences
City College of San Francisco
San Francisco, CA
www.bio-link.org

09 **NBC2**
Northeast Biomanufacturing Center and Collaborative
Montgomery County Community College
Blue Bell, PA
www.biomanufacturing.org

10 **VESTA**
Viticulture and Enology Science and Technology Alliance
Missouri State University
Springfield, MO
www.vesta-usa.org

Bio-Link

Next Generation National ATE Center
for Biotechnology and Life Sciences

www.bio-link.org

CITY COLLEGE OF SAN FRANCISCO
SAN FRANCISCO, CA

KEY ACTIVITIES

- Increases the number and diversity of well-educated technicians in the workforce.
- Meets the ever-growing needs of a continually evolving and diversifying industry for highly educated technicians.
- Institutionalizes community college educational practices that make high-quality education and training in the concepts, tools, skills, processes, regulatory structure, and ethics of biotechnology available to all students.

Course-in-a-Box Collection Helps Educators Start Biotech Courses

Bio-Link's Course-in-a-Box collection contains most of the resources an instructor needs to start a new course. The six-course collection covers everything from basic laboratory practices to stem cells. Each course "box" contains laboratory exercises, lecture, and lab materials; classroom activities; homework assignments; exams and quizzes; and videos from Bio-Link-affiliated educators.

Since 2011, 123 individuals—of which 72 are instructors—have obtained Course-in-a-Box accounts. Among the 123 registered users, 63% work at a community or technical college, 17% are affiliated with a high school, 16% work with a university, and 4% are from another type of organization, such as an industry association. According to the National Biotechnology Program Survey results, 63% of the 97 biotechnology programs in community colleges across the country have a high level of interest in Course-in-a-Box.

Bio-Link's curriculum teaches students to attend to details like carefully checking and measuring ingredients before making buffers.

A biotechnician sets up an enzyme-linked immunosorbent assay (ELISA) to measure the sensitivity of antibodies.

Biotech-Careers.org Connects Biotechnicians to Jobs

The jobs-skills-programs matrix on Bio-Link's biotech-careers.org website provides up-to-date information on employment opportunities and educational requirements in the life sciences and related fields.

Since it was launched in June 2012, the interactive biotech-careers.org website has become one of Bio-Link's most popular products. It averaged 1,293 visits per month from new users and 122 from returning visitors in 2012-2103. According to the National Biotechnology Program Survey, many of the returning visitors are high school teachers who use the career site in their classrooms.

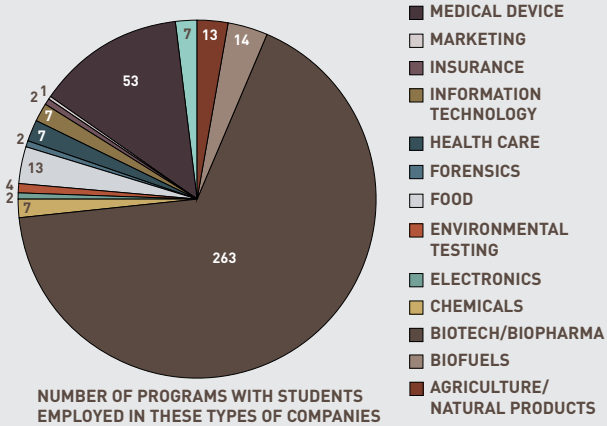
The website brings biotechnology careers to life with 50 videos and nine photo journals. The biotech-careers.org website provides detailed information about careers such as cell culture technician and facilities technician in job areas such as agricultural biotechnology and genomics. Each career page includes a photo, description, salary information, articles, and links to current listings of open jobs. As of January 2014, there were 36 career descriptions accessible from a link on Bio-Link's home page and table on the other website pages. The careers ranged from biofuels technician to water quality technician.

More than 69 Bio-Link biotechnician and bioscience programs shared information about the companies that hired their graduates. Most of the employers identified by Bio-Link programs are biotechnology or biopharmaceutical companies.

> "The biotech workforce expanding Bridge to Biotech program at City College of San Francisco, a key component of the Bio-Link Center, has been of incalculable value to our early stage biotechnology company. Approximately 25% of our nearly 50 employees are former City College interns."

Vishwanath R. Lingappa - Chief Technology Officer & Co-CEO
Prosetta Antiviral Inc.

TYPES OF COMPANIES WHERE BIO-LINK STUDENTS ARE EMPLOYED



NUMBER OF PROGRAMS WITH STUDENTS EMPLOYED IN THESE TYPES OF COMPANIES

NBC2

Northeast Biomanufacturing Center and Collaborative

www.biomanufacturing.org

MONTGOMERY COUNTY COMMUNITY COLLEGE
BLUE BELL, PA

KEY ACTIVITIES

- Supports biomanufacturing career pathways with industry and education partnerships.
- Develops textbooks, hands-on laboratories, and game-style virtual industrial processes based on global biomanufacturing skill standards.
- Offers professional development for educators at BIOMAN conferences and at Protein is Ca$h workshops.
- Instructs students through nationally-disseminated curricula, internships, and apprenticeships.

A MiraCosta College student transfers a microalgae culture to a photobioreactor, designed by Elmar Schmid, associate faculty member and chief scientific officer of T2e Energy Holdings, LLC. Schmid wrote *Biofuels Production and Analysis*, a textbook with lab manual that NBC2 plans to publish in 2014.

NBC2 Graduates Work at Global & Local Biomanufacturers

NBC2's hub community colleges enrolled 371 students in associate degree or certificate programs during the 2012-2013 academic year. About half of the graduates from NBC2 partner colleges are employed at global biopharmaceutical companies like Merck & Co., Inc., Pfizer Inc., Genzyme Corporation, and Lonza Group. Other graduates are employed by small biomanufacturers such as Promethean Biofuels and Synthetic Genomics, Inc.

Biofuels Workforce Summit Drafts Skill Standards

With NSF support, NBC2 convened the Biofuels Workforce Summit in 2013 to gather information from industry experts about the emerging biofuels industry. These experts then worked with NBC2 educators to draft skill standards for educating biofuels technicians. When finalized, the skill standards will guide community colleges' development of programs that prepare technicians for employment at new and growing companies that create fuel from corn, oil seeds, algae, waste cooking oil, and biomass.

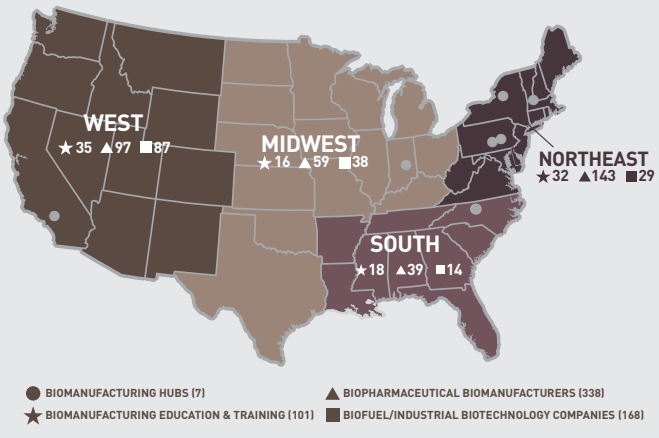
NBC2 Builds Workforce with Crossover Skills

To maintain strong growth in the bioeconomy, NBC2 endeavors to build a pool of technicians with skills to fill biomanufacturing jobs in the areas of biopharmaceuticals, bioenergy, and other bio-based products. In the last year, with a more intense focus on biofuels and industrial biotechnology, NBC2 added 31 new educational partners for a total of 101 biomanufacturing education programs in the US.

MiraCosta College in Oceanside, CA, is an example of an NBC2 hub that has excellent industry partnerships. The growth of its bioprocessing program mirrors the development and growth of the industry in the greater San Diego area.

- More than 40 MiraCosta students have been hired at Genentech's Oceanside facility since 2005.
- 30 students graduated in 2011-2012 with Biomass Production certificates as part of the EDGE (Educating and Developing Workers for the Green Economy) initiative with University of California, San Diego and San Diego State University.

Historically, nearly half of NBC2 program graduates are hired immediately by biopharmaceutical and biomanufacturing employers represented by triangles on the map. Many program graduates also go on to further education.



Technicians control industrial-scale biomanufacturing processes with computers like these at Pacific Biodiesel in Kea'au, HI.

- 14 MiraCosta biotech students were selected for year-long, full-time internships in stem cell research as part of the California Institute for Regenerative Medicine's Bridges to Stem Cell Research program.
- 46 incumbent technicians at Genentech Oceanside participated in a 100-hour bioprocess training program that uses NBC2's *Introduction to Biomanufacturing* textbook.
- 161 students enrolled in MiraCosta's biotech program in 2012-2013; 29% of them already had bachelor's degrees. Course success rates were 78%; of those who completed courses 86% continued in the program.

> "NBC2's *Introduction to Biomanufacturing* textbook serves as a well-paced guide for beginning learners as well as a cogent reference for seasoned biotechnology professionals alike."
>
> **Ben Locwin** - Site Head of Training & Development
> Lonza Biopharmaceuticals

VESTA

Viticulture and Enology
Science and Technology Alliance

www.vesta-usa.org

MISSOURI STATE UNIVERSITY
SPRINGFIELD, MO

KEY ACTIVITIES

- Establishes technology-based programs in viticulture, enology, and wine business entrepreneurship.
- Utilizes the latest distance learning tools to provide students with educational experiences in an easily accessible, timely manner.
- Provides field-based practical experiences for students at vineyard and winery operations with mentoring by experienced professionals.

VESTA Students Persist in Online Viticulture & Enology Program

VESTA's online program has a 59% average retention rate. This is higher than the 46% average retention rate for online programs nationally, and the 55.5% retention rate for two-year public colleges.

Key to this retention rate is the importance VESTA places on faculty development. Each year, VESTA conducts an annual curriculum development workshop for its faculty of 24 industry professionals. At the 2013 workshop, VESTA's instructional designer helped instructors sharpen their online pedagogy and implement organizational strategies for their specific courses.

At the annual workshop faculty also meet with 100 industry and education leaders from 20 states. Information from these discussions is used to refine the STEM-based competencies that form the foundation of VESTA's 40 viticulture and enology courses.

A VESTA student works with his mentor at St. James Winery to assess fruit ripeness prior to harvest.

An enologist at St. James Winery prepares to run a sulfur analysis on wine samples.

VESTA Grows Along with Grape Industry

VESTA's leaders work closely with the grape industry, which produces the sixth largest crop and highest-value fruit crop in the US. A recent economic impact study by MKF Research LLC, reports that the 23,000 US farms that grow grapes for wine, raisins, and table grapes contribute $162 billion to the economy.

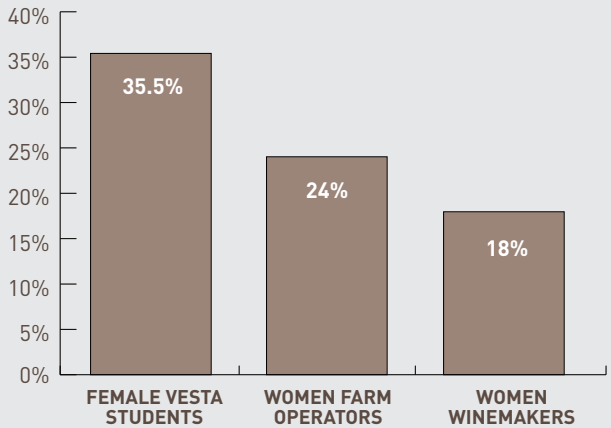
In the last five years, the US wine industry has grown 70% with 7,200 wineries across all 50 states producing 605 million gallons of wine. VESTA has experienced similar vigorous growth with a 319% increase in enrollment across the same five-year span. During the 2008-2009 academic year, VESTA had 288 online students. By the close of 2012-2013, VESTA had gained 920 new online students from 44 states and four foreign countries for a total program involvement of 1,208 students. Successful students have become entrepreneurs, managers, and technicians.

VESTA's partnership with Highland Community College-Wamego is an example of the online educational program instigating a thriving on-campus program that has both a teaching winery and vineyard. Since the VESTA-Highland Community College partnership began in 2010, the college has enrolled 58 campus-based students; 40% are employed in the local wine industry as technicians or as owner-entrepreneurs.

> "As a business owner, the VESTA courses and workshops have offered our organization an opportunity to continually learn and improve upon our skills and business practices. As a VESTA practicum site, we are able to connect students with experience and practices directly relevant to our region."
>
> **Bob DesRuisseaux** - CEO & Winemaker
> Prairie Fire Winery, LLC

The proportion of female students enrolled in VESTA programs exceeds the percentage of women farm operators and winemakers.

WOMEN SHOW STRONG INTEREST IN VESTA PROGRAMS



Source: US Department of Agriculture; Wine Institute

ENERGY & ENVIRONMENTAL TECHNOLOGIES

ENERGY & ENVIRONMENTAL TECHNOLOGIES
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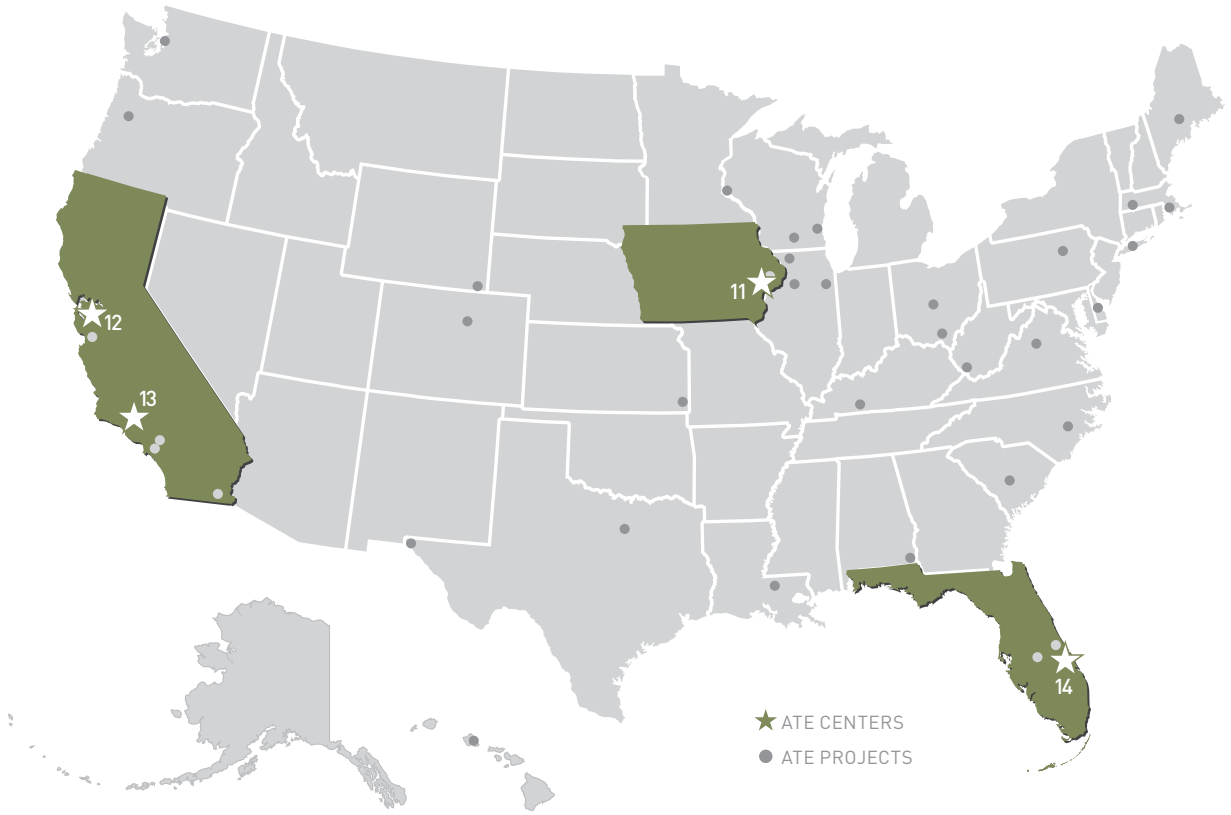


11 **ATEEC**
Advanced Technology Environmental and
Energy Center
Eastern Iowa Community College District
Davenport, IA
www.ateec.org

12 **BEST**
Building Efficiency for a Sustainable Tomorrow Center
Laney College
Oakland, CA
www.bestctr.org

13 **CREATE**
California Regional Consortium for Engineering
Advances in Technological Education
College of the Canyons
Santa Clarita, CA
www.create-california.org

14 **RCNET**
Regional Center for Nuclear Education and Training
Indian River State College
Fort Pierce, FL
www.gonuke.org

ATEEC

Advanced Technology
Environmental and Energy Center

www.ateec.org

EASTERN IOWA COMMUNITY COLLEGE DISTRICT
DAVENPORT, IA

KEY ACTIVITIES

- Partners with business, industry, government agencies, professional organizations, and academic institutions.
- Defines technician knowledge, skills, and competencies needed for the evolving, converging, and emerging technical workplace.
- Collects, validates, and broadly disseminates exemplary education materials.
- Supports and mentors institutions with environmental science and sustainable energy technology programs.

ATEEC's workshops inform educators about energy research and provide hands-on experiences producing biodiesel and other types of alternative energy.

ATEEC Engages & Empowers Students

At ATEEC, the science, technology, engineering, and math (STEM) pipeline engages students by empowering them for careers in the environmental and energy fields.

Its Interactive Learning Lab provides an immersive environment that teaches K-12 students about the fundamentals of sustainable energy. Hands-on activities introduce students to biodiesel, green energy, solar power, and wind energy. The lab gives students a contextual foundation for energy technology that can be built on by later STEM pipeline activities.

ATEEC also works with K-12 and college students at its Nahant Marsh Education Center (NMEC), a 513-acre wetland with bottomland forest, open-water habitat, and a marsh on a former EPA Superfund site. NMEC's accelerated curriculum prepares high school and college students for careers in outdoor recreation and natural resources management.

A technician demonstrates monitoring of wind energy production.

ATEEC Process Creates Pathway from Earning Credit Hours to Earning a Living

ATEEC bridges the gap between classroom and workplace through its Developing A CurriculUM (DACUM) process. This process provides the means for community colleges to conduct a formal job analysis to ensure that technician education is tied to real-world jobs. Led by a trained facilitator, expert practitioners in an occupation come together in a two-day workshop to provide input on the specific tasks, knowledge, and skills required to perform their job. This input provides instructional designers and instructors with the tools to develop new courses or revise existing curricula.

"As water supplies worldwide are tightening because of increasing demand from industry, municipalities, agriculture, and global population is on the rise, careers in the treatment of water and reuse of wastewater offer growing opportunities."

Leonard J. Hoogerwerf - President & CEO
QCAnalytical Services, LLC

ATEEC Forum Examines Water Management Workforce Trends

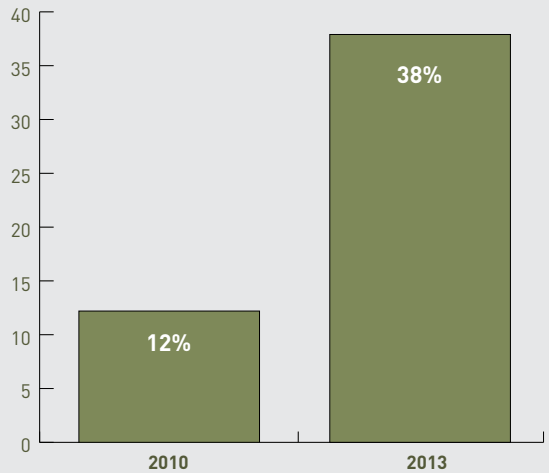
NSF recently tasked ATEEC with spearheading the effort to analyze and redefine the water management field. ATEEC conducted a national forum with representatives of business, industry, and government agencies. The result of this forum was *Defining Water Management*, a national report that provides an overview of occupational categories, titles, and functions in the water management field.

ATEEC Resource Center Puts Materials in Educators' Hands

The ATEEC Resource Center website is the primary tool for information and product dissemination for ATEEC and other ATE projects and centers that focus on environmental and sustainable energy technology. Its 400 products can be downloaded at no charge. These products include publications; occupational analyses, workforce analyses and trends; and a wide array of instructional materials. On average, users downloaded 2,400 products per month in 2013, up from 1,300 downloads per month in 2010.

Use of ATEEC's Resource Center webpage has increased substantially since 2011 when it was reconfigured for easier access and usability. In 2013, the percentage of webpage visitors who downloaded materials increased to 38% (2,400) from 12% (1,300) in 2010.

PERCENTAGE OF ATEEC RESOURCE CENTER WEBPAGE VIEWERS WHO DOWNLOAD RESOURCES



BEST

Building Efficiency for a Sustainable Tomorrow Center

www.bestctr.org

LANEY COLLEGE
OAKLAND, CA

KEY ACTIVITIES

- Promotes technician education in building performance.
- Develops curricula that incorporate energy-efficient, sustainable technologies.
- Educates instructors about building automation systems, sustainable facilities operations, and commercial energy efficiency programs.
- Connects industry advisors with community college educators.
- Strengthens the national STEM pipeline for educating building technicians and engineers.

BEST Center Serves Students & Instructors

BEST Center's website assists students by featuring an aggregator of jobs listings, a directory of colleges with building performance programs, as well as student and alumni success stories.

Providing professional development for instructors is critical to ensuring currency of courses and programs relative to the marketplace. Lawrence Berkeley National Lab and Pacific Northwest National Lab offer their cutting-edge research and expertise for BEST Center to share with other educators.

In 2013, 81 faculty from 17 states participated in innovative workshops that covered industry trends, career pathways, curriculum development, and lab setups. Activities involved industry and student panels, tours of model facilities, and hands-on demonstrations. After analyzing their programs, participants created action plans, which have led to the center providing on-site mentoring at several campuses. BEST Center will store model curricula and course details on its website for faculty to use.

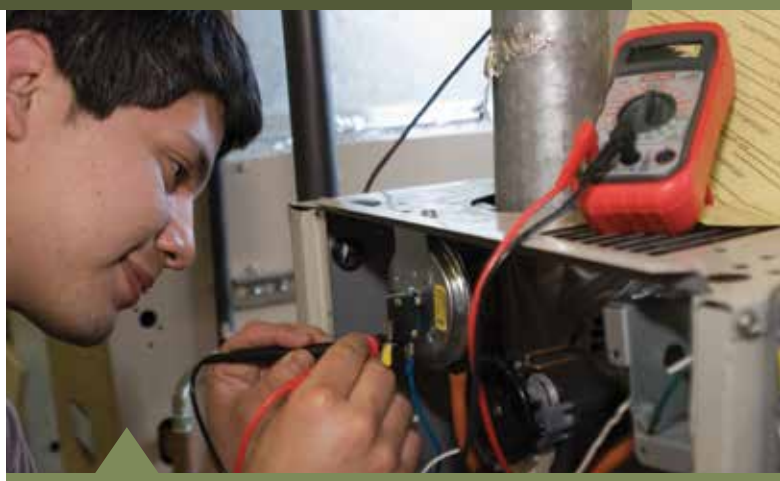
Building automation students learn about direct digital control systems, and the hardware and software to optimize energy management of building systems.

BEST Center Broadens Impact with Research Studies & Other Initiatives

BEST Center and its affiliate colleges promote improved building performance through the advancement of building science and technician education. By bridging community and technical colleges, universities, high school programs, and industry partners, this national collaboration supports advanced technician education programs in heating, ventilation, air conditioning and refrigeration (HVAC/R) control systems, building automation, and energy management.

To broaden its impact, BEST Center has undertaken the following initiatives.

- Compiling four case studies of high performance facilities and the strategies they use for continual improvement. These studies appear on BEST Center's website with other research reports that examine the key roles of technicians in building operations.
- Exploring the development of national certifications for building technicians in tandem with the Department of Energy, industry advisors, and the International Institute for Sustainable Laboratories. Such credentialing has the potential to help recognize and validate the work of technicians in high-performance buildings.
- Partnering with the National Institute for Standards and Technology (NIST) and the Department of Energy to educate incumbent technicians to "re-tune" their buildings, implementing low- or no-cost energy efficiency improvements at their facilities.

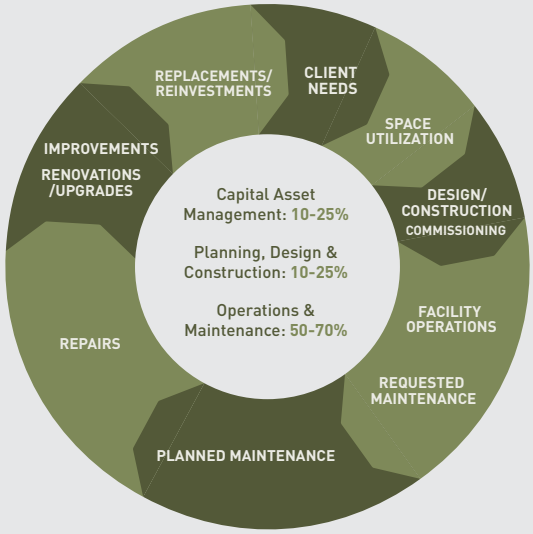


Technicians troubleshoot equipment issues to improve energy-efficient building operations.

- Working with the American Association of Community College's Sustainablilty Education and Economic Development (SEED) Center to promote the Campus as a Living Lab initiative. By leveraging faculty interest in campus sustainability efforts, colleges can enhance hands-on classroom experiences. BEST Center plans to encourage the use of energy management projects as a source of student activities to increase energy literacy across entire college communities.

With enhanced education and strong facilities support, technicians can work proactively on operations and maintenance to optimize building systems' performance.

TECHNICIANS' KNOWLEDGE & SKILLS AFFECT BUILDING PERFORMANCE



PHASES OF THE BUILDING LIFECYCLE

Source: National Research Council

"As we are challenged to improve the performance of buildings, a skilled engineering and technical workforce is necessary to assure that buildings are properly designed, constructed, and maintained."

Steve Selkowitz - Senior Advisor for Building Science & Leader of the Windows & Envelope Materials Group
Lawrence Berkeley National Lab

CREATE

California Regional Consortium for Engineering Advances in Technological Education

www.create-california.org

College of the Canyons
Santa Clarita, CA

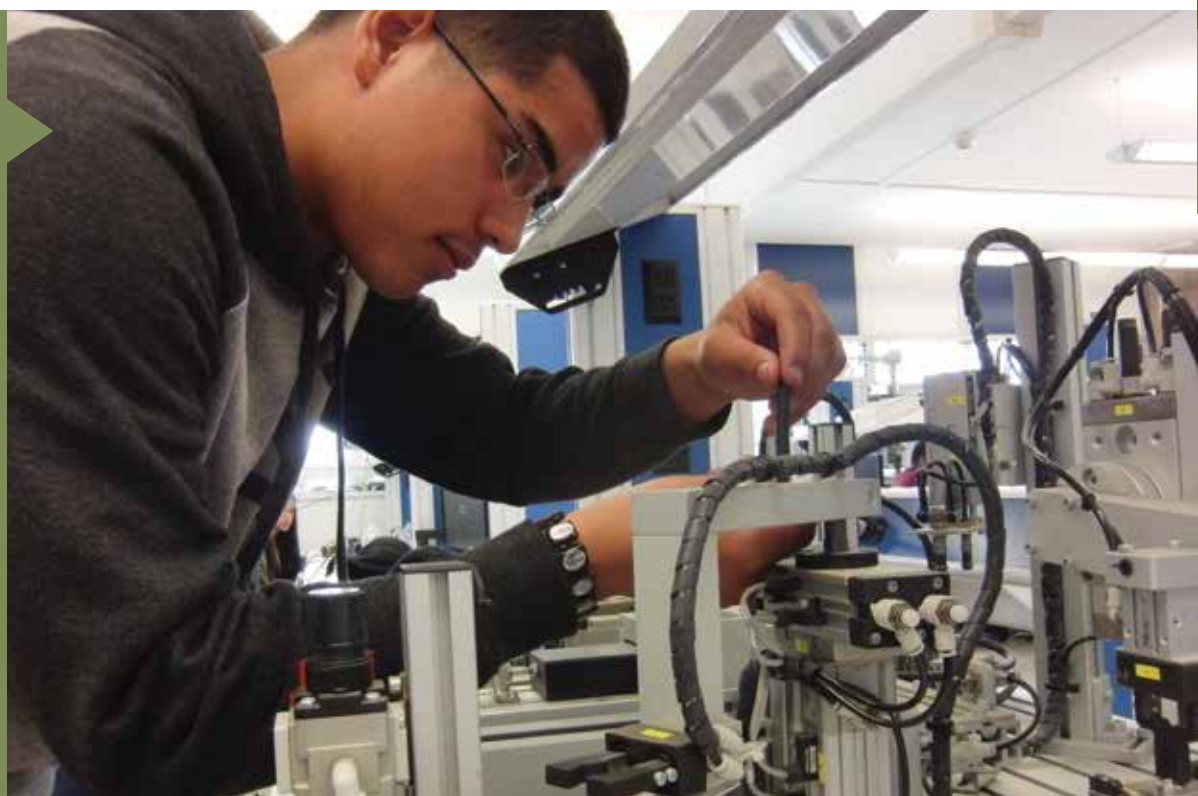
KEY ACTIVITIES

- Develops and refines curricula.
- Implements technical educator professional development.
- Creates 2+2+2 pathways through partnerships with high schools and universities.
- Assesses and evaluates embedded targeted research of curricular and professional development strategies to ensure that student, faculty, and industry goals are attained.
- Disseminates cross-educational collaborations.

CREATE Prepares Students for Renewable Energy Careers

CREATE prepares students to meet the needs of industry by providing faculty development programs and developing specialized curricula embedded in degrees with strong foundational skills in electrical mathematics, drafting, electronics, and robotics. Since 2010 when CREATE became a regional ATE energy center, more than 2,300 students have taken at least one of its new renewable energy courses; 283 of these students have completed either energy degrees or certificates.

CREATE addresses the demand for diverse and gender-balanced workforces by offering girls-only renewable energy camps and developing model renewable energy curricula for high schools. Two high schools with large populations of underserved minority students have successfully implemented CREATE's renewable energy curricula. Their enrollments have increased in recent years with graduation and retention rates remaining high.

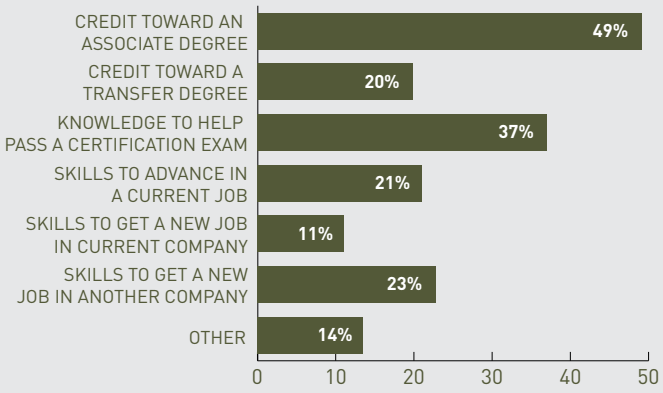


A student makes adjustments to an electro-pneumatic handling system.

Technicians mount mirrors as part of the College of the Desert's Utility-Scale Solar Energy Program.

As CREATE students pursue degrees or certificates, they expect their new energy skills to have an immediate impact on their work.

CREATE STUDENTS' MULTIPLE ENROLLMENT GOALS



CREATE Bridges Education with Industry for Student Success

Partnership with industry is the cornerstone of student success for CREATE. The consortium works closely with more than 125 businesses, industry, and educational entities to develop up-to-date energy-related curricula, provide industry-relevant faculty development, and create career pathways for students. Industry advisory board members at CREATE partner colleges are the source of crucial information about workforce needs, equipment, training, internships, and career pathways. They also provide in-kind and monetary support to CREATE.

Through its collaborative work with industry, CREATE has developed curricula to prepare students to work at utility-scale solar photovoltaic, thermal, and wind facilities; electrical and construction contractors; as well as residential and commercial energy efficiency companies. Six colleges have added solar certificate or degree programs or both types of credentials using CREATE's curricula.

CREATE faculty have worked with solar industry employers to refine several career pathways for solar photovoltaic and solar thermal technical education in the multi-county region in Southern California served by CREATE educational institutions. CREATE is also working with colleges on energy efficiency and energy management curricula that meet Building Performance Institute and Home Energy Rating System certification standards.

Industry support includes mentoring, opening facilities for site visits, providing classroom speakers, and advising community service projects like those that add solar power to low-income housing.

"I use the practical training I received in my CREATE courses almost every day in my job."

Eli Stone - Substation Electrical Technician
Pacific Gas & Electric

RCNET

Regional Center for
Nuclear Education and Training

www.gonuke.org

INDIAN RIVER STATE COLLEGE
FORT PIERCE, FL

RCNET Leads Effort to Standardize Nuclear Technician Curriculum

RCNET is a consortium of 42 colleges and universities, 35 industry partners, and multiple agencies and industry groups. The center develops partnerships between academic institutions and employers to promote improvement in the education of nuclear technicians at the undergraduate level. Since implementation, RCNET has increased enrollment by 65% (from 891 to 1,368 enrollments) in nuclear technician programs at partner institutions.

KEY ACTIVITIES

- Offers systematic response to the demand for skilled nuclear technicians.
- Provides standardized curriculum, human performance, problem-based learning, problem-based research, and hands-on labs for nuclear technicians.
- Develops, categorizes, and maintains a learning repository for nuclear curriculum.
- Offers faculty professional development.
- Serves as a resource for lesson plans and remote access to unique education and training systems.
- Creates academic and career pathways for students and technicians.

RCNET's efforts to standardize curriculum material based on national standards and to establish articulation agreements with four-year colleges help nuclear program graduates enter the workforce and continue their education.

RCNET graduates return to Indian River State College to work on the IRSC flow loop.

RCNET Helps Meet Demand for Skilled Nuclear Technicians

The US nuclear industry is experiencing unprecedented workforce demands due to its growth, an aging workforce, international competition, and natural attrition. By the year 2030, there will be a need for 41,000 new nuclear workers. Current training platforms are not scaled to meet this need, which puts both the industry and the nation at risk. Since NSF established RCNET in 2011, it has addressed these workforce demands in a unified and systematic way.

RCNET developed career assistance materials that emphasize nuclear-specific interview and résumé writing skills to help graduates secure employment in the nuclear workforce. RCNET also implemented the résumé bank at www.gonuke.org as an online repository so that nuclear industry personnel managers can easily access the contact information of graduates seeking employment. To date, 635 graduates of RCNET-affiliated programs have found employment in nuclear and nuclear-related fields.

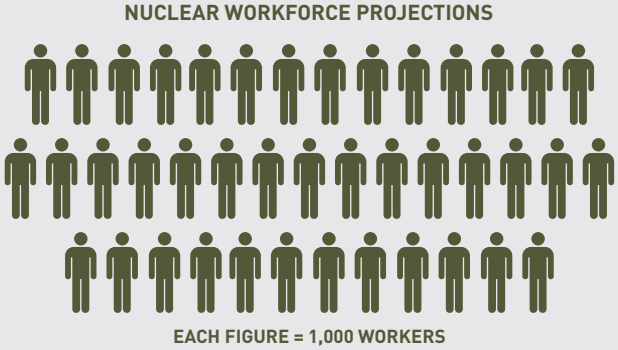
Technicians update their skills with a reactor simulator.

RCNET Enhances Connections Between Navy, Community Colleges & Nuclear Industry

The community colleges affiliated with RCNET are part of the two-way career path cemented by a memorandum of understanding between the Nuclear Energy Institute and the US Navy.

The agreement, facilitated by RCNET, provides honorably discharged sailors with "articulated credit" toward associate in science degrees for their experience operating submarines and aircraft carriers. The agreement also allows the Navy to recruit graduates of Nuclear Uniform Curriculum Programs, which are offered at RCNET-affiliated community colleges.

The nuclear energy industry estimates it will need 41,000 more skilled workers by 2030.



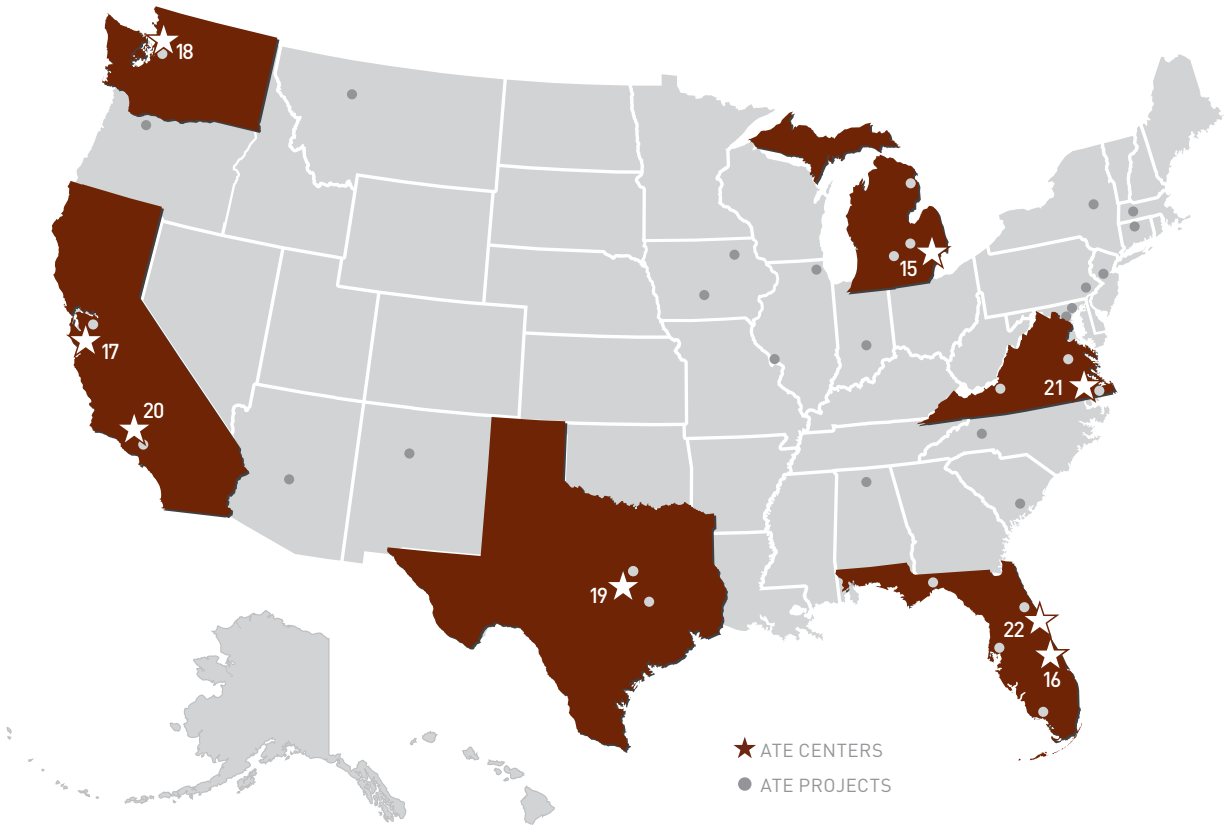
> "The large workforce needs in the nuclear industry created a void in training that RCNET successfully addressed by building academic and industry partnerships and promoting a standardized curriculum. In addition, the RCNET career and academic pathways help address a leadership need in the industry."

James Auld - Director of External Training Initiatives
Florida Power & Light

ENGINEERING TECHNOLOGIES

ENGINEERING TECHNOLOGIES
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS



15 **CAAT**
Center for Advanced Automotive Technology
Macomb Community College
Warren, MI
www.autocaat.org

16 **LASER-TEC**
Laser and Fiber Optics Regional Center
Indian River State College
Fort Pierce, FL
www.laser-tec.org

17 **MATE**
Marine Advanced Technology Education Center
Monterey Peninsula College
Monterey, CA
www.marinetech.org

18 **MatEdU**
National Resource Center for Materials Technology Education
Edmonds Community College
Lynnwood, WA
www.materialseducation.org

19 **OP-TEC**
National Center for Optics and Photonics Education
University of Central Florida
Waco, TX
www.op-tec.org

20 **SCTE**
National Center for Supply Chain Technology Education
Norco College
Norco, CA
www.supplychainteched.org

21 **SMART**
Southeast Maritime and Transportation Center
Tidewater Community College
Virginia Beach, VA
www.maritime-technology.org

22 **SpaceTEC**
National Resource Center for Aerospace
Technical Education
Eastern Florida State College
Cape Canaveral, FL
www.spacetec.us

CAAT

Center for Advanced Automotive Technology

www.autocaat.org

MACOMB COMMUNITY COLLEGE
WARREN, MI

KEY ACTIVITIES

Meets the automotive industry's need for middle-skill technicians in the growing field of electrified and advanced technology vehicles by

- Preparing career-ready technicians to work with advanced propulsion vehicles.
- Collaborating with education, industry, government, and professional organizations.
- Serving as a regional resource for developing and disseminating advanced automotive technology curricula.

CAAT's Multi-faceted Approach Informs Students & Educators

CAAT prepares career-ready automotive technicians for the 21st century workplace. Seed funding that CAAT awarded to community colleges and universities, two of which directly integrated collaboration with industry partners, resulted in the development of a module in the safe manufacturing of advanced energy storage products.

Other center support was used to update 13 courses, and develop three new courses on hybrid and electric vehicle technology.

These curriculum improvement efforts resulted in students earning 14 associate of applied science degrees and 73 certificates. In addition, 44 students were enrolled in Macomb Community College's Electric Vehicle Development Technology Certificate Program in 2013.

CAAT presented a workshop on batteries to 40 members of the Southeast Michigan Automotive Teachers Association. In a follow-up survey, 78% of the 19 participants who completed CAAT's survey indicated that they had used the workshop information.

An instructor and students analyze a hybrid electric vehicle transmission.

Technicians test the resistance on an electric vehicle's power steering system.

CAAT Leverages Partnerships for Workforce Needs Related to Hybrid & Electric Vehicles

CAAT's vision is to be recognized as the preeminent regional center with national impact on advanced automotive technology, developing strong relationships with industry partners, and connecting with other educational institutions to further the education of technicians and engineering technologists in advanced automotive technologies.

CAAT leverages its industry and educational partnerships to

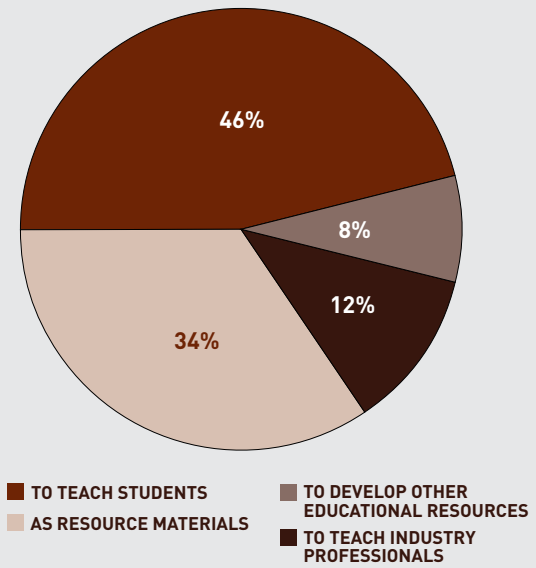
- Lead the development of an Electric Vehicle Development Technology Certificate Program at the request of the Michigan Academy for Green Mobility Alliance.
- Provide internships for students in Macomb Community College's Electric Vehicle Development Technology Certificate Program.
- Assemble an impressive Industry Advisory Council comprised of high-level representatives from eight automotive businesses to ensure CAAT's goals and activities are aligned with employer needs.
- Assist SAE International by providing 14 students and two faculty members to participate in beta testing for the SAE Electric Vehicle Safety credential.
- Provide 80 emergency first responders with safety training workshops about hybrid and electric vehicle technology.
- Host or sponsor educational conferences for students, educators, and industry professionals to highlight advanced automotive technology and to bridge the gap between industry and education.
- Provide seed funding to four community colleges and two universities for development of curricula to address critical employer needs. Three employers participated.

"The Center for Advanced Automotive Technology is using an innovative approach to educate technicians for middle-skill jobs in hybrid and electric vehicle technology that effectively combines mechanical and electrical skills."

Ed Fagan - Senior Human Resources Representative
Link Engineering Co.

During the first year of CAAT's online Resource Library, hundreds of classroom-ready educational materials were downloaded.

USES OF CAAT RESOURCE LIBRARY MATERIALS



LASER-TEC

Laser and Fiber Optics Regional Center

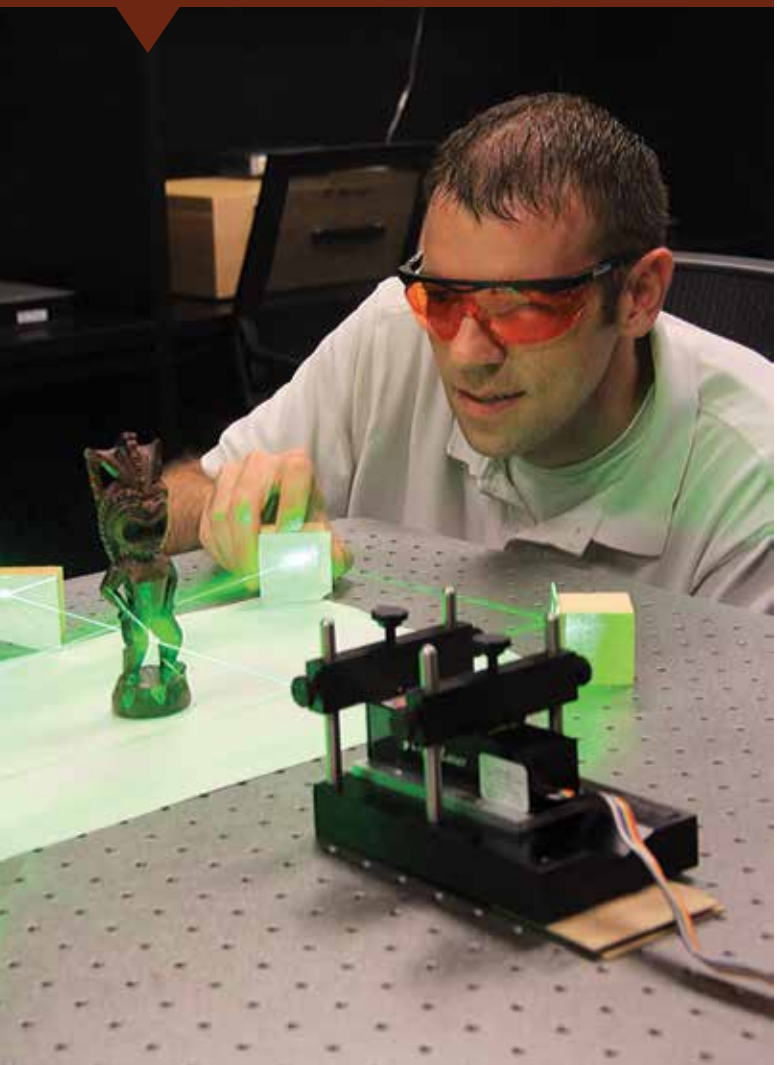
www.laser-tec.org

INDIAN RIVER STATE COLLEGE
FORT PIERCE, FL

KEY ACTIVITIES

- Offers $10,000 grants and guidance to colleges that start laser or fiber optics courses or programs.
- Provides free online courses in lasers and fiber optics with hands-on lab instruction and other educational materials.
- Offers educators free, in-person, one-day workshops on lasers and fiber optics.
- Offers educational and career information to returning veterans.
- Anchors a broad education infrastructure in the southeastern US to enhance and promote STEM careers.

A student experiments with a laser system.



LASER-TEC Network Launches Students on Careers with Family-Sustaining Wages

LASER-TEC and the 10 colleges in the LASER-TEC network partner with 253 companies. The center's regional workforce development mission only began in 2013, but for the last 25 years the laser and fiber optics programs at LASER-TEC network colleges have been educating technicians through associate in applied science degree programs. The LASER-TEC network colleges have also offered more than 100 professional development workshops for high school educators, who, in turn, have taught more than 30,000 students about lasers and optics.

Laser and fiber optics technicians' starting salaries average $40,000, similar to the average earnings of bachelor degree holders in 2012 who were between 26 and 30 years old. The relatively high salaries available to laser and fiber optic technicians elevate the socioeconomic status of LASER-TEC program graduates.

LASER-TEC Supports US Leadership in Lasers & Fiber Optics Industry

LASER-TEC aims to help maintain the United States' world leadership in the field of lasers and fiber optics. These industries affect the vitality of US companies involved in the advanced instrumentation of life sciences and information technology. A 2012 study by the University of North Texas Survey Research Center estimated that US employers would need an additional 1,590 two-year degreed photonics technicians in 2013.

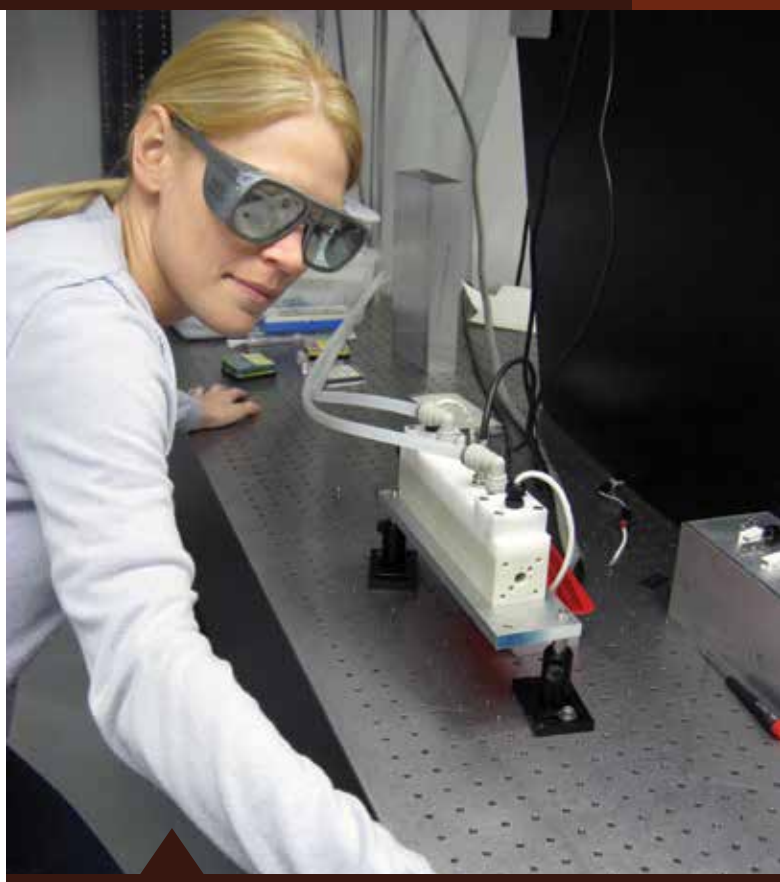
As the center and its 10-college network develop a steady supply of qualified laser and fiber optic technicians, they will be collaborating with economic development efforts to encourage more companies to move their research, development, and manufacturing operations to the Southeast US. These educator-employer partnerships are expected to have a beneficial and lasting effect not only in the region, but on the entire nation.

LASER-TEC Reaches Out to Women, Minorities & Veterans

LASER-TEC's principal investigator, as a member of the advisory board of the NSF's Gender Equity Cooperative, organizes events aimed at attracting more women and minorities into its degree program. In 2013, for instance, LASER-TEC offered two laser-photonics camps for junior and senior high school girls.

To help military veterans transition to civilian life, Laser-TEC participates in the Veterans Retraining Assistance Program. Indian River State College began offering the certificate program in 2013; LASER-TEC plans to replicate the program at its partner colleges.

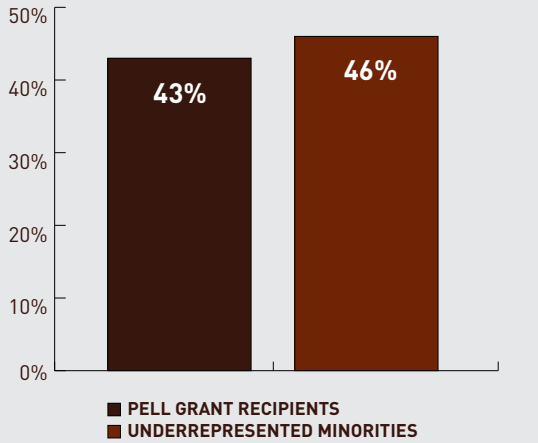
> "My professors guided me and gave me excellent knowledge to better myself, not only in photonics, but in life as well."
>
> **Jason Troyano** - Technician
> GE Healthcare



A graduate of Central Carolina Community College aligns an Er:YAG resonator at MegaWatt Lasers, Inc.

Of the 120 students enrolled in LASER-TEC programs in fall 2013, 43% received Pell grants and 46% were underrepresented minorities.

LASER-TEC REACHES UNDERSERVED POPULATIONS



MATE

Marine Advanced Technology Education Center

www.marinetech.org

MONTEREY PENINSULA COLLEGE
MONTEREY, CA

KEY ACTIVITIES

- Researches trends on the ocean workforce and develops marine occupational guidelines.
- Organizes international and regional competitions of underwater remotely operated vehicles (ROVs).
- Runs engaging interdisciplinary, technology-rich professional development focused on marine issues.
- Runs SeaMATE, a social enterprise that employs college students to build underwater robotics kits for education.
- Offers at-sea marine technical internships for students to gain work experience.

At-Sea Internships Lead to Marine Technology Careers & Other STEM Jobs

MATE's marine technical internship program began in 1999 and has placed 280 students in at-sea and shore-based internship positions. The program helps students overcome the paradox of not being able to acquire a job without marine technical work experience, and not being able to get work experience without a job. MATE's internships also help ocean-related employers gain access to qualified technical professionals who can fulfill their workforce needs. By working with marine technicians and scientists, MATE interns develop technical, scientific, seamanship, and interpersonal skills.

MATE has longitudinal data for 210 interns. To date, 25% of them are continuing their education in STEM fields; 40% are working in marine science and technology positions; 18% are working in a STEM field other than marine science or technology; and 8% are educators in a STEM subject.

A student intern fabricates remotely operated vehicles (ROV) parts.

MATE Attracts Students to the Ocean Workforce through Underwater Robotics ROV Competitions

Recent workforce studies conducted by MATE with funding by the Office of Naval Research identified more than 20 STEM-based ocean occupations that are limiting the growth of ocean industries because of the current lack of qualified personnel. At the top of the list are electronics and marine technicians, including ROV technicians; engineers (electrical, mechanical, civil and structural); and computer scientists, including software application developers, computer programmers, and hardware developers.

However, these are not "just" technicians, engineers, and computer scientists; they are professionals who understand ocean applications within their fields. For example, ROV technicians who support ocean operations must have an understanding of ocean science in addition to engineering and computer science knowledge. Mastery of multiple complex technologies is necessary because all commercial ROVs possess computer-controlled systems that must be maintained, repaired, and modified in remote locations far from port. These skill sets are also transferable to almost every sector of the economy that uses robotics and computer-controlled systems.

Combining STEM education with ocean applications via the MATE ROV competition network provides students with a pathway to achieve their goals, including the gainful employment that is so critical to engaging students from economically disadvantaged environments. To date, the competitions and their supporting professional development workshops have impacted more than 20,000 students and 2,000 teachers at more than 2,000 formal and informal educational institutions such as middle schools, high schools, home schools, community colleges, universities, 4-H clubs, and public aquaria.

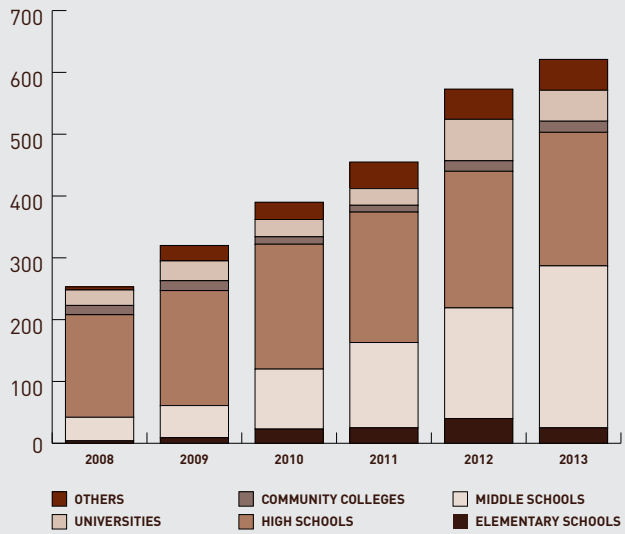
"The MATE Center works hard to provide the industry with skilled people by exposing them to our world and helping to make their education more relevant to what our industry needs."

Drew Michel - President
Marine Technology Society

Marine technicians must be able to repair ROV electronics and troubleshoot problems in remote locations.

Interest in MATE ROV competitions continues to grow, particularly among middle school and high school students.

MATE ROV COMPETITION TEAM PARTICIPATION 2008-2013



MatEdU

National Resource Center for
Materials Technology Education

www.materialseducation.org

EDMONDS COMMUNITY COLLEGE
LYNNWOOD, WA

KEY ACTIVITIES

- Advances materials technology education nationally.
- Disseminates industry-approved core competencies for materials science technicians to improve their preparation for careers in various fields.
- Facilitates industry, education, and community collaborations to meet materials technology workforce needs.
- Provides easy and direct access to web-based resources and professional development opportunities.

MatEdU Fosters Innovation by Explaining Materials Science

MatEdU teaches students, educators, and the general public about the materials and processes behind everyday products. Its diverse approach encompasses industry, education, art, and science because understanding materials science is integral to technicians' work in engineering technology, manufacturing, electronics, and nanotechnology.

Internship Program Leads to Employment

MatEdU was instrumental in the design and implementation of a unique, replicable educational internship model. The educators who lead Edmonds Community Colleges' materials science technology (MST) degree program along with industry partners have created a two-summer internship program that has exposed 48 students to high tech materials testing and research labs. Students and employers unanimously praise the internship model, which includes both paid and unpaid opportunities. Best of all, the program has led directly from internships to jobs for 16 graduates. Several of the individuals hired from internships are continuing their education in bachelor degree programs while employed.

MatEdU Prepares Technicians Who Understand the "Science of Stuff"

MatEdU's peer-reviewed modules, labs, and demonstrations inform educators who teach students to understand a broad array of materials and their diverse uses. Demand for technicians who

MatEdU Guitar Building Workshops teach students about different types of materials.

understand the "science of stuff" is high in many fields because successful product design relies on the proper selection of materials.

MatEdU and its national network of partners offer professional development and mentoring for elementary and secondary school teachers, as well as for faculty from community and technical colleges, and four-year institutions. These opportunities help educators integrate materials science information, labs, and hands-on experiments into their programs. More than 600 people have attended MatEdU workshops since 2010.

The National Educators Workshop (NEW) is a special forum that MatEdU offers to bring together K-12 teachers, two- and four-year instructors, and industry representatives to share hands-on teaching and learning through presentations of classroom experiments, labs, and demonstrations.

MatEdU Develops Core Competencies For Materials Science Technicians

Working with industry, secondary schools, community and technical colleges and university partners, MatEdU identified the essential skills and knowledge that materials science technicians need to know. MatEdU's Core Competencies have Washington state government approval for use in the development of materials science curricula and other STEM programs. MatEdU also uses the core competencies to guide the development of its modules and technician education courses, to create NEW presentations, and to plan coverage of emerging areas of materials science.

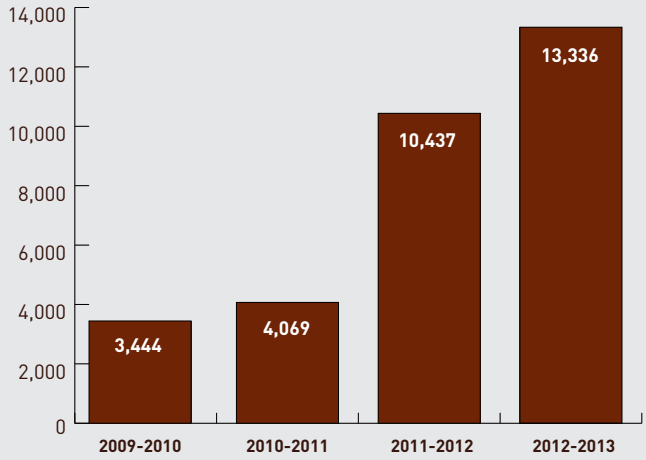
Technicians prepare to mark the binding location to complete assembly of a snowboard.

Slightly more than half of the 13,336 individuals who accessed MatEdU's website resources in 2012-2013 were involved in education and research; 27% of users were involved in commercial enterprises.

"The modules [and] instructional materials are great. When I need an idea for a module, demonstration, or lab I can search for and download one from the MatEdU website. My favorite is a materials science lab from Virginia Tech titled Materials Science—It's a Piece of Cake. This is a great way to get my materials science classes started!"

Gabe Cronin - Instructor
Seattle Academy

MATEDU WEBSITE TRAFFIC CONTINUES TO INCREASE



OP-TEC

National Center for Optics and Photonics Education

www.op-tec.org

WACO, TX

KEY ACTIVITIES

- Promotes photonics technician education.
- Assists colleges and high schools in program planning.
- Develops and distributes standards-based curricula and teaching materials for photonics, laser electro-optics, and precision optics instruction.
- Delivers professional development for faculty and training for employed technicians.
- Facilitates program development and improvement through sharing of research and best practices.

OP-TEC Assists Colleges & High Schools to Teach Photonics

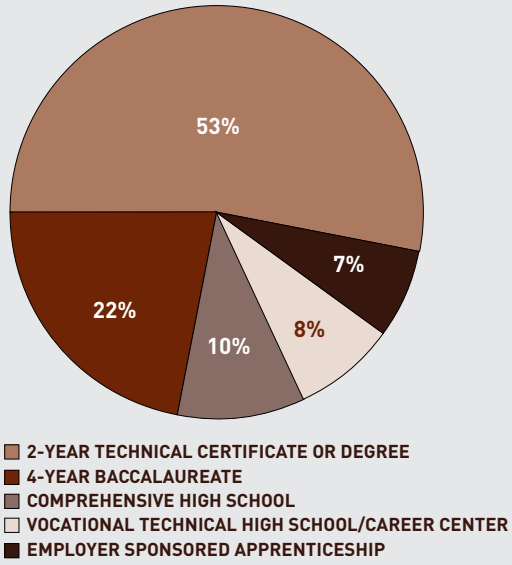
Photonics applications involve the use of lasers, optics, fiber-optics, and electro-optical devices in fields such as manufacturing, medicine, aerospace, information technology, communications, defense, and solid-state lighting. Optics and photonics education offers technicians a variety of careers and professional advancement opportunities. OP-TEC's *Success Stories in Photonics Careers* publication showcases 34 photonics technicians.

OP-TEC creates and distributes standards-based teaching materials, planning guides, and monographs on successful practices. Its professional development courses prepare hundreds of faculty members to teach photonics. OP-TEC awards grants to colleges to fund summer camps and Saturday academies. It also provides grant funds for colleges to use dedicated recruiters to inform students, teachers, and parents of career opportunities available in photonics. OP-TEC's 32 college partners are developing career pathways through well-planned secondary course sequences articulated to postsecondary programs.

AAS photonics programs prepare students for exciting and rewarding careers.

Of the 346 photonics employers who responded to an OP-TEC survey, 53% prefer to hire technicians prepared by two-year colleges.

EMPLOYER EDUCATIONAL PREFERENCES FOR PHOTONICS TECHNICIANS



OP-TEC Responds to Employer Needs for Highly Educated Photonics Technicians

Today, more than 20,000 photonics technicians are at work in businesses, laboratories, government, hospitals, defense industries, and educational institutions. A recent OP-TEC study found that US employers require 800 new photonics technicians each year, while two-year colleges are currently producing fewer than 300 graduates annually. Photonics employers are increasingly forced to hire underprepared applicants; some companies are moving offshore. Meanwhile, many capable high school students are not aware of the opportunities for rewarding careers in photonics.

To help meet the urgent workforce need and maintain US competitiveness, OP-TEC is supporting new associate in applied science (AAS) programs and strengthening existing ones by creating secondary-to-postsecondary "pipelines" to increase the number and diversity of photonics students. OP-TEC has created and is cultivating four regional photonics clusters to establish regional photonics centers. These regional centers allow colleges to broaden their reach and offer more internships and job opportunities for deserving students. They will also provide more opportunities for students to use industry standard equipment, faculty to access supplemental funding opportunities, and colleges to recruit adjunct faculty from more industry partners. Benefits for employers include the opportunity to offer regional advice, serve as a source of adjunct faculty, provide support for the two-year colleges that prepare their workforces, create a larger pool of well-prepared graduates, and lower their internal education and training expenditures.

OP-TEC is also leading a national initiative to educate employed technicians through online courses and capstone lab experiences at nearby colleges.

"When individuals have completed an OP-TEC developed program, the training and education they have will meet my expectations. OP-TEC's National Skill Standards assure that graduates have the capability to fulfill my expectations."

Gary Gorsuch - CEO
Meadowlark Optics

Laser technicians conduct hands-on research and custom design equipment to improve manufacturing processes.

SCTE

National Center for Supply Chain Technology Education

www.supplychainteched.org

NORCO COLLEGE
NORCO, CA

National Center for Supply Chain Technology Education

KEY ACTIVITIES

- Conducts gap analyses of existing technician education programs, identifies available supply chain technologies, and develops supply chain education modules.
- Develops and delivers professional development related to supply chain technologies.
- Disseminates information about supply chain technician careers to students, educators, and industry.

SCTE Explains New Supply Chain Careers

Supply chain technicians install, operate, support, upgrade, and maintain the software, hardware, automated equipment and systems that support the supply chain. The supply chain encompasses commercial enterprises such as retail, pharmaceutical, and food processing businesses, as well as public sector operations such as the Department of Defense's movement of materials to support troops. SCTE's key mission is explaining to educators and prospective students the new career opportunities in this growing field that affects the smooth operation of so many industries.

With clever animations and fast-paced videos, SCTE's website illustrates the need for supply chain technicians and shows the wide range of tasks technicians perform in highly automated warehouses and distribution centers.

The center's professional development programs also help clarify for educators what supply chain technicians do. Center personnel help educators modify industrial maintenance programs to meet the demand for industrial machinery mechanics, electro-mechanical technicians, as well as electronics and electrical technicians. SCTE estimates that by 2015 demand for additional industrial machinery mechanics alone will surpass 11,000.

Assignments in the supply chain technology lab prepare students by mimicking real work challenges.

Supply chain technicians install and maintain sensors on automated conveyor systems.

SCTE Survey Finds Strong Demand & High Wages for Supply Chain Technicians

SCTE's national survey of 625 businesses with warehouses and distribution centers found that 30% plan to increase the number of supply chain technicians they employ by 2015. Nearly 80% of the businesses surveyed employed at least one supply chain technician. SCTE's survey also found that supply chain technicians earn family-sustaining wages ranging from $37,300 to $63,200 annually. SCTE estimates there are 47,500 supply chain businesses in the US.

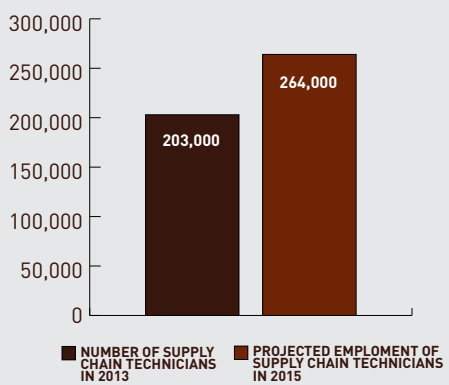
SCTE's 2013 study to measure the growing demand for supply chain technicians was conducted with the Center of Excellence, an initiative of the California Community Colleges Economic and Workforce Development program. California is among the 10 states where nearly half of all US supply chain businesses are located. In addition to California, supply chain businesses are concentrated in Texas, Florida, New York, Illinois, Pennsylvania, Ohio, Michigan, North Carolina, and Georgia. SCTE's 2013 study recommends community colleges in these states add supply chain certificate and degree programs.

To help start new programs, SCTE worked with industry to develop a model program that prepares students to work in automated warehouses. This model program focuses on the skills necessary to be successful in facilities throughout the US. It emphasizes critical thinking, problem solving, and a hands-on teamwork approach to learning. Educators can work directly with their local employers to customize SCTE's model program to meet their particular needs.

Based on its survey of 625 employers with warehouses and distribution centers, SCTE projects 61,000 more supply chain technicians will be needed in 2015 than were employed in 2013. SCTE's industry advisory committee provided salary data.

30% INCREASE IN DEMAND FOR SUPPLY CHAIN TECHNICIANS BY 2015

SUPPLY CHAIN TECHNICIANS' AVERAGE ANNUAL SALARY IS $48,000.



"There is a need for a person who installs, upgrades, or maintains the software, hardware, or material handling equipment which supports the supply chain; the National Center for Supply Chain Technology Education is helping us to meet this need."

Phil Jones - Senior Project Manager for Distribution Engineering & Facilities, Vendor Relations
Target Corporation

SMART

Southeast Maritime and Transportation Center

www.maritime-technology.org

TIDEWATER COMMUNITY COLLEGE
VIRGINIA BEACH, VA

KEY ACTIVITIES

- Coordinates career pathways with stackable academic credentials embedded in registered apprenticeships and other maritime transportation programs, resulting in students earning college certificates and degrees as well as industry–recognized credentials.
- Provides timely, relevant professional development ranging from one-day workshops to week-long SMART Institutes.
- Sponsors opportunities for industry and education partnerships.

Institute Participants Invigorate Programs & Recruit Students

SMART's Maritime and Transportation Institute is a professional development workshop for two- and four-year college instructors, K-12 teachers, and industry representatives. The institutes feature hands-on learning and tours of shipyards, ports, terminals, ships, and equipment simulators to familiarize participants with the four major maritime transportation sectors.

More than 150 institute participants continue to work with SMART as collaborators with regional industry and education partnerships that recruit students for maritime and transportation careers. Institute participants meet throughout the nation to share successful program outcomes, present materials, and track the use and effectiveness of SMART's Maritime Transportation Career Guide.

The institutes have launched five new secondary school and three new community college maritime programs. The enrollment of more than 250 students in community college maritime transportation programs and 80 high school students in dual enrollment maritime courses can be traced to the institutes.

Students enrolled in Maritime Technologies Pathway programs learn how to install electrical and mechanical controls using simulators in college labs.

Maritime Technologies Pathway Blends Apprenticeship & College Credentials

With input from more than 80 maritime and transportation employers, SMART developed its Maritime Technologies Pathway to help US educational institutions prepare the highly-skilled technicians needed to meet the critical workforce demand created by technological advances and the aging workforce.

The four maritime and transportation academic certificates in SMART's pathway "stack" toward attainment of associate in applied science degrees. They also count toward Department of Labor registered apprentice program requirements for journeyperson credentials. Journeyperson status is highly valued throughout the maritime industry. Companies competing for government contracts also want technicians to earn college certificates and degrees because of requirements for evidence that their technical workers are educated and highly-skilled.

In 2013-2014, more than 1,300 registered apprentices and 50 new students were enrolled as maritime transportation students in SMART partner colleges. By January 2014, 210 SMART pathway graduates had earned both the journeyperson credential and at least one academic credential in the Maritime Technologies Pathway.

SMART also facilitates the delivery of technical courses to maritime industry locations. SMART-affiliated educators use remote instructional technologies to deliver the content simultaneously across multiple time zones. Students in various locations interact in real-time with the instructor and other students taking the intense week-long courses. In addition to the instructor, SMART provides a certified technician in the labs at each site.

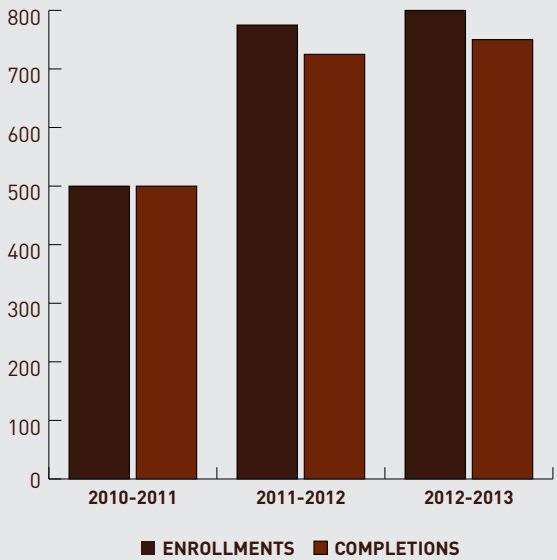
> "The SMART Center has broken new ground for the industry by creating critically-needed career and academic pathways for producing maritime and transportation technicians."

Brad Mason - Director of Operations
AMSEC LLC, subsidiary of Huntington Ingalls Industries

Engineering technicians maintain the complex engine components of ships, like the RORO (Roll-On, Roll-Off) ship operated by the US Maritime Administration (MARAD).

Enrollment in and completion of maritime-related courses has increased since the SMART Center started in 2010. Maritime Technologies Pathway students usually complete four to six courses per year.

SMART CENTER MARITIME-RELATED COURSE ENROLLMENT & COMPLETION



SpaceTEC

National Resource Center for
Aerospace Technical Education

www.spacetec.org

EASTERN FLORIDA STATE COLLEGE
CAPE CANAVERAL, FL

KEY ACTIVITIES

- Encourages students to become "explorers" in aerospace careers.
- Empowers educators to teach aerospace-derived competencies.
- Produces relevant curricula driven by employer needs.
- Develops national standards that meet aerospace safety and quality expectations.
- Offers credentials that demonstrate aerospace best practices and lessons learned.

SpaceTEC Partners Empower Aerospace Technicians

SpaceTEC education partners empower experienced aerospace technicians to enhance their skills and status with their employers by attaining SpaceTEC certification and college credits.

For example, an aerospace technology instructor at Calhoun County Community College led seven Boeing technicians through a six-week, 16-hour course to prepare them for the SpaceTEC Certified Aerospace Core certification. Six of the seven technicians earned the core credential on their first attempt and were rewarded with $500 bonuses from their employers. Under the American Council on Education's CREDIT program, each of the technicians also qualified for up to 24 college credit hours. The American Council on Education, which represents 1,800 higher education institutions, has approved SpaceTEC exams for credit toward baccalaureate and associate degrees.

The hands-on electronics portion of the SpaceTEC Core Certification exam tests the skills that employers seek.

SpaceTEC Certifications Influence Hiring Decisions & Military Training

SpaceTEC's aerospace technician certification programs are being adapted to serve a wide array of technical employers and to train military personnel. For example,

- Tennessee College of Technology-Hohenwald uses the CertTEC Basic Electricity and Electronics certification as an end-of-course requirement for Electronics Technology and Electro-Mechanical Technology in response to employer needs.
- AAR Corp. in Oklahoma City, OK, hires 100% of its new structural fabrication technicians from Francis Tuttle Technology Center, a new SpaceTEC partner.
- Thomas Nelson Community College's Aerospace Program aligns with the SpaceTEC Core certification exam. Fourteen of the 19 Thomas Nelson students who passed the written and hands-on performance exams to attain SpaceTEC Core certification are now employed at NASA Langley Research Center as apprentices; four are enrolled in baccalaureate degree programs at Old Dominion University.
- SpaceTEC hosted two NASA High Power Rocket workshops for Kennedy Space Center engineers in 2012 that helped participants achieve certifications from the National Association of Rocketry.
- The US Army employs CertTEC Basic Electricity and Electronics certifications as part of the Soldier for Life initiative at the Army's Ordnance School at Fort Gordon. CertTEC Basic Composites certification is also used for service member and contractor professional development at Redstone Arsenal and Hunter Army Airfield.

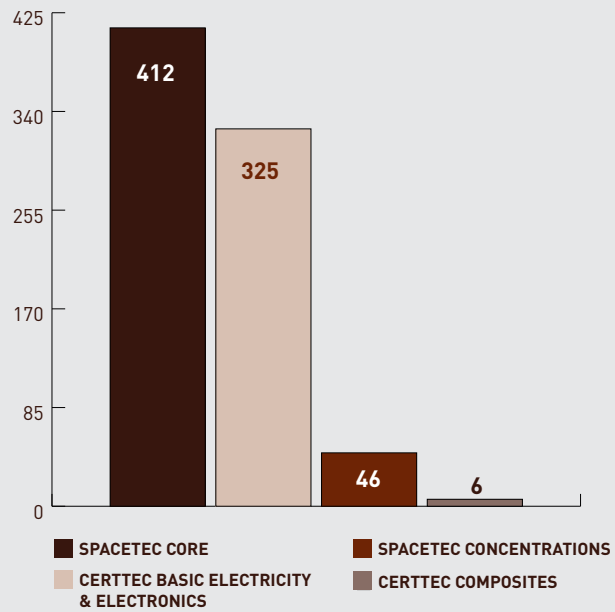
"We learned SpaceTEC-certified technicians are anxious to take what they have learned in the classroom and apply it to their real-world careers, and they enter into the workplace with greater enthusiasm."

Mark A. Miller - Operations Manager
Embraer Executive Aircraft, Inc.

Technicians conduct a torque wrench verification procedure on a ground support purge and pressurization panel at the Mid-Atlantic Regional Spaceport.

With the commercialization of the space industry, employers and colleges are using SpaceTEC and CertTEC certifications.

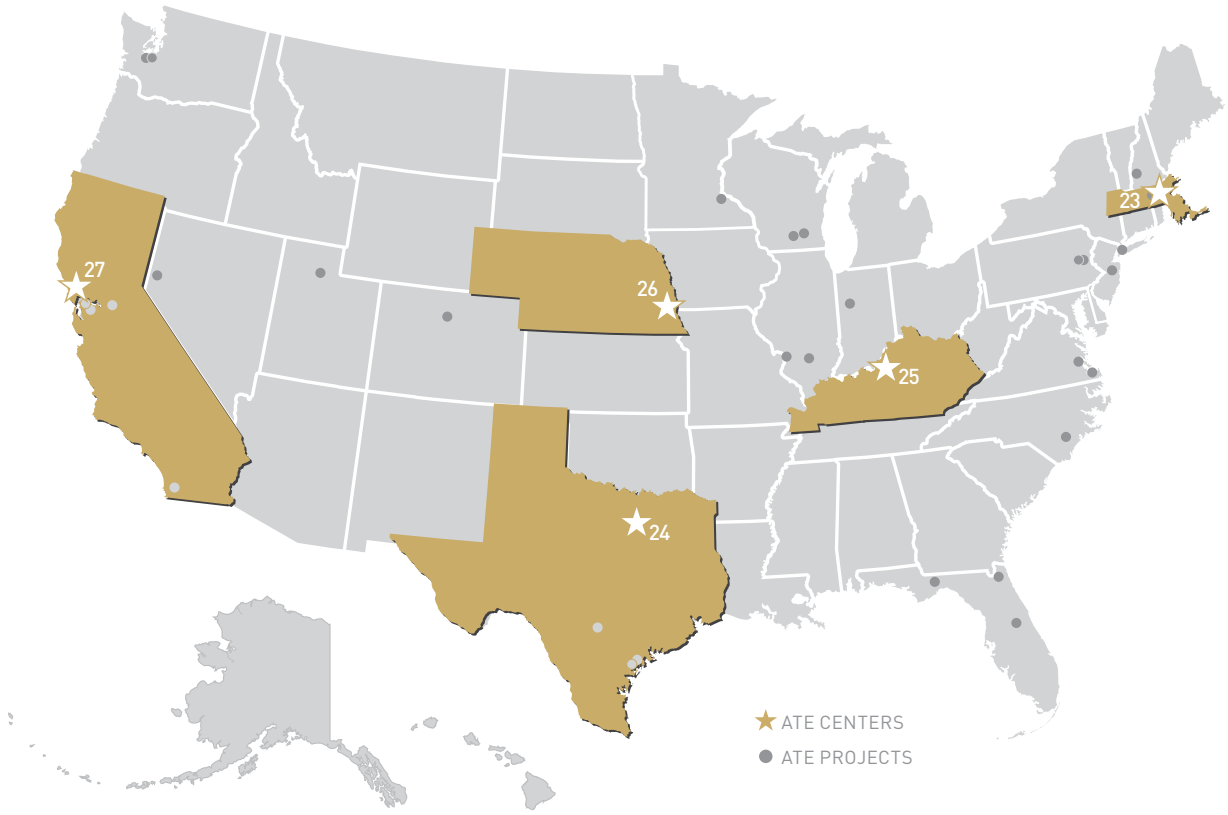
SPACETEC & CERTTEC CERTIFICATIONS EARNED SINCE 2004

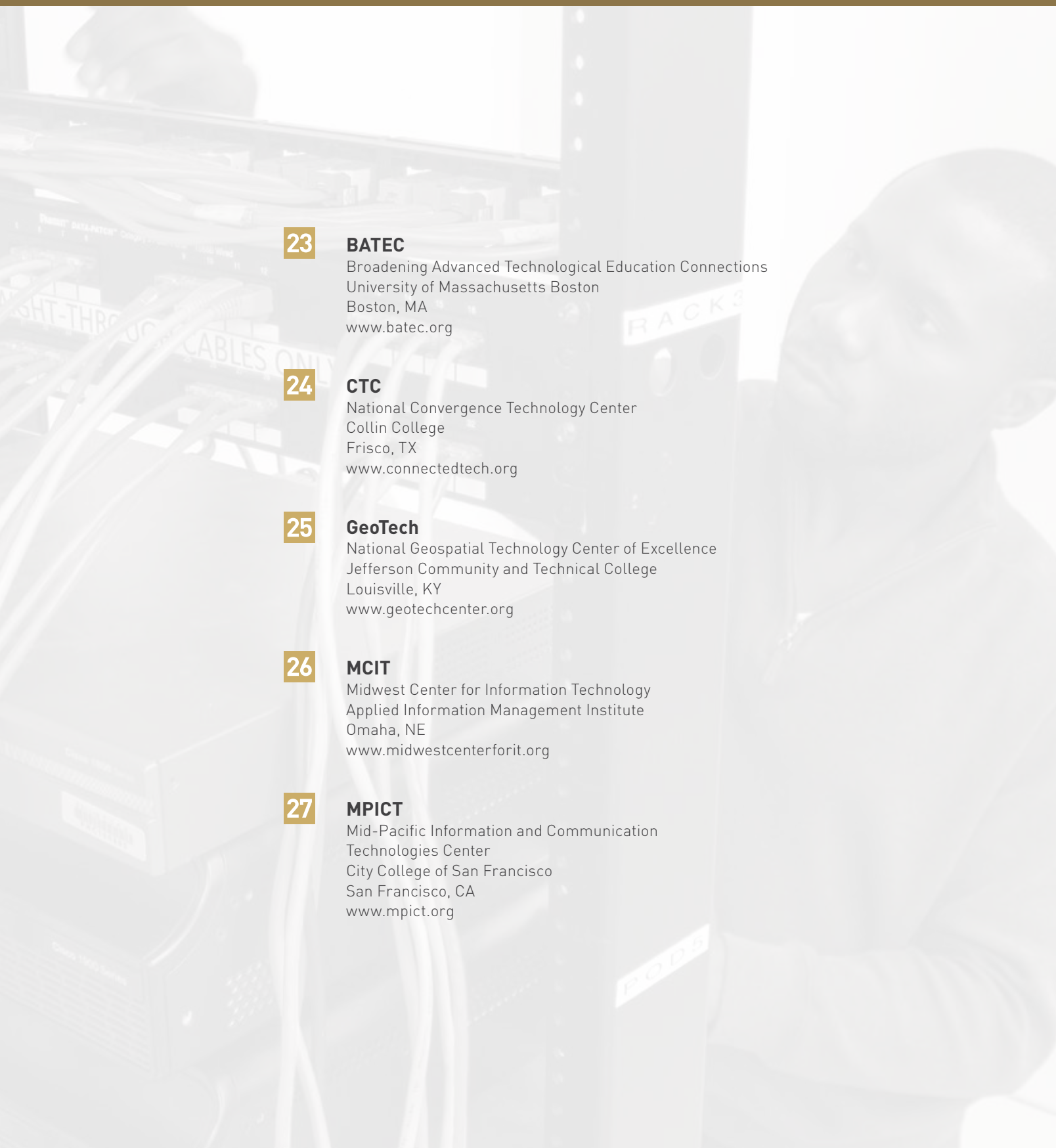


INFORMATION TECHNOLOGIES

INFORMATION TECHNOLOGIES
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS





23 **BATEC**
Broadening Advanced Technological Education Connections
University of Massachusetts Boston
Boston, MA
www.batec.org

24 **CTC**
National Convergence Technology Center
Collin College
Frisco, TX
www.connectedtech.org

25 **GeoTech**
National Geospatial Technology Center of Excellence
Jefferson Community and Technical College
Louisville, KY
www.geotechcenter.org

26 **MCIT**
Midwest Center for Information Technology
Applied Information Management Institute
Omaha, NE
www.midwestcenterforit.org

27 **MPICT**
Mid-Pacific Information and Communication Technologies Center
City College of San Francisco
San Francisco, CA
www.mpict.org

BATEC

Broadening Advanced Technological Education Connections

www.batec.org

UNIVERSITY OF MASSACHUSETTS BOSTON
BOSTON, MA

KEY ACTIVITIES

- Defines and strengthens academic pathways and career opportunities for computing and information technology (IT) professionals.
- Designs and implements programs that build awareness, generate interest, and support learning in the ethnically diverse urban areas of Boston, Chicago, Las Vegas, and San Francisco.
- Conducts research about workforce development and authentic curriculum.

Collaborations Create New Academic Programs

Collaborations among BATEC's academic partners and industry professionals are creating academic programs that emphasize authentic workplace experiences and successful student outcomes.

Middlesex Community College invigorated its computer science degree program by adding a secure software development track that conforms to the federal government's cybersecurity framework. This track was developed with the assistance of MIT Lincoln Laboratory, the MITRE Corporation, Bunker Hill Community College and the National Center for Systems Security and Information Assurance (CSSIA).

Bunker Hill Community College has restructured all of its computing information and network technology programs to offer students a seamless, stackable progression of achievement. These new certificates make it possible for students to experience success in shorter intervals and leverage the accomplishments to obtain work-study employment while they continue to pursue traditional degrees.

IT students at Bunker Hill Community College develop technical problem-solving skills for setting up IT networks.

IT technicians must be able to troubleshoot computer and IT systems.

BATEC Colleges Develop Scalable Internship Program

BATEC's academic partners have developed a systematic, scalable model for student qualification, preparation, and placement in semester-long internships that provide both academic credit and financial compensation.

Building on the success of the Boston-based Tech Apprentice program (which places about 125 urban high school students in technology work experiences each summer), MassBay Community College and Quinsigamond Community College have developed a model for placing about 50 media technology students each year in internships at small- and medium-size businesses.

City College of San Francisco and the College of Southern Nevada in Las Vegas are extending this model to other disciplines within their regions.

"BATEC fosters a dynamic environment where business and industry can work closely with educators to create the computing workforce that companies depend on for our future growth."

Edwin Guarin - Solutions Specialist
Microsoft Corporation

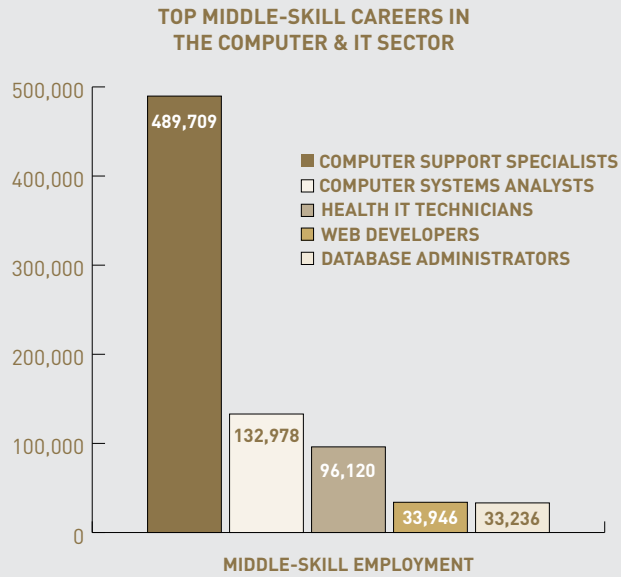
Workshops Integrate Professional & Technical Skills

The College of Southern Nevada and Western Nevada College have collaborated to develop the Content in Context workshop series. At the workshops, faculty work with industry leaders to incorporate professional skills instruction into classroom experiences. The first series has the potential to impact several thousand students in Nevada. Its early success led to additional workshops in Nevada, California, Massachusetts, and Ohio.

BATEC Research Informs Discussions with Employers

Sizing the Middle-Skill Employment Gap analyzes entry-level jobs and career pathways. The report documents work activities, prerequisite skill requirements, and economic data profiling four middle-skill career pathways and is an effective platform from which to engage industry professionals in data-driven discussions of workforce needs and student outcomes.

By analyzing labor market data, BATEC aligns academic programs to meet industry needs for middle-skill technicians, who have more than a high school diploma but less than four-year degrees in IT and computer science.



CTC

National Convergence Technology Center

www.connectedtech.org

COLLIN COLLEGE
FRISCO, TEXAS

Professional Development, IT Industry Input & Community Expansion Impact Student Success

A recent survey reports that CTC's Working Connections professional development events have educated more than 1,050 educators since 2004. These events have resulted in the creation of 159 new degree and certificate programs or courses. From 2008 to spring 2012, 81% of 443 participants reported utilizing CTC programs to learn about topics they were not currently teaching.

The center uses regular meetings with IT industry leaders to validate 19 knowledge areas (and 350 skills within those areas) and map them directly to curricula offered by its community of practice, the Convergence College Network (CCN). This process ensures students learn the skills employers need.

As the CCN community expands, so does CTC's influence. A recent survey showed a 63% year-to-year jump in IT graduations from 459 to 751 among CCN institutions and a 129% year-to-year jump in enrollments from 4,083 students to 9,376 students.

KEY ACTIVITIES

- Engages businesses to lead information technology (IT) and convergence programs from start to finish.
- Drives and mentors a "community of practice" of IT faculty at more than 30 institutions.
- Delivers free, in-depth professional development to IT faculty.
- Leverages technology to offer students virtual labs and virtual internships.

Convergence technology students learn how to link multiple platforms.

A student practices hands-on router configuration in a classroom convergence lab.

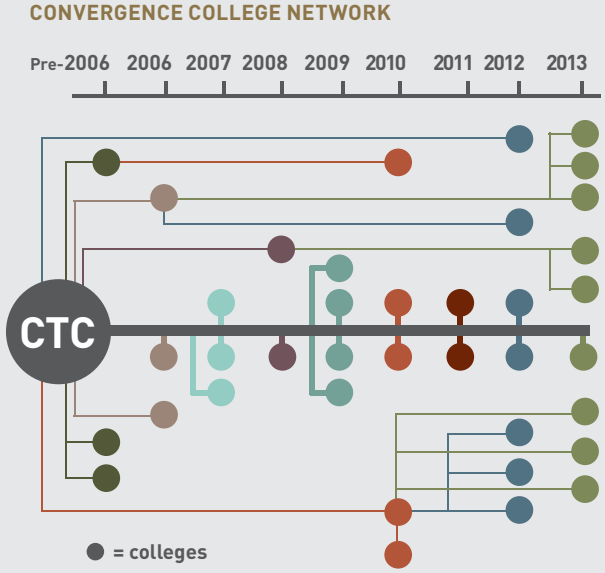
CTC Customizes Curricula Improvements to Save Businesses Time & Money

By collaborating with businesses start to finish, CTC ensures that its curricula produce job-ready, employable graduates. Regular updates and alignments of IT and convergence curricula—based on workforce-need forecasts by business leaders—allowed CTC to deliver the right technical skills to its 751 program graduates in 2012.

Relying on community colleges saves businesses time and money they would otherwise have to spend on ramp-up training for new hires, who historically have not been productive during their first period of employment. CTC's industry connections also provide unique opportunities for students to develop relationships with business leaders. These interactions give students a glimpse into real-world practices and strengthen the "soft skills" that are necessary to get hired, stay employed, and later in their careers, get promoted.

> "The newest IT knowledge challenges and job opportunities are grounded in the increased growth and complexity of convergence including wireless, voice, data, and data center technologies."
>
> **Glenn C. Wintrich Jr.** - Director, Services Innovation Dell

The Convergence College Network, with 8,400 graduates since 2009, continues to expand thanks to member colleges recruiting and mentoring new colleges.



GeoTech Center

National Geospatial Technology Center of Excellence

www.geotechcenter. org

JEFFERSON COMMUNITY AND TECHNICAL COLLEGE
LOUISVILLE, KY

KEY ACTIVITIES

- Develops innovative geospatial science and technology (GST) curricula to meet workforce needs.
- Helps colleges implement GeoTech courses and modules.
- Reaches out to underserved populations and veterans.
- Provides career pathways, internships, and service learning opportunities.
- Facilitates a community of practice among geospatial educators with professional development and mentoring.

GeoTech Prepares Faculty & Students To Use Geospatial Technologies

The GeoTech Center team includes two-year college, university educators, and employers. The team expands the well-qualified, diverse geospatial workforce by providing faculty professional development, model courses, mentoring, and career pathways based on core competencies for geospatial technicians.

GeoTech is dedicated to helping students gain the necessary skills and competencies to succeed in a wide array of career paths. With the growing use of geospatial science and technology (GST), global positioning systems (GPS), and mobile technologies, technicians in almost every field are expected to be able to analyze spatial data and execute geo-visualization tasks. Global Industry Analysts, Inc. estimates the geospatial industry will reach $10.6 billion by 2015.

GeoTech's curricula teach students to use GST hardware and software to map and analyze data about natural resources and other community attributes.

GTCM Shapes Teaching of Geospatial Technologies

GeoTech, in conjunction with the US Department of Labor and the center's industry partners, developed and updated the Geospatial Technology Competency Model (GTCM). As the first fundamental identification of geospatial skills used by complex, evolving industries, the GTCM has gained acceptance by employers for screening job applicants and educators as the foundation for curricula.

In collaboration with education and industry partners, GeoTech Center has used the GTCM to create

- Frameworks for educators to evaluate the alignment of their courses with each competency in the model.
- Six courses that colleges can adopt or adapt for associate degree and certificate programs.
- Modules for faculty to incorporate GST skills in existing courses in multiple disciplines.
- Micro-credentials or "badges" that students use to document mastery of particular GST skills for the many non-geography occupations that use spatial technologies.

The GeoTech Center's collaboration with Kaskaskia College exemplifies how ATE centers share their expertise with community colleges to develop highly skilled technicians for regional workforce needs.

2010 Survey finds South Central Illinois employers need GST skills.

2011 GeoTech leader becomes Kaskaskia College's MentorLinks mentor.

2012 GeoTech offers workshops for faculty and staff. Two GST courses developed and offered.

2013 College launches six-course GST certificate based on GeoTech curricula. More GeoTech workshops lead faculty to add GST content in various disciplines. NSF awards ATE project grant to Kaskaskia to

- Develop GST associate degree.
- Incorporate GST in 20 STEM courses.
- Continue regional outreach.

GPS receivers gather spatial data that can assist in improving agriculture productivity and help protect the environment.

GeoTech Helps Start or Improve GST Programs

GeoTech's professional development and formal mentoring opportunities help colleges create or revamp certificate and degree programs, and educators implement GeoTech modules in multiple disciplines.

Kaskaskia College utilizes GeoTech's curricula for a 19-credit hour geospatial technology certificate program it launched in 2013 with MentorLinks assistance. The American Association of Community Colleges, with NSF-ATE support, awards MentorLinks grants to help colleges start or revamp technician education. A GeoTech Center leader served as the college's MentorLinks mentor.

Another GeoTech educator led workshops that taught faculty how to use GST in various disciplines.

> "The double-helical structure of DNA was groundbreaking from the standpoint of being able to describe the molecule's complexity ... the work of the GeoTech Center in implementing the GTCM is no less groundbreaking from the geospatial community's perspective."
>
> **Bill Hodges** - Executive Director
> GIS Certification Institute

MCIT

Midwest Center for
Information Technology

www.midwestcenterforit.org

APPLIED INFORMATION
MANAGEMENT INSTITUTE
OMAHA, NE

KEY ACTIVITIES

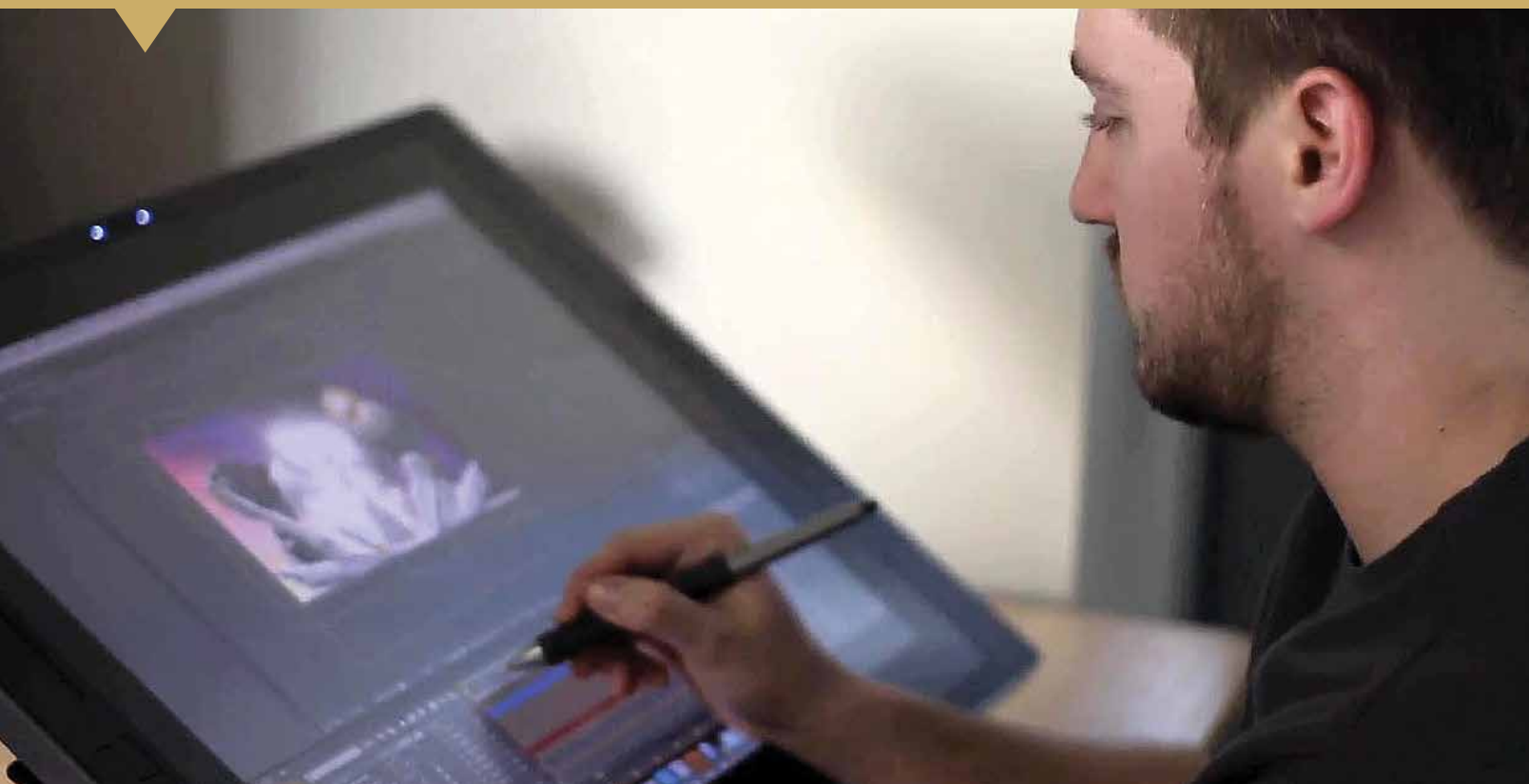
- Integrates Careerlink technology connecting information technology (IT) curriculum to the workplace.
- Shares faculty development to improve technician education and increase the number of highly skilled technicians.
- Recruits and helps retain underrepresented populations in IT programs.

Increasingly Skilled Faculty Broaden MCIT's Impact

MCIT has steadily built an active consortium of 10 community colleges across four states. It has accomplished this by strengthening the skills of more than 1,000 educators through a shared process for ongoing faculty professional improvement.

The center's collaborations with an interested and contributing business community have helped with the development of its innovative Careerlink system. This integrated system connects IT classroom activities with IT workplace skills. Hundreds of students now engage in cloud-based educational scenarios while learning the skills most needed by IT businesses. MCIT's network of educational institutions has robust articulation agreements that provide seamless educational paths for students throughout their careers.

Working with interactive media sparks students' interest in IT technician education.



MCIT Supports & Expands IT WorkforcePipeline

MCIT's collaborative innovation is steadily expanding the IT workforce pipeline. MCIT has already partnered with 2,200 midwestern employers, while leveraging the online Careerlink system to make direct connections between industry needs and schools' curricula through a shared skills approach. An average of 4,250 IT jobs is now listed monthly on Careerlink and are directly connected to IT coursework and problem-based scenarios.

MCIT's efforts have been informed by consortium studies, including a *Women in IT* study based on interviews with 43 female and 26 male IT professionals. This study documents insights from IT technicians about the perceived improvement to the "glass ceiling," the importance of early IT engagement for girls, and the subtle "social exclusion" that girls interested in IT experience with their peers.

The *Youth Perceptions of IT* study, which conducted 16 youth focus groups with 157 young people, found that most students think of IT as an individual enterprise. Students also reported that they would become more interested in IT careers if they were given more useful coursework. One of their criticisms is that the way some IT courses are taught makes them relatively unattractive.

The studies, past successes, and growing Careerlink resources position MCIT to continue building a foundation of IT program and workplace innovation that is becoming the consortium's hallmark.

A technician confirms connections through a network switch.

In addition to awarding 445 associate degrees and certificates in IT, MCIT and its partner colleges have established a viable consortium with businesses based on trust, collaboration, and shared resources.

> "AIM and the MCIT community colleges have done an outstanding job of helping to meet our regional needs for well-trained technicians. By aligning industry needs with their training through Careerlink, they give Cosentry and other businesses the confidence to expand their operations in the Midwest, knowing that the trained workers will have the proper skills to meet our needs."
>
> **Manny Quevedo** - Vice President
> Cosentry, Inc.

Impact on Instructors

86% of IT faculty participants influenced by MCIT content & pedagogy

Impact on Curriculum

Value of curricula innovations rated by IT faculty at 3.71 on 4.0 scale

Impact on Students

43.7% female enrollment & growing

Impact on Businesses

58% of businesses surveyed rate MCIT curriculum "effective"

MPICT

Mid-Pacific ICT Center

www.mpict.org

CITY COLLEGE OF SAN FRANCISCO
SAN FRANCISCO, CA

KEY ACTIVITIES

- Researches, reports, and champions the strategic importance of information and communication technologies (ICT).
- Creates a collaborative community between educators, industry, employers, and workforce development.
- Identifies and shares best practices.
- Delivers high quality faculty professional development.
- Works to align curricula and credentials.
- Improves, expands, and diversifies ICT education and workforce.

ICT students learn computer hardware, software, networking, and information system technologies for real-world applications.

MPICT Improves Teaching & Curricula; Influences Funding Across California

One in four community college students in the US attends a California community college. The California Community College system is the largest higher education system in America. Its 112 public two-year colleges have more than 660,000 enrollments in ICT-related courses taught by 5,700 faculty annually.

MPICT initiatives have led the California Community Colleges to name and select ICT/Digital Media as the second highest strategic sector priority in the state and commit at least $3.5 million in annual support to ICT education improvements. ICT strategic sectors have also been designated by California's K-12 system, and the California public workforce system. These two enormous systems, also the largest in the US, are working to align their programs with community college ICT education to improve career pathways for thousands of students.

Since 2008, more than 900 faculty have attended MPICT professional development events that have positively impacted their teaching of more than 100,000 students annually.

MPICT Data Analysis Influences State & Federal Policies

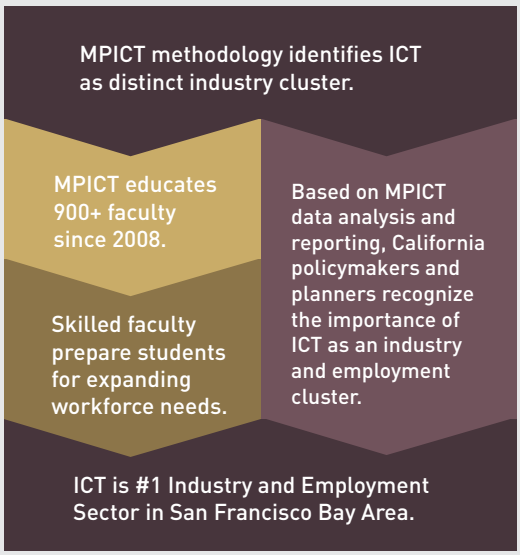
The California Employment Development Department adapted MPICT methodology to report labor market information for ICT as a sector, identifying for the first time that ICT is the largest employment sector opportunity in the San Francisco Bay region.

This and other MPICT efforts have led the California State Workforce Investment Board to recognize the strategic importance of ICT, and to create the ICT/ Digital Media strategic sector for the workforce system, consistent with California Community Colleges. All 49 local California workforce investment boards have voted some level of strategic support for the ICT sector and have shown interest in aligning with community colleges.

MPICT's collaboration with the US Department of Labor on refreshing its IT Competency Model involved gathering input from representatives of 782 California employers to provide statistically significant input on ICT workforce foundational competency needs.

MPICT educates faculty, enabling them to prepare students for ICT careers, the largest industry and employment sector in the San Francisco Bay region.

MPICT Identifies ICT Industry Cluster & Helps Faculty Prepare Growing Workforce



ICT technicians deploy and manage voice and data networks at many scales.

MPICT Annual Winter Conference Connects ICT Educators & Employers

Representatives from 82 industry and employer organizations have attended MPICT's Winter ICT Educator Conferences since 2008 to help ICT educators improve the development of the ICT workforce. MPICT co-produces these annual events with eight other NSF ATE centers.

MPICT's policy work and faculty professional development programs have contributed to thousands of students obtaining valuable, employer-recognized ICT industry certifications.

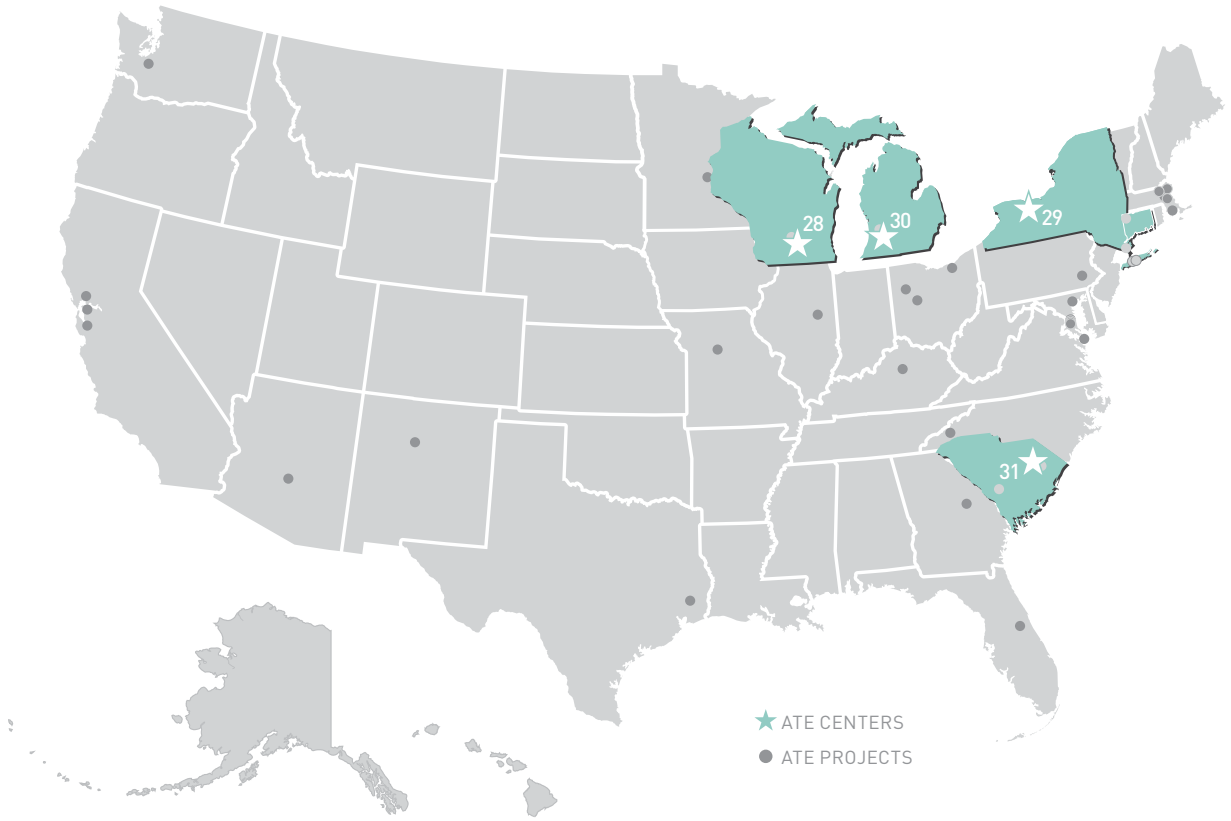
> "The Mid-Pacific ICT Center has been invaluable in bringing together educators with technology industry vendors and suppliers to advantage students and improve ICT education throughout the MPICT region."

Dave Nelson - Academy Program Director
VMware, Inc.

LEARNING, EVALUATION & RESEARCH

LEARNING, EVALUATION & RESEARCH
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS



28 **ATE Central**
Supporting the ATE Community
University of Wisconsin-Madison
Madison, WI
www.atecentral.net

29 **DeafTEC**
Technological Education Center for Deaf and Hard-of-Hearing Students
Rochester Institute of Technology
Rochester, NY
www.deaftec.org

30 **EvaluATE**
Evaluation Resource Center for Advanced Technological Education
Western Michigan University
Kalamazoo, MI
www.evalu-ate.org

31 **SC ATE**
South Carolina ATE National Resource Center
Florence-Darlington Technical College
Florence, SC
www.scate.org

ATE Central

Supporting the ATE Community

www.atecentral.net

INTERNET SCOUT RESEARCH GROUP
UNIVERSITY OF WISCONSIN-MADISON
MADISON, WI

KEY ACTIVITIES

- Acts as an information hub for the ATE community, providing support for outreach, sustainability, resource and data management, and archiving.
- Provides access to the full depth and breadth of ATE resources, events, and initiatives.
- Offers tools, training, and documentation related to online resource dissemination and digital library collection building and maintenance.
- Highlights the impact of ATE's first 20 years through the *ATE@20* book and blog.

ATE Central Supports & Connects the ATE Community

ATE Central's services and tools are designed to support and amplify the critical work that ATE centers and projects deliver through their NSF funding. Whether it is through the monthly ATE Central Connection newsletter, which features events and news from the community, or tools like the ATE Outreach Kit or open source CWIS collection building software, ATE Central facilitates the ATE program nationally. It responds to community needs and delivers tools and services that make it easier to leverage ATE work already done, share new deliverables, and extend the impact of ATE projects and centers to new audiences.

ATE Central also acts as a vehicle for collaboration and sharing of successful practices. Through the ATE Central map interface, the ATE principal investigators (PIs) and other educators can discover potential collaborators or partners in their state or region, or reach out to projects and centers doing similar projects across the nation. Accessing the ATE Central collection online allows PIs and staff to leverage work done by others, help spot research or pedagogical gaps, and discover and share events or resources of interest with their target audiences.

ATE Central also creates the ATE PI Conference App annually. The app provides meeting attendees easy access to schedules, meeting-related materials, and allows them to connect and share information with other attendees via their mobile devices.

A graduate of Northern Essex Community College's laboratory science program is among the ATE program alumni featured in the *ATE@20* blog that ATE Central publishes online weekly to inform potential students, their families, and other audiences about advanced technology career opportunities.

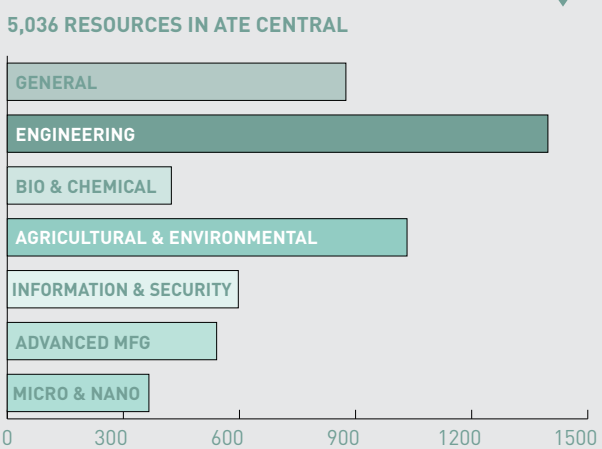
Professional development programs for tribal college instructors are among the innovative programs featured in ATE Central's *ATE@20* book about the history and accomplishments of the ATE program from 1993 to 2013.

ATE Central Promotes ATE Innovations

ATE Central showcases the aggregate impact of the ATE program for those within the ATE community as well as for those from industry, education, and the general public. By providing a pathway to the full spectrum of ATE resources and bringing together materials from multiple centers and projects in a single searchable location, ATE Central encourages cross-disciplinary learning and helps highlight the cross-disciplinary nature of today's technician education programs. ATE Central connects faculty, administrators, staff, industry partners, and students to the full range of diverse ATE resources and ATE initiatives that enhance student learning, provide professional development opportunities, and support workforce development and technician education nationwide.

ATE Central's *ATE@20* book and blog project celebrates the first 20 years of innovations and accomplishments that the ATE program has generated at community colleges, secondary schools, and universities around the nation. It tells the story of the ATE program through interviews, infographics, and photos. The book, *ATE@20: Twenty Years of Advancing Technological Education*, is available for free on the ATE Central website. The accompanying *ATE@20* blog highlights exciting and interesting stories from the ATE community.

In 2013, ATE Central's digital collection contained 5,036 resources created by ATE centers and projects for educators and the general public to use for free.



"The ATE PI Conference App from ATE Central has been wonderfully effective in providing access to conference information, agenda items, and updates—as well as helping to promote networking among participants. It brings a much-needed and appreciated 'technology' to an advanced technological education conference!"

Ellen Hause - Program Director, Innovative Learning & Student Success
American Association of Community Colleges

DeafTEC

Technological Education Center for
Deaf and Hard-of-Hearing Students

www.deaftec.org

DeafTEC

ROCHESTER INSTITUTE OF TECHNOLOGY
ROCHESTER, NY

KEY ACTIVITIES

DeafTEC provides deaf and hard-of-hearing students, their teachers, and potential employers with

- An online clearinghouse of information related to technological education and technician careers.
- Improved access to a STEM education and a successful STEM career through partnerships with high schools, community colleges, and industry.
- A national dual-credit program in STEM.

DeafTEC Improves Access to Learning & Careers

Through its train-the-trainer model, DeafTEC offers several workshops that teach educators strategies that give deaf and hard-of-hearing students, as well as other students in their classrooms, greater access to STEM education and STEM careers.

Trainers from high school and community college regional partners in California, Florida, and Texas receive professional development at DeafTEC and then offer workshops within their regions. The Project Access workshop focuses on best practices for teaching deaf and hard-of-hearing students in a mainstream classroom. The Writing in the Disciplines workshop helps STEM teachers provide students with valuable writing practice. The Promoting Student Success in Math workshop offers accessible strategies and resources for teaching math.

DeafTEC Offers Dual Credit Courses in 10 States

DeafTEC's national dual-credit program offers credit-bearing college courses to deaf and hard-of-hearing high school students. Thirty-six high school teachers from 21 schools in 10 states have received instruction to teach STEM-related, college-level courses. By fall 2013, 337 deaf and hard-of-hearing students had taken these courses, earning a total of 855 college credits.

A lab science technology student stains and examines cells.

A deaf CNC operator (right) discusses with a hearing colleague the settings he uses to make jewelry at Tiffany & Co.

DeafTEC Develops an Untapped Resource

Deaf and hard-of-hearing people are an untapped pool of skilled and dedicated employees. A recent study estimates that there are four million deaf and hard-of-hearing people of working age (between 25 and 65 years old) in the US. Compared to the population with hearing, the deaf and hard-of-hearing population participates in the workforce at a lower rate, has higher unemployment, and lower wages.

DeafTEC's community college and industry partners are educating employers from a variety of STEM industries on how to integrate deaf and hard-of-hearing people successfully into their organizations, providing access to this untapped pool of talent, and adding to their organizations' diversity. Using DeafTEC's train-the-trainer model, industry partners learn how to offer the Working Together: Deaf and Hearing People workshop. This enables business people to educate other employers within their regions on how deaf and hearing workers can work together to their full potential. Just in 2012-2013, Working Together trainers offered five workshops to 62 participants.

DeafTEC Provides Resources for Both Employers & Employees

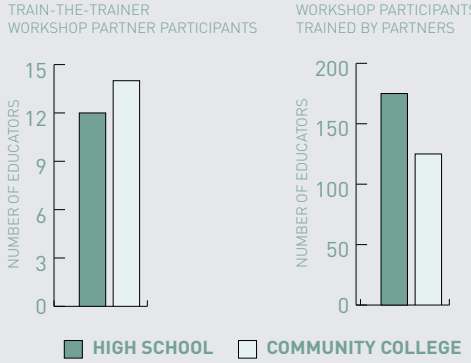
For employers hoping to hire skilled technicians, DeafTEC's nationally-focused, comprehensive website offers information on how deaf and hard-of-hearing individuals can be successfully integrated into their technician workforce. The website includes information on dispelling myths about the limitations of deaf employees, and on best strategies for communication and accommodation.

For potential deaf and hard-of-hearing employees, the website includes information on selected STEM careers and features videos of successful deaf technicians in a variety of STEM fields. These successful professionals share how they prepared for their careers and how they succeeded on the job. They also offer deaf and hard-of-hearing individuals important role models to emulate, something that is not normally available to them.

During 2012-2013, the 26 educators who received Project Access training at DeafTEC provided professional development to 300 educators in three states.

> "Partnering with DeafTEC has opened our eyes to a whole new population of untapped STEM students — the deaf and hard of hearing. Participating in DeafTEC is enabling us to seamlessly integrate deaf and hard-of-hearing students into our workforce. It is imperative for the future of our innovation pipeline."
>
> **Catherine Hunt** - Retired Research & Development Director of Innovation Sourcing & Sustainable Technologies The Dow Chemical Company

PROJECT ACCESS PROVIDES TECHNIQUES FOR TEACHING DEAF AND HARD-OF-HEARING STUDENTS



EvaluATE

Evaluation Resource Center for
Advanced Technological Education

www.evalu-ate.org

WESTERN MICHIGAN UNIVERSITY
KALAMAZOO, MI

EvaluATE

KEY ACTIVITIES

- Promotes the development of highly qualified technicians by partnering with ATE projects and centers to use exemplary evaluation practices.
- Strengthens the evaluation knowledge base of ATE grantees with webinars, publications, and a database of evaluators.
- Supports the continuous improvement of technician education throughout the nation.

"Evaluation might seem perplexing, but it doesn't have to be. EvaluATE's resources are clear, concise, user-friendly and tailor-made for ATE. They are available 24-7—whenever you need them."

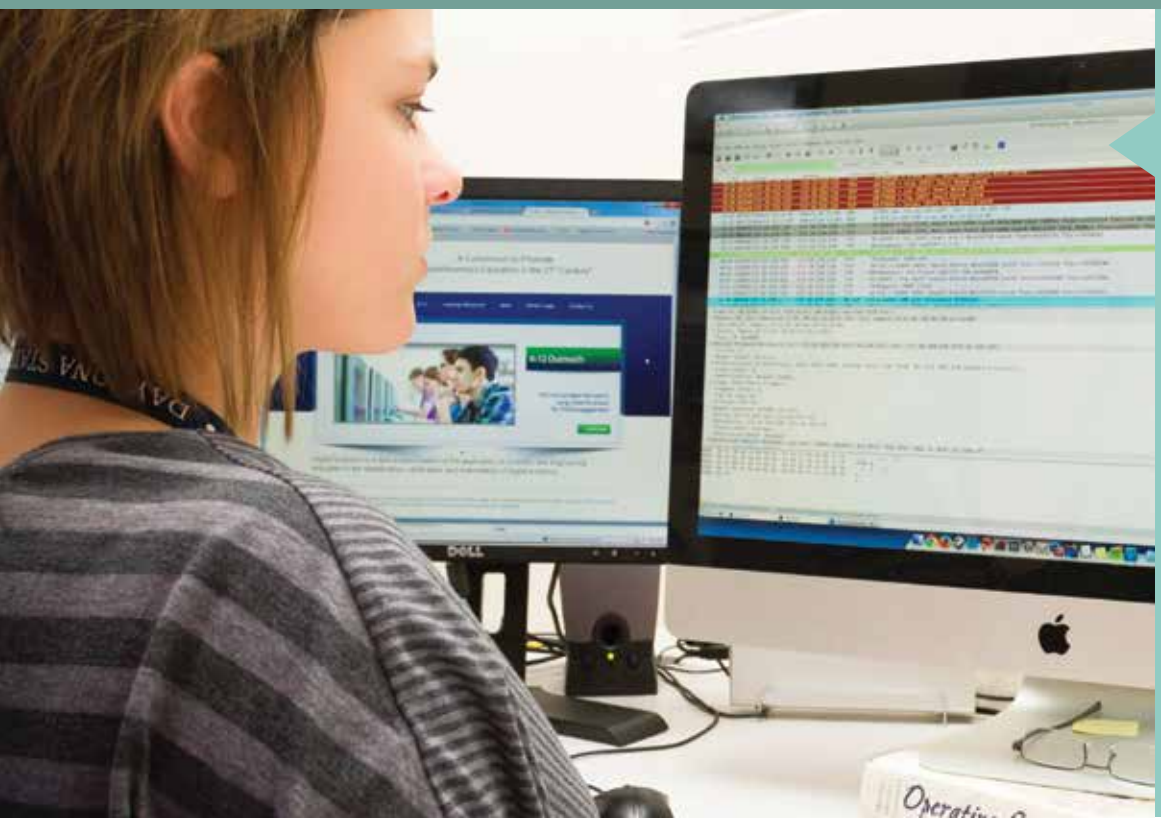
Barbara Pellegrini - Consultant
STEP Consulting

EvaluATE's Resources Help to Build Evaluation Capacity in the ATE Community

With an eye on accountability and improvement, ATE centers and projects need and want to determine their impact on students. EvaluATE supports the ATE community with this task in a variety of ways. For example, EvaluATE's webinars and workshops—attended by more than 900 individuals since 2009—are helping ATE grantees and evaluators design, conduct, and utilize evaluations that ultimately advance and enhance technological education.

ATE grantees' focus on evaluation has grown steadily over the years. The percentage of ATE grantees that formally evaluate their projects has increased from 87% in 2005 to 94% in 2013. These evaluations are leading to improved programs. In 2013, 83% of ATE grantees reported that they changed some aspect of their activities based on evaluation results.

Formative evaluations use students' feedback and performance data to adjust ATE innovations as they unfold.



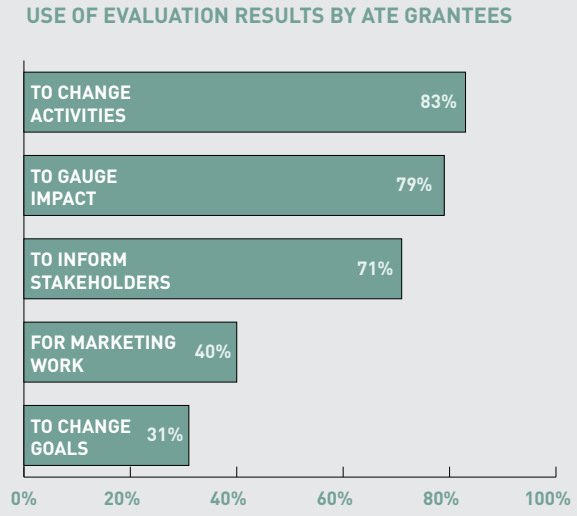
By promoting the use of thorough evaluations by ATE centers and projects, EvaluATE improves technicians' preparation for advanced technology careers.

EvaluATE Builds Culture of Evaluation

EvaluATE leads the national effort to develop a community of STEM educators at two-year colleges who conduct, use, and value evaluation as a tool for maximizing students' success and for addressing community and workforce needs. Through EvaluATE's webinars, workshops, and quarterly newsletters, the ATE community is expanding its knowledge base, solving problems around common evaluation challenges, and sharing materials and best practices. EvaluATE's efforts to build and nurture a culture of evaluation within the ATE community support the center's ultimate goal of enhancing the ATE grantees' use of evaluation to support the improvement of technician education.

EvaluATE influences the quality of technicians entering the workforce by helping ATE grantees connect with evaluators and build evaluation into their project designs at the proposal stage and beyond. EvaluATE encourages leaders to learn from evaluations while projects are going on and make adjustments based on data. EvaluATE's events and materials showcase successful ATE grantees and evaluators whose design and implementation of effective evaluation practices have enhanced their project outcomes. With the involvement of personnel from more than 30 other ATE projects and centers, EvaluATE helps grantees learn from each other in order to advance evaluation knowledge and practice within the ATE program.

A significant majority of ATE grantees (191) uses evaluation results to refine the innovative activities they initiate with NSF grant support.



SC ATE

South Carolina ATE
National Resource Center

www.scate.org

FLORENCE-DARLINGTON
TECHNICAL COLLEGE
FLORENCE, SC

KEY ACTIVITIES

- Connects faculty development providers and seekers.
- Leads Mentor-Connect, ATE's leadership development and outreach program.
- Provides the Compendium of Research on Technician Education and ATE Proven and Promising Practices repository.
- Develops acclaimed problem-based curricula for technician education.
- Promotes teaching methodologies that improve technician education.
- Offers successful student recruitment and retention strategies.
- Facilitates NSF and industry scholarships, and paid internships.

SC ATE Offers Model Internship Program

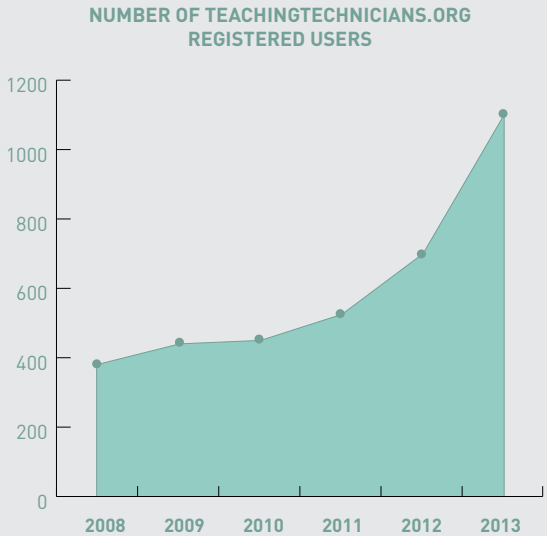
Internships are a key part of SC ATE's model for recruiting and retaining students. More than 150 ATE students have worked as paid interns for 30 employers. Some companies have taken as many as 16 interns at a time. Of these 150 interns, 85% were hired upon graduation by the company with whom they interned.

Florence-Darlington Technical College (FDTC) offers innovative course scheduling to support internship schedules. These accommodations to interns' schedules, as well as significant scholarships, help students attend college full time, graduate on schedule, and enter the workforce well prepared. Industry has provided more than $800,000 in scholarships, and NSF has provided $1.2 million for scholarships through its S-STEM program.

Industrial trainers develop essential workplace skills for industrial technology students.

Engineering technicians apply physics in research and for problem solving using a motion sensor, fan cart, and lab interface data.

More educators connect each year with professional development opportunities via SC ATE's TeachingTechnicians.org.



SC ATE Expands Excellence in Programs, Teaching & Leadership

Since 1995, SC ATE has addressed the need for highly skilled technicians in advanced technology by helping the nation's community and technical colleges expand excellence in programs, teaching, and leadership.

SC ATE develops, tests, and shares innovative educational practices. It impacts the workforce by helping educators gain access to and benefit from research on technician education, learn from one another, benefit from evaluation, and adapt successful ATE practices to their work.

In 2013, SC ATE adapted industry models for talent development and retention to its Mentor-Connect project. This new mentoring system facilitates knowledge transfer among two-year college faculty, energizes technician education programs, expands national outreach of the ATE program, and prepares the next generation of leaders for ATE.

SC ATE links educators to exceptional ATE faculty development opportunities, and provides workshops and webinars for the technician education community and other STEM educators. SC ATE innovations now span 25 states and the District of Columbia. They are being used to build STEM career pathways, address the needs of underprepared students, and improve technician programs and related STEM courses. By enriching educators' knowledge with hands-on and virtual workshops, ATE projects and programs are improving in fields that include biotechnology, nanotechnology, transportation and supply chain technologies, aviation, automotive, geospatial, engineering technology, wind energy, sustainable technologies, enology and viticulture, rapid prototyping and additive manufacturing, robotics, and nuclear energy.

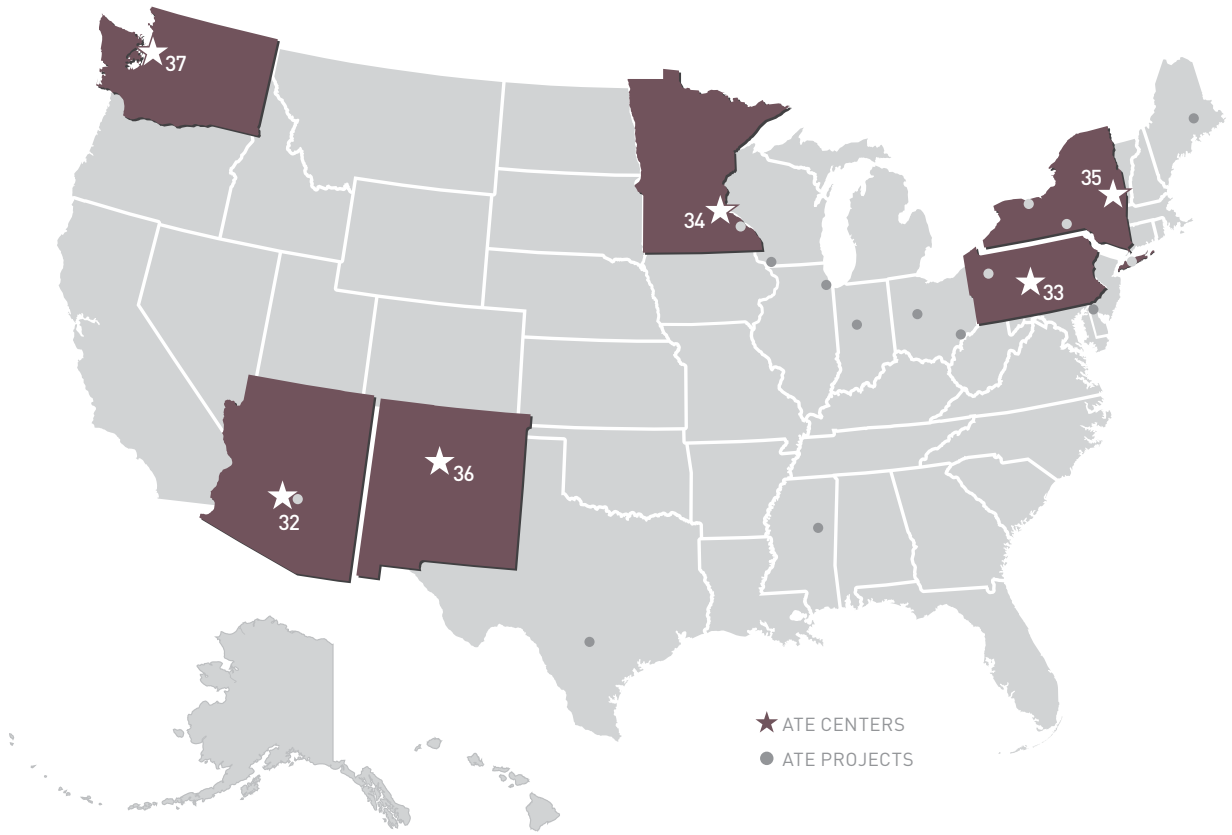
"ATE graduates are skilled technicians ready to meet the needs of industry! They've earned a solid educational background allowing them to quickly add value to any organization that builds, tests, troubleshoots, and repairs electronic equipment."

Eric Bingaman - Senior Human Resources Manager
ESAB Welding & Cutting Products

MICRO & NANO TECHNOLOGIES

MICRO & NANO TECHNOLOGIES
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS



32 **MATEC NetWorks**
MATEC NetWorks National Resource Center
Maricopa Community Colleges
Phoenix, AZ
www.matecnetworks.org

33 **NACK Network**
Nanotechnology Appplications and
Career Knowledge Network
Pennsylvania State University
University Park, PA
www.nano4me.org

34 **Nano-Link**
Center for Nanotechnology Education
Dakota County Technical College
Rosemount, MN
www.nano-link.org

35 **NEATEC**
Northeast Advanced Technological Education Center
Hudson Valley Community College
Troy, NY
www.neatec.org

36 **SCME**
Southwest Center for Microsystems Education
University of New Mexico
Albuquerque, NM
www.scme-nm.org

37 **SHINE**
Seattle's Hub for Industry-driven Nanotechnology Education
North Seattle Community College
Seattle, WA
www.seattlenano.org

MATEC NetWorks

MATEC NetWorks National Resource Center

www.matecnetworks.org

NETWORKS

MARICOPA COMMUNITY COLLEGES
PHOENIX, AZ

KEY ACTIVITIES

- Enhances learning environments with classroom-ready resources for technology education.
- Promotes quality instruction and innovative teaching.
- Provides faculty with professional growth and program-building strategies.
- Responds quickly to employers' and educators' identification of workforce needs.
- Partners with industry to reach underserved students for career awareness.

Knowledgeable Faculty & Up-to-Date Curricula Ensure Student Success

To ensure students graduate with the skills that advanced technology employers require, MATEC NetWorks has developed and refined webinars as effective vehicles for faculty professional development.

These webinars allow educators to immerse themselves online for 60-to-90 minute live lessons on emerging topics such as advances in systems electronics, or the advantages of digital badges as learning credentials.

In response to demand, NetWorks has expanded its production of webinars and added hosting services for ATE centers and other education programs. In 2012 and 2013, NetWorks produced 15 webinars and partnered with eight different organizations to host another 50. More than 5,000 individuals from higher education and industry are registered users of NetWorks'programming.

GateWay Community College uses MATEC NetWorks materials to prepare precision manufacturing students for careers in aviation, aerospace, and defense industries.

NetWorks Quickly Informs Educators About Tech Advances & New Trends

By attentively listening to its education and industry partners, NetWorks continually identifies workforce trends and responds with learning materials and professional development to help address new challenges.

Its annual Critical Issues and Best Practices forum is a key opportunity for college faculty and secondary school teachers to engage in face-to-face conversations with high-tech employers about emerging technologies in electronics, manufacturing innovations, and the skills they expect technicians to have. NetWorks also uses insights from the forum to guide its programming activities.

For example, at the July 2013 forum industry representatives explained the enormous impact they expect wireless communication technologies to have on mobile technologies. The educators present noted the lack of instructional materials for these new, in-demand skills. By November 2013, NetWorks had added relevant curricular resources to its digital library and offered professional development webinars and workshops on the topic.

Industry Collaboration Helps STEM Teachers Meet New Standards

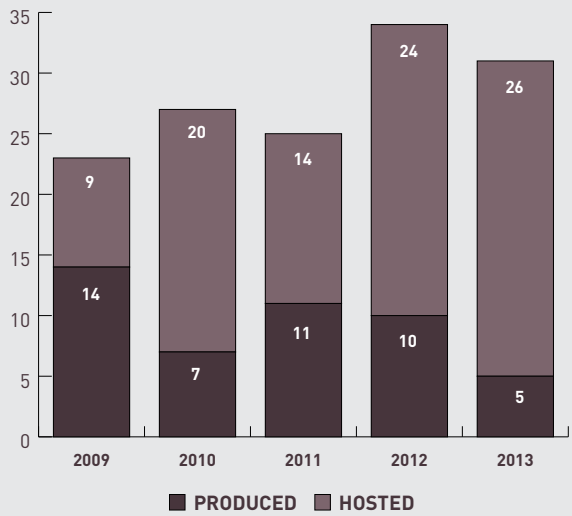
NetWorks partners with the SEMI Foundation and companies, such as Boeing and Intel Corporation, to offer an intensive, two-day High Tech U Teacher Academy. At the academy, teachers learn hands-on activities related to high-tech workplace skills, experience MATEC's modular instruction, and receive guidance on implementing these innovations in their classrooms. The sessions also help teachers align their lessons to Common Core and Next Generation Science standards.

> "This academy helps teachers know what industry professionals are looking for, and helps their students meet that criterion."
>
> **Jarrett Pack** - Science Teacher
> Perry High School

An ASM technician prepares a chemical vapor deposition furnace for semiconductor manufacturing.

Webinars produced and hosted by MATEC Networks—and attended by 5,000 individuals in 2012 and 2013—have emerged as a significant and effective method for faculty professional development.

NETWORKS WEBINARS INFORM EDUCATORS ABOUT ATE INNOVATIONS & INDUSTRY TRENDS



NACK Network

Nanotechnology Applications
and Career Knowledge Network

www.nano4me.org

PENN STATE UNIVERSITY
UNIVERSITY PARK, PA

KEY ACTIVITIES

- Enables nanotechnology education at community and technical colleges to develop a workforce for the many industries across the US that utilize micro- and nanotechnology.
- Develops and disseminates free course material; over 35,000 downloads through 2013.
- Prepares educators through professional development opportunities including webinars, workshops, and conferences.
- Promotes hands-on learning via real-time access to state-of-the-art cleanroom equipment.

NACK Network Builds Nano Knowledge Base

The NACK Network partners with education institutions across the US to promote a model for broad nanotechnology education and preparation. The nanotechnician skill set developed by NACK and disseminated through its network enables students to enter this emerging field successfully.

NACK makes resources available to instructors through professional development opportunities and the nano4me.org website. Its online resources, developed with industry input, provide materials to update or develop individual courses or entire nanotechnology programs. Most remarkably, its remote access to characterization equipment at Penn State University and six other colleges and universities gives students across the US first-hand experience with nanoscience tools.

NACK also cultivates a "nano-literate population" with webinars. More than 2,200 instructors, students, industry personnel, and interested adults are learning about nanoscience via NACK's webinars.

Industry values the hands-on training that NACK Network graduates receive.

As part of the production team at F Cubed, LLC, two Ivy Tech Community College nanotechnology students calibrate robots and other electronic devices.

Industry Champions the NACK Network Model

Through its numerous partnerships with K-12 schools, two-year colleges, and four-year universities, NACK has fostered a growing interest in nanotechnology education and workforce development. Although still an emerging technology, the demand for graduates with the knowledge, skills, and abilities to work in nano-related industries is projected to grow substantially over the next five years. To date, 23 programs in the US and Puerto Rico include nanotechnology in their associate degrees or certificate programs thanks to NACK's assistance. This translates to more than 1,000 graduates, of which 69% are employed in a nanotechnology field.

> "The combination of nano-scale theoretical as well as hands-on training that these employees have in their educational toolbox enables them to hit the ground running, significantly reduces in-house training time, and enables them to be valuable long-term contributors to bottom-line company profitability."
>
> **Bryan P. Segner** - Director of III/V Operations
> Avago Technologies

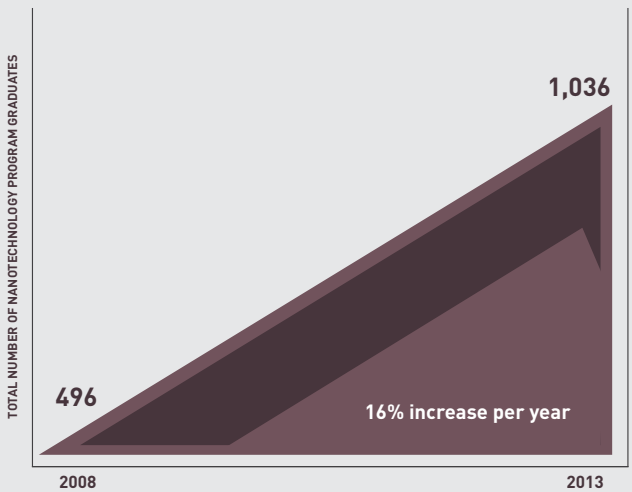
NACK's six-course suite provides students with a unique skill set that includes fabrication, synthesis, and characterization. In a survey of 183 industry leaders, 100% endorsed the skills and education content taught in this suite as the right skills for nanotechnicians and engineers. Students have also reported that the diversity of their skills and their proficiency with hands-on tasks allow them to jump into work immediately.

The NACK Network has a robust relationship with industry across the nation. Nanotechnology employers hire program graduates, serve as presenters in NACK's webinars, provide feedback on skill standards as they are developed, host internships for students, and guide NACK's nanotechnology workforce development initiatives.

NACK also promotes professional networking among nanotechnology program graduates. As the industry expands and graduates of NACK-affiliated programs gain more education and skills, this networking association will allow technicians and engineers the opportunity to collaborate in other diverse nanotechnology fields.

The number of nanotechnology program graduates increased by an average of 16% per year over the last five years as a result of NACK Network support. More than 1,000 nanotechnology students have graduated from programs in the NACK Network.

NANOTECHNOLOGY PROGRAM GRADUATIONS INCREASE



Nano-Link

Center for Nanotechnology Education

www.nano-link.org

DAKOTA COUNTY TECHNICAL COLLEGE
ROSEMOUNT, MN

KEY ACTIVITIES

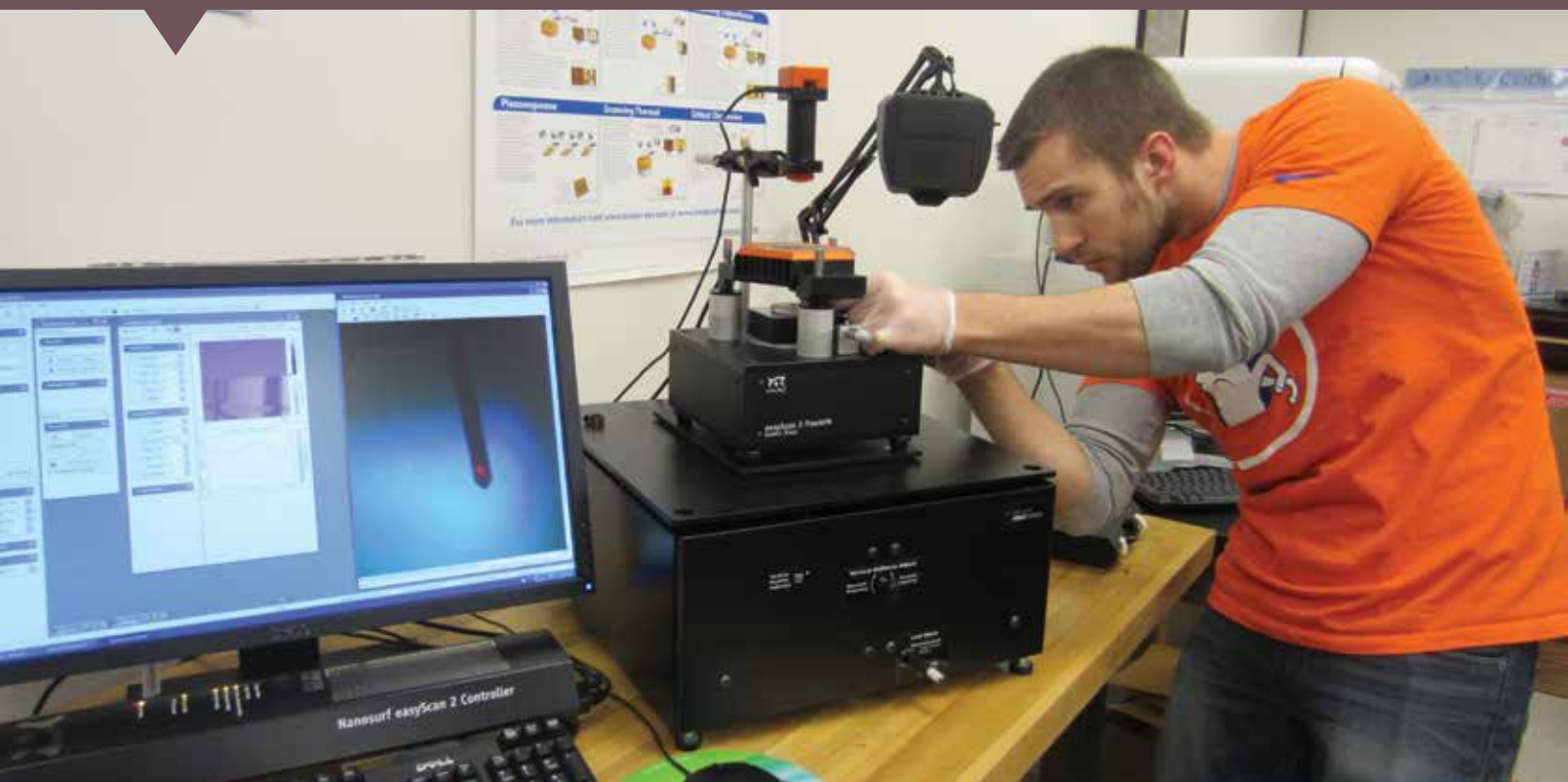
- Develops nanoscience courses for two-year colleges and high schools.
- Creates hands-on modules that teach nanoscience concepts and incorporate emerging technologies such as photonics, biotechnology, and materials science.
- Distributes modules at no cost to Nano-Infusion project educators who have used them to teach more than 16,000 students.

Nano-Link Provides Skilled Technicians to Regional Industry

Each year, about 40 new students begin associate in applied science (AAS) degree programs at Nano-Link partner community colleges. These programs include general education content and nanoscience lecture and lab experiences geared to local industry needs; one of the programs requires 43 nano-specific credit hours plus 29 general education credit hours. Course completion rates typically exceed 90%. Due to the program's rigor, it often takes students three years to complete the program.

Student outcomes after graduation are similarly strong. Of the 42 AAS graduates from three Nano-Link affiliated colleges in 2012-2013, 30 are employed in technical fields and 10 are continuing their education full time either in bachelor or associate degree programs. Fourteen of the graduates employed in technical fields are taking course work part time. The two remaining graduates are working, but not in STEM fields.

A Nano-Link program student places a sample in an atomic force microscope in preparation for scanning.



Nano-Link program graduates measure the integrity of nanoscale metallic conductor lines at Optomec.

Nano-Infusion Project Responds to Employers, Impacts Thousands of Students

Nano-Link reconfigured its educational content and revamped its outreach efforts to inform more students in more states about nanoscience and nanotechnology-related career opportunities. This shift from strictly offering nanoscience courses and degree programs to incorporating nanoscience content in science and general education courses is driven by widespread interest in the nanoscale. As demand for nano-savvy employees grows across disciplines and market segments, more teachers want nanoscience information to share with students.

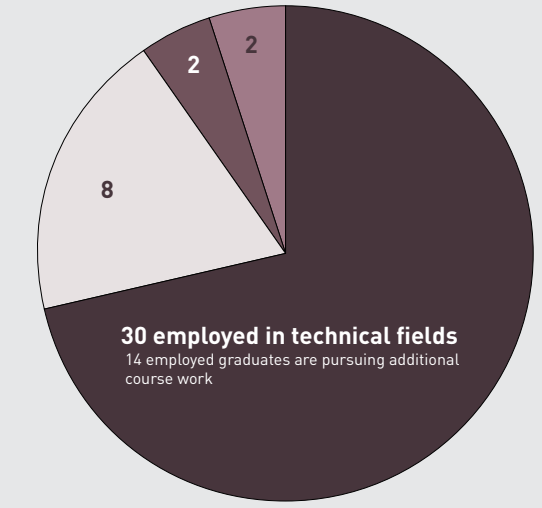
Nano-Link has responded to these educators' requests with Nano-Infusion. This project offers modules that educators can use in existing courses in multiple disciplines. As a result of this shift, the number of students impacted by Nano-Link materials has increased from about 100 per year to several thousand.

Since 2012, Nano-Link has created modules about 20 different nanoscience topics. More than 200 educators in 23 states—elementary and secondary school teachers as well as community college and university instructors—are among those who have received the free modules. Surveys returned by the educators report that module content has been used in 300 classrooms at every grade level; in science courses such as physics, chemistry, biology, and materials science; and non-science courses including English, social studies, and speech pathology.

> "The program provides the graduate an important balance of rigorous math, science, and materials science while also providing very significant laboratory experience using a variety of relevant state-of-the-art metrology tools."
>
> **Justin Patten** - Operations Manager
> Hysitron Inc.

All of the 42 AAS graduates from three Nano-Link-affiliated college programs in 2012-13 are either working, continuing in college full time, or working full time and taking classes. All but two are involved in STEM fields.

NANO-LINK PROGRAMS POST STRONG STUDENT OUTCOMES



NEATEC

Northeast Advanced
Technological Education Center

www.neatec.org

HUDSON VALLEY COMMUNITY COLLEGE
TROY, NY

NEATEC Offerings Span Educational Spectrum

NEATEC's learning modules use fun approaches to introduce nanotechnology applications to K-12 students. The modules also connect STEM concepts to career pathways.

NEATEC's Mathematics for Emerging Technologies course provides an exciting alternative to the traditional third year of high school mathematics. This hands-on exploration of nanoscience and semiconductor manufacturing teaches students to use algebraic expressions, trigonometry, quadratic functions and other math concepts in 300mm wafer production. The course's "real life" math demonstrations address students' "When will I use this?" question and prepare them for college entrance exams.

NEATEC's nanoelectronics and nanotechnology professional development workshops boost the STEM content taught in middle school and high school classrooms. More than 250 teachers have participated in 20 workshops since 2011. These nanotech-savvy teachers now help connect students to two-year degree programs, and their internship and cooperative learning opportunities.

KEY ACTIVITIES

- Creates workshops and short courses for semiconductor and nanotechnology educators and students.
- Partners with industry to create experiential learning opportunities for students.
- Develops nanotechnology modules for K-12 science and technology courses.
- Creates and distributes nanotechnology courses for high schools and colleges.
- Educates the general public about nanotechnology and semiconductor technology.

A female student rinses a silicon wafer in the semiconductor cleanroom lab at Hudson Valley Community College's (HVCC) TEC-SMART facility.

NEATEC Partnerships Benefit Students & Faculty

NEATEC's industry and academic partnerships have provided many opportunities for students and faculty to participate in intellectually enriching activities such as job shadowing, internships, and cooperative work experiences that have enhanced their nanotechnology skills. As a result, students are better prepared to enter the workforce, and faculty are more capable of teaching new technologies.

In 2012-2013 NEATEC

- Offered workshops attended by 150 technicians and educators.
- Facilitated 100 job shadowing experiences at General Electric.
- Placed 50 interns in high tech workplaces such as the College of Nanoscale Science and Engineering (CNSE), the National Institute of Standards and Technology (NIST), General Electric, and GLOBALFOUNDRIES.

Experts Share Insights at Colloquiums

NEATEC created a monthly series of Speaker Colloquiums where nanotechnology industry experts make three-hour presentations to students on topics in their respective areas of expertise. All of the colloquiums focus on topics that are not typically taught at community colleges. Response to this new activity has been quite strong. An average of 40 students attended the seven colloquiums offered during 2012-2013.

Employers Help Redesign Programs

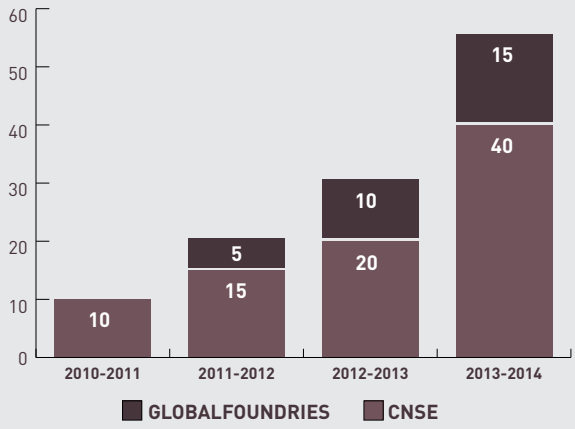
NEATEC's industry partners have been involved in revising the semiconductor and electronics courses and programs at partner colleges to improve students' workforce preparation. GLOBALFOUNDRIES and General Electric assisted HVCC with the creation of a 25-credit semiconductor manufacturing certificate. GLOBALFOUNDRIES, SEMATECH, and CNSE helped redesign the semiconductor programs at HVCC and Mohawk Valley Community College (MVCC).

An HVCC graduate works on an ion implanter in Fab8 at GLOBALFOUNDRIES.

> "I felt it was a very worthwhile forum to share experiences and our ideas for meeting future objectives of both General Electric needs and NEATEC's."
>
> **Carol Shatley** - Thin Film Operations Manager
> GE Global Research

The number of HVCC and MVCC students that NEATEC places in paid internships at GLOBALFOUNRIES and CNSE increases every year.

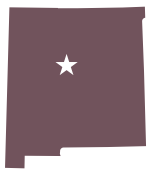
INTERNS PLACED BY NEATEC



SCME

Southwest Center for
Microsystems Education

www.scme-nm.org



UNIVERSITY OF NEW MEXICO
ALBUQUERQUE, NM

KEY ACTIVITIES

- Enables educators to bring microelectromechanical systems (MEMS) to the classroom.
- Offers cleanroom experiences at multiple partner sites.
- Provides MEMS model kits for STEM classrooms.
- Enriches microsystems technician education for today's workforce.

SCME Teaches Educators About MEMS

SCME's professional development programs, kits, and web presence allow educators to adopt, adapt, and customize educational materials to meet the needs of their students and local employers. Since SCME's 2004 inception, more than 400 educators have participated in SCME's cleanroom fabrication and hands-on workshops.

Surveys of workshop participants from 2009 to 2013 indicate that at least 2,000 secondary school students received more than 20,000 hours of microsystems instruction, while 1,600 postsecondary students received more than 12,000 hours of MEMS learning.

In recent years the number of downloaded SCME learning modules has doubled to 5,000 per month. Meanwhile, the number of views of SCME YouTube videos has surpassed 1,500 views-per-week.

At SCME workshops, teachers build MEMS model components for lessons they can use to teach STEM classes including electronics, physics, engineering, and materials processing.

SCME Ascertains Microsystems Industry Needs

Microsystems and related industries are growing 10% to 15% annually. To understand how this affects technicians' job prospects, SCME surveyed a sample of US MEMS fabricators, semiconductor manufacturers, and capital equipment providers. Small enterprises, with annual revenues of less than $5 million, plan to double their tech positions from five to 11 on average. Medium enterprises, with annual revenues up to $20 million, plan to increase their technician positions from 10 to 14 on average. The largest companies surveyed, those with annual revenue greater than $20 million and 100 to 45,000 employees, plan to hire anywhere from a dozen new technicians to several hundred.

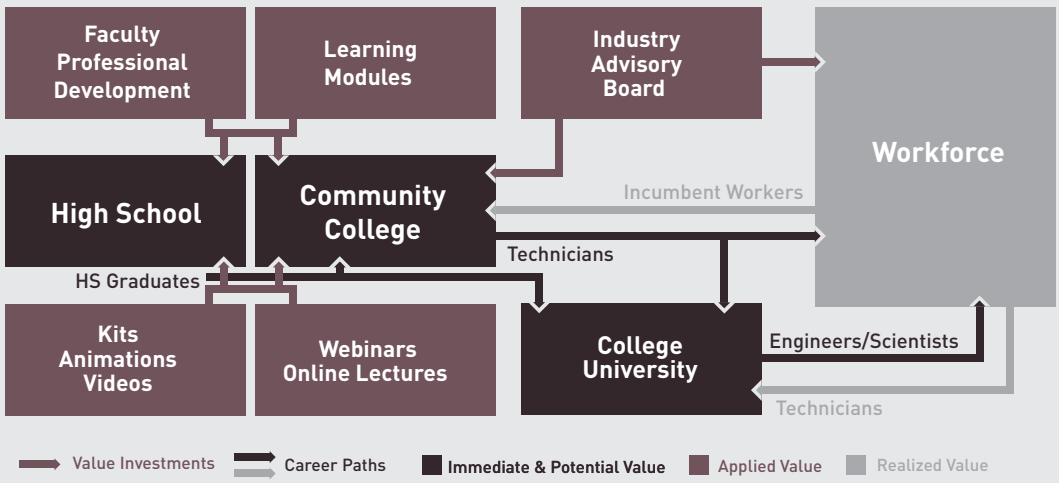
With this data SCME has identified likely hiring clusters and their locations relative to community colleges.

SCME's work with industry has resulted in a suite of learning modules, kits, and videos. This digital content is available on the center's website and in customizable distance learning course shells and hands-on kits. Secondary schools are using these resources in physics, math, and other STEM classes to drive students' interest in advanced technology careers. Technical educators use these tools to educate more skilled, adept, and agile technicians who are capable of supporting evolving micro- and nanotechnology industries.

> "As commercialization of micro- and nano-scale technologies gathers speed and value, the educational infrastructure that SCME provides is more important than ever."
>
> **Scott Bryant** - President
> Nano Network of New Mexico

An HT Micro technician inspects lithographic processing on a MEMS wafer.

The backbone of SCME's value-creation system is the career pathway it creates from high schools to community colleges to industry.



SHINE

Seattle's Hub for Industry-driven Nanotechnology Education

www.seattlenano.org

NORTH SEATTLE COMMUNITY COLLEGE
SEATTLE, WA

SHINE Graduates Excel in Regional Nanotechnology Industry

SHINE students graduate from the North Seattle Community College Nanotechnology program with strong technical skills and career preparation. SHINE offers program options at both the associate degree and certificate level with an 89% second-year course completion rate in 2012-2013. Comprehensive career counseling with a dedicated SHINE recruitment and employment specialist, quarterly Nano Lunches with local nanotechnology researchers, and additional networking opportunities ensure that students develop high caliber professional skills. Hands-on labs and 200-hour internships promote technical skills that prepare students for immediate employment. In 2012-2013, all 10 graduates secured employment in nanotechnology within two months of graduation or enrolled in additional education.

SHINE alumni offer additional program support through class presentations and informational interviewing opportunities.

KEY ACTIVITIES

- Educates nanotechnicians to meet industry needs through hands-on instruction with high-quality instrumentation and more than 200 hours of internship experience.
- Promotes awareness of nanoscience through extensive high school outreach to both teachers and administrators.
- Connects nanotechnology stakeholders in the Pacific Northwest to provide regional support for nanotechnology workforce development.

A nanotechnology student determines self-assembled monolayer thickness during a lab.

SHINE Creates Key Industry & Education Partnerships

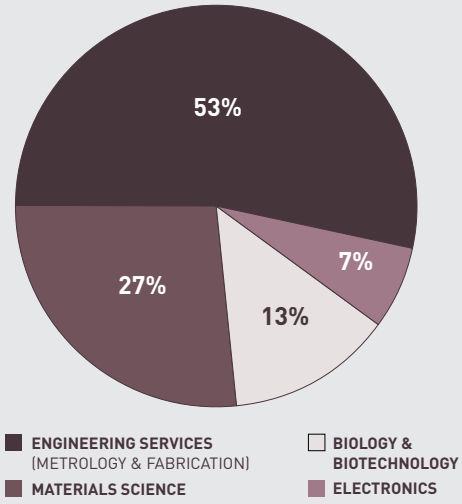
In its first year, SHINE developed and expanded key employer and university connections. Through these connections, employers and universities receive technical assistance, SHINE students strengthen their technical skills, and industry users gain access to a talented pool of nanotechnicians. In 2012-2013 these partnerships resulted in five full- and part-time positions for students in company labs and numerous networking opportunities.

SHINE's close partnership with the Washington Nanofabrication Facility (WNF) at the University of Washington has been highly successful. In the WNF cleanroom, SHINE nanotechnology students complete research and development projects alongside industry users. As a direct result of SHINE students' strong performance at the facility, a company planning to fill one nanotechnician position was so impressed by the two SHINE students who interviewed for the job that it hired both students.

As SHINE expands into Oregon and Idaho, it will continue to develop win-win partnerships with companies, community colleges, and universities in the Pacific Northwest.

In its first year, SHINE placed students into 15 internships and jobs.

2013 SHINE STUDENT INTERNSHIPS & EMPLOYMENT BY INDUSTRY



A student prepares samples in a cleanroom.

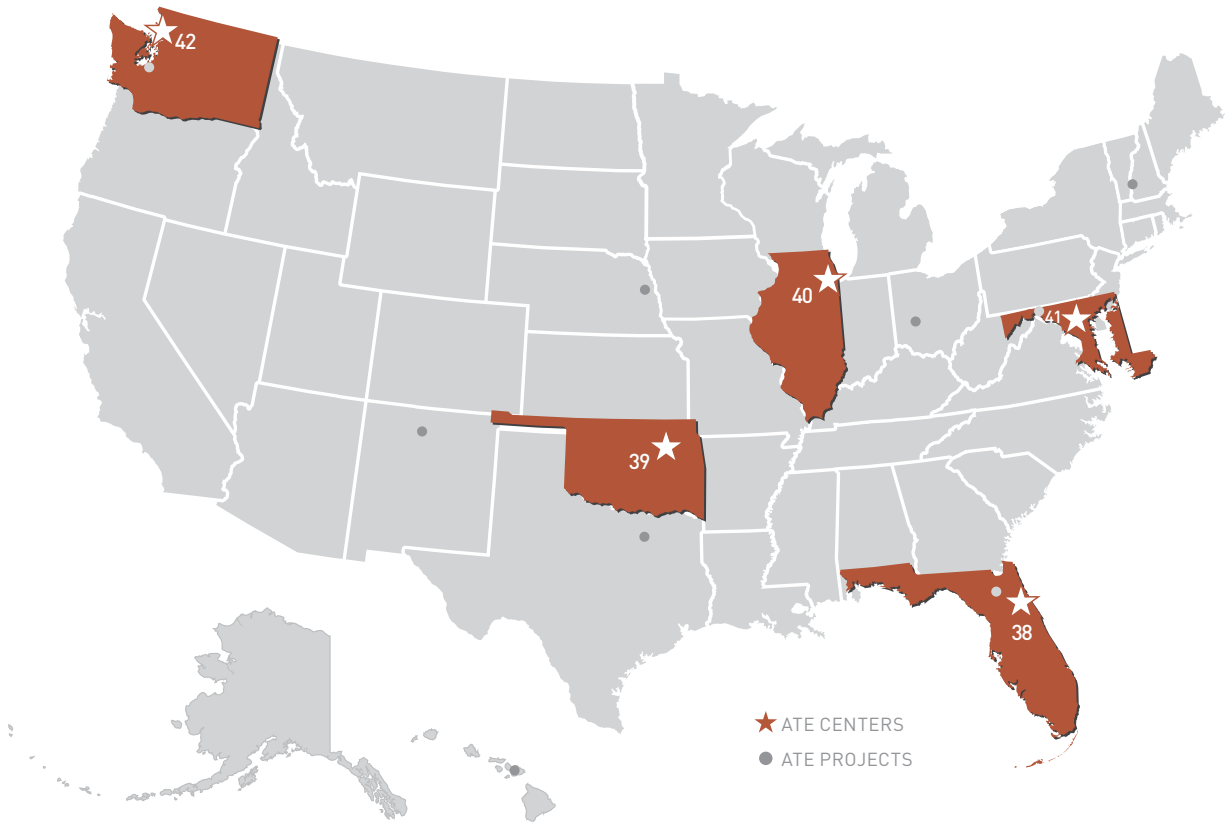
> "We hired two graduates from North Seattle Community College's nanotechnology program, and the hands-on experience and theoretical foundation they had coming into the job was invaluable."

Sarah McQuaide - Research Engineer
Silicon Designs, Inc.

SECURITY TECHNOLOGIES

SECURITY TECHNOLOGIES
CENTERS & PROJECTS

SEE ALL ATE PROJECTS AT WWW.ATECENTRAL.NET/PROJECTS



38 **ACE**
Advanced Cyberforensics Education
Daytona State College
Daytona Beach, FL
www.cyberace.org

39 **CSEC**
Cyber Security Education Consortium
University of Tulsa
Tulsa, OK
www.cseconline.org

40 **CSSIA**
National Center for Security System and Information Assurance
Moraine Valley Community College
Palos Hills, IL
www.cssia.org

41 **CyberWatch**
National CyberWatch Center
Prince George's Community College
Largo, MD
www.cyberwatchcenter.org

42 **CWW**
CyberWatch West
Whatcom Community College
Bellingham, WA
www.www.cyberwatchwest.org

ACE

Advanced Cyberforensics Education Consortium

www.cyberace.org

DAYTONA STATE COLLEGE
DAYTONA BEACH, FL

Students learn to collaborate in order to solve digital forensics challenges.

KEY ACTIVITIES

- Provides self-paced online courses to prepare faculty in Florida, Georgia, North Carolina, and South Carolina to teach cyberforensics courses.
- Distributes comprehensive curricula allowing schools to bootstrap course offerings.
- Shares its model cybersecurity and cyberforensics certificate program to facilitate workforce retraining.
- Partners with K-12 organizations to provide hands-on cybersecurity curricula and activities as a pathway to higher education.

ACE Promotes Cyberforensics Education

Cybersecurity and cyberforensics are synergistic. While cyberforensics is a new science that applies scientific and engineering principles to the identification, verification, and examination of digital evidence, cybersecurity seeks to anticipate and prevent attacks on digital devices.

In the first nine months of 2013, 70 students in Florida and North Carolina attended ACE's multi-day hands-on cyber camps where they applied best practices in computer security to hands-on lab assignments. ACE also rolled out cyber clubs at 12 high schools in consortium states. At the four consortium colleges, more than 300 college students completed at least one of the five ACE-developed core cyberforensics courses.

ACE's online faculty development prepares educators to offer ACE's core cyberforensics courses in a streamlined fashion at their institutions. ACE's train-the-trainer program covers everything from basic cyberforensics procedures to advanced malware analysis.

ACE Provides Competency-Based Workforce Education

ACE, a large ATE project, provides students with high-quality, hands-on educational experiences to increase their marketability in the cybersecurity and digital forensics sectors of business and government. Additionally, faculty members have access to ACE's self-paced, online train-the-trainer program of cyberforensics courses, which may

Hands-on exercises help develop crucial mastery of cyberforensics skills such as forensic imaging and packet capture analysis for network forensics.

be re-purposed for educators to use in their own courses.

ACE leverages partnerships with organizations that provide school-to-workforce transitions, such as Kelly Services and its subsidiaries, to provide internships in technical fields to high school students. The Kelly Services partnership, which ACE leaders embarked on in 2009 for other initiatives, has placed 283 high school students in internships with more than 15 companies. The career sectors of these placements include STEM-related fields such as civil, mechanical, electrical engineering, and computer science. ACE plans to expand job placements to include cybersecurity and cyberforensics-related positions.

ACE is collaborating with the Department of Defense's (DoD) Cyber Crime Center to provide pathways for academic programs to obtain the DoD's National Centers of Digital Forensics Academic Excellence (CDFAE) designation. Students graduating from CDFAE-designated programs will be better prepared to pass industry-standard certifications and meet the expectations of the DoD 8570 Information Assurance Workforce Improvement Program Directive.

Additionally, ACE's state leaders are developing cybersecurity and cyberforensics certificates for employed technicians and displaced workers who want to enhance their skills.

> "Information security relies on individuals with strong digital forensics skills. Quality educational programs, such as those developed by the Advanced Cyberforensics Education Consortium, are critical to developing the next generation of competent information security professionals."

W. Hord Tipton - Executive Director (ISC)²

ACE tailors its strategies to increase the pool of qualified cyberforensics practitioners.

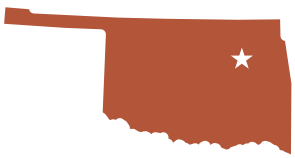
ACE STRATEGIES TARGET 3 GROUPS

K-12	COLLEGE	WORKFORCE
Implement cyberforensics curricula into existing frameworks.	**Provide** comprehensive digital forensics education to faculty.	**Identify** internship and job placement opportunities.
Distribute hands-on learning tools.	**Distribute** comprehensive course materials.	**Offer** workforce education through flexible certificate programs.
Establish cyber camps, clubs, and programs to increase student motivation.	**Facilitate** program development and accreditation.	**Promote** industry certifications.

CSEC

Cyber Security Education Consortium

www.cseconline.net



UNIVERSITY OF TULSA
TULSA, OK

KEY ACTIVITIES

- Fuels economic development.
- Leads to cybersecurity credentials.
- Creates a highly skilled cybersecurity workforce.
- Helps reverse exporting and outsourcing of jobs.
- Develops and disseminates high quality cybersecurity curricula.
- Cascades faculty development programs to eight states.
- Specializes in critical infrastructure physical systems security related to manufacturing and energy industries.

CSEC Advances Cybersecurity & Homeland Defense

Since 2004, 884 CSEC students have received associate degrees and 208 students have completed bachelor degrees in cybersecurity. During the same period, 1,309 students have completed certificate programs. CSEC institutions have issued more than 1,500 Committee on National Security Systems certificates.

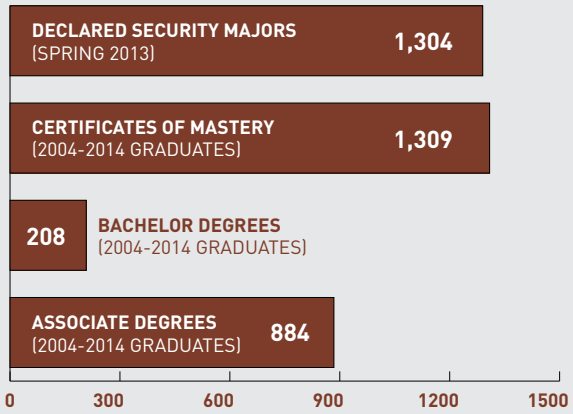
Enrollments are growing to meet industry demand. In July 2013, CSEC institutions had 1,304 security degree majors and 267 students pursuing security-related certificates of mastery. During 2013, CSEC institutions also helped 274 incumbent workers upgrade their skills and knowledge of cybersecurity and physical system security.

CSEC institutions have 123 articulation agreements that provide students with advanced placement, dual enrollment, or cybersecurity course credit at two- and four-year institutions. CSEC institutions also align their programs with industry and vendor-neutral certifications. Twelve CSEC institutions offer students Committee on National Security Systems certifications.

CSEC's curriculum teaches students how to troubleshoot SCADA systems.

CSEC's cohesive eight-state partnership of community colleges and career and technology centers provides technicians with up-to-date cybersecurity skills for careers in business, industry, and government.

CYBERSECURITY EDUCATION WORKFORCE IMPACT



A Central Technology Center instructor teaches technicians how to set the upper and lower limit switches on a motor-operated valve that connects to a SCADA system.

CSEC Uses Rigorous Curricula to Prepare Workforce in Eight States

CSEC's highly successful faculty development and program-building efforts led to the establishment of cybersecurity certificate and degree programs at 49 two-year program sites in eight states.

CSEC institutions' rigorous cybersecurity curricula encompass five core areas: information assurance principles, secure electronic commerce, network security, enterprise security management, and digital forensics. CSEC faculty members who have attended the center's Faculty Certificate Program have developed 64 distinct courses. Seven CSEC institutions are designated National Centers of Academic Excellence in Information Assurance Two-Year Education (CAE/2Y).

"Hackers are constantly trying to exploit holes in the state's computer network. They are always testing the limits."

Mark Gower - Chief Security Officer
State of Oklahoma, Office of Management & Enterprise Services

Centers of Excellence Respond to Employers' Needs

To meet employers' needs, CSEC has created centers of excellence in automation and control systems and mobile communications devices.

- The University of Tulsa, which serves as the principal training entity and mentor to CSEC's two-year institutions, offers five-day advanced hands-on courses on supervisory control and data acquisition (SCADA) security and mobile device forensics.
- Central Technology Center launched a Control Room Training Center to prepare new technicians for energy and pipeline industries and to upgrade incumbent workers' skills. This program emphasizes industrial networking, SCADA systems, and control technology security.
- Francis Tuttle Technology Center's SCADA technician program prepares graduates for careers as instrumentation, energy, or SCADA technicians in manufacturing and energy sectors.
- Manhattan Area Technical College created mobile device security curricula and a hands-on lab to teach students how to secure iPhones and iPads.

CSSIA

National Center for Systems Security and Information Assurance

www.cssia.org

MORAINE VALLEY COMMUNITY COLLEGE
PALOS HILLS, IL

CSSIA Educates Students & Faculty About Cybersecurity

CSSIA provides subject-matter expertise to bridge institutional curriculum to cybersecurity workforce skills and national standards. The center provides relevant and innovative faculty development opportunities with workshops and conferences.

Over the last 10 years, CSSIA has mentored, established, and expanded cybersecurity degree and certificate programs in about 30 states. Its Cyber Security Center for Teaching and Learning has educated more than 3,500 instructors about cybersecurity threats, emerging technologies, and products.

Its Virtual Data Center (VDC) provides students at more than 120 institutions with 24-hour, seven-day-per-week access to virtual learning exercises that utilize a wide range of scenarios.

Educators also use the VDC to make their classrooms safe environments for students to experiment at no additional cost to their institutions.

KEY ACTIVITIES

- Develops innovative cybersecurity curricula.
- Partners with business for research and development of virtual teaching and learning environments.
- Helps community colleges in 30 states expand cybersecurity degree and certificate programs that align with national cybersecurity standards.
- Teaches virtualization and high availability computing.
- Grows the capacity of cybersecurity workforce through diversity.

A student configures components in CSSIA Virtual Data Center.

CSSIA has 250 cybersecurity labs for students and faculty to access from its Virtual Data Center.

CSSIA Builds Diverse Industry Collaborations

CSSIA has built strong relationships with business and industry leaders responsible for information assurance. These partnerships include employers in health care, finance, manufacturing, service industries, transportation, and energy. CSSIA performs workforce needs assessments and skills assessments, and identifies new and emerging technologies for its business partners. Business partners, meanwhile, assist CSSIA with curriculum content, skills-based exercises, and innovative elements threaded into local and national skills competitions.

"Our business has consistently hired graduates from the CSSIA-affiliate community colleges. These students enter the workforce with the foundational skills necessary for us to develop senior technicians and fill a critical need in defending the nation's infrastructure."

Rudy Ristich - Senior Manager
Dell SecureWorks

CSSIA Reaches Out to Underserved Populations

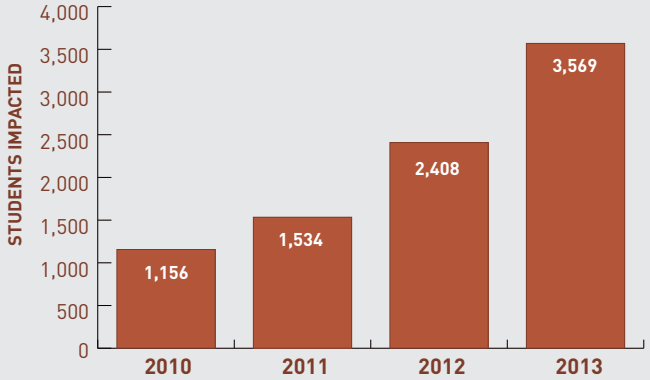
CSSIA offers job fairs, résumé reviews, and mock interview sessions, and facilitates internships for students at its partner institutions. The center focuses particular attention on recruiting military veterans and underrepresented populations for careers in cybersecurity. It partners with the Association of Computer Information Sciences, the Computing Alliance of Hispanic-Serving Institutions, and faculty to strengthen the information assurance and cybersecurity programs at minority-serving institutions.

Virtualization Data Center Sharpens Students' Cybersecurity Skills

More than 120 institutions utilize CSSIA's Virtualization Data Center (VDC). Meanwhile, more than 1,200 students have used the VDC to prepare for cybersecurity competitions, and more than 7,500 students have used the system to prepare for cybersecurity employment. Employers report that they value the hands-on experiential learning the VDC allows.

The number of students learning virtually by accessing the Cybersecurity Teaching & Learning Center has increased to several thousand annually as CSSIA's partnerships with education institutions have grown from 32 in 2010 to 93 in 2013.

CYBERSECURITY TEACHING & LEARNING CENTER USE INCREASES



CyberWatch

National CyberWatch Center

www.cyberwatchcenter.org

PRINCE GEORGE'S COMMUNITY COLLEGE
LARGO, MD

KEY ACTIVITIES

- Leads collaborative state and regional consortia to advance cybersecurity education and strengthen the national cybersecurity workforce.
- Promotes national conversations concerning cybersecurity education, representing especially community colleges.
- Models college curricula, articulation agreements, and K-12 outreach.
- Hosts national cybersecurity student competitions.
- Conducts research on cybersecurity education.

CyberWatch Evolves to Meet Changing Needs

Since the inception of CyberWatch in 2005, community college members have had exponential growth in their cybersecurity education programs. Most of these colleges had either no or only minimal cybersecurity programs at the time they joined the CyberWatch Consortium. Much of this growth represents new academic programs and student enrollment, rather than simply an increase in the number of participating institutions.

Over the years, the center's cybersecurity curricula have grown with new courses and specialties, such as law enforcement and digital forensics; and modules in finance, medical records, and energy. With stackable certificates, CyberWatch's model curricula fold smoothly into workforce development programs.

Students talk about strategies before a network defense competition that simulates cybersecurity attacks they will face in workplaces.

Technicians must know how to analyze and resolve system hacks.

"Thanks to the CyberWatch program, I chose a career path that is exciting, evolving, and meaningful."

Re'el Hawkins - Information Security Honors Student
Prince George's Community College

CyberWatch Addresses Cybersecurity Education Priorities

The cybersecurity profession needs a coherent workforce framework, widely-accepted curricula standards to prepare students for that workforce, and defined educational and career pathways. To address these workforce issues, CyberWatch

- Works with the National Initiative for Cybersecurity Education (NICE) on NICE's National Cybersecurity Workforce Framework 2.0, helping to map knowledge, skills, and abilities to specific job titles.
- Engages with the National Security Agency (NSA) and Department of Homeland Security (DHS) on developing knowledge units to inform cybersecurity curricula.
- Assists NSA and DHS to update the criteria for designation as a Center of Academic Excellence in Information Assurance Education (CAE) and CAE 2-Year program (CAE2Y).
- Participates in conversations with the National Academy of Sciences about professionalizing the cybersecurity workforce.
- Partners with NICE, DHS, and the National Science Foundation (NSF) on developing educational standards for software assurance.
- Collaborates with four NSF ATE centers on the National Cyber League and provides cybersecurity education information to the ATE Central clearinghouse.
- Conducts National Cybersecurity Student Association (NCSA) programs; a monthly webinar series and YouTube Channel; Mid-Atlantic Collegiate Cyber Defense Competitions; extensive K-12 programs; community college tracks at the Colloquium for Information Systems Security Education, NICE Annual Workshop, and CAE Principal Investigators Conference; and the Community College Cyber Summit.

More than 10,000 students have been taught by educators who received professional development from CyberWatch. Since 2005, another 5,000 students have enrolled in cybersecurity courses or programs at community colleges affiliated with CyberWatch.

STUDENT & FACULTY OUTCOMES OF CYBERWATCH-AFFILIATED PROGRAMS

	2005	2013
FACULTY EDUCATED TO TEACH CYBERSECURITY COURSES	0	845 (impacting 10,000+ students)
STUDENTS ENROLLED IN CYBERSECURITY COURSES & PROGRAMS	310	5,000+
CYBERSECURITY DEGREE & CERTIFICATE PROGRAMS	4	50+
CURRICULA MAPPED TO NATIONAL STANDARDS	3	61

SECURITY TECHNOLOGIES

CWW
CyberWatch West

www.cyberwatchwest.org

WHATCOM COMMUNITY COLLEGE
BELLINGHAM, WA

KEY ACTIVITIES

CWW strengthens western US institutions' cybersecurity education programs and the region's workforce infrastructure through

- Unique faculty mentoring programs.
- Robust student competition initiatives.
- Professional development opportunities for faculty.
- Industry partnerships.
- Shared curriculum models.

CWW Engages Students' Interest

There is a high level of engagement among the students enrolled in security programs at CWW's core institutions: Whatcom Community College; California State University (CSU), Dominquez Hills; CSU, San Bernardino; and California State Polytechnic University, Pomona (Cal Poly Pomona). Of the 821 students enrolled at the CWW core institutions through 2013, 173 completed certificates or degrees, 506 are still enrolled, and 142 discontinued.

Students' interest in cybersecurity extends beyond classrooms. In 2013, 88 students at CWW institutions participated in an online Student-2-Student workshop about a form of cyber-eavesdropping known as a man-in-the-middle attack. During the season-long online National Cyber League competition, students applied network traffic analysis and other skills in a "capture-the-flag" exercise to retrieve files that contained passwords (the "flags"). Of 1,317 students from CWW core institutions and other member colleges who participated, 58% captured at least one flag.

College students serve as cybersecurity competition judges, sharing their knowledge with participating high school students.

Internships Help CWW Students Gain Work Experience

A CyberWatch West internship placement specialist facilitated internships for students to help them acquire real-world work experiences. During its first year of operation, CWW far exceeded its goal to place 25 students per educational institution. Three partner institutions almost doubled their internship placements as a result of their participation in CWW's program.

In 2011-12, Cal Poly Pomona placed 36 interns compared to 22 in 2010-11; CSU, Dominguez Hills placed 38 interns compared to 20 in 2010-11; and Whatcom Community College placed 28 compared to 12 in 2010-11.

CWW Builds Educators' Cybersecurity Skills

It is a CWW priority to help faculty stay current in cybersecurity technologies. Educators' abilities to address the continuously evolving cybersecurity landscape translate into students' skills and career prospects. CWW builds faculty members' skills with workshops on ethical hacking, forensics, and other topics. The center also provides a faculty mentor to help educators build courses using repositories for virtual images, tools, and other resources.

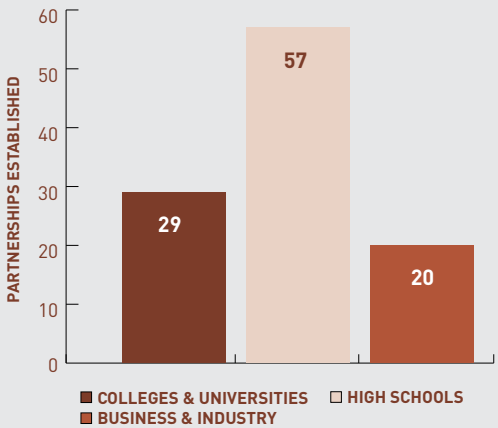
The time constraints and demanding teamwork of cybersecurity competitions prepare college students for the intensity they will face in the workplace.

During its first year, CyberWatch West made significant progress toward its goal of strengthening member institutions' resources for students and faculty through the 106 partnerships it started throughout the region.

"Whatcom [Community College, host of CyberWatch West] has quietly been establishing a reputation as a significant national player in technology education and building a level of expertise that's setting a standard for community college cybersecurity programs."

Mark Knittel - Owner
Ovation Technical Services
Board Chairman, Technology Alliance Group Northwest

CYBERWATCH WEST ESTABLISHES 106 PARTNERSHIPS IN YEAR ONE (2011-2012) TO STRENGTHEN PROGRAMS



FACES OF ATE

A tool and die maker, **Narkavis "Dontae" Grant** re-enrolled at Florence-Darlington Technical College to earn a Mechanical Engineering Technology degree.

This program, developed by the South Carolina ATE National Resource Center (SC ATE), blends diverse industry experiences that Grant uses as an engineering manager at Superior Machine.

The father of two works full time, attends classes full time, and hopes to complete his second associate degree in 2014.

Matt Martella is an applications developer at Highmark Inc., a health insurance company in Pittsburgh, Pennsylvania. Using sign language, Martella explains his work in an award-winning video on DeafTEC's website.

The video series is part of the center's effort to recruit deaf and hard-of-hearing individuals for STEM fields, and to encourage employers to hire deaf and hard-of-hearing technicians.

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Broadening Advanced Technological Education Connections
University of Massachusetts Boston
www.batec.org

24 **CTC**
National Convergence Technology Center
Collin College
www.connectedtech.org

25 **GeoTech**
National Geospatial Technology Center of Excellence
Jefferson Community and Technical College
www.geotechcenter.org

26 **MCIT**
Midwest Center for Information Technology
Applied Information Management Institute
www.midwestcenterforit.org

27 **MPICT**
Mid-Pacific Information and Communication Technologies Center
City College of San Francisco
www.mpict.org

LEARNING, EVALUATION & RESEARCH

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Supporting the ATE Community
University of Wisconsin-Madison
www.atecentral.net

29 **DeafTEC**
Technological Education Center for Deaf and Hard-of-Hearing Students
Rochester Institute of Technology
www.deaftec.org

30 **EvaluATE**
ATE Evaluation Resource Center
Western Michigan University
www.evalu-ate.org

31 **SC ATE**
South Carolina ATE National Resource Center
Florence-Darlington Technical College
www.scate.org

NSF ATE Funding Opportunities

The ATE program promotes improvement in the education of science and engineering technicians at the undergraduate and the secondary school levels. Proposals are accepted in three major tracks: projects, centers, and targeted research in technician education.

For complete details visit: **www.nsf.gov/ate**

MICRO & NANO TECHNOLOGIES

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MATEC NetWorks National Resource Center
Maricopa Community Colleges
www.matecnetworks.org

33 **NACK Network**
Nanotechnology Appplications and Career Knowledge Network
Pennsylvania State University
www.nano4me.org

34 **Nano-Link**
Center for Nanotechnology Education
Dakota County Technical College
www.nano-link.org

35 **NEATEC**
Northeast Advanced Technological Education Center
Hudson Valley Community College
www.neatec.org

36 **SCME**
Southwest Center for Microsystems Education
University of New Mexico
www.scme-nm.org

37 **SHINE**
Seattle's Hub for Industry-driven Nanotechnology Education
North Seattle Community College
www.seattlenano.org

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LEGEND

ATE CENTERS

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03 **CA²VES** - Clemson, SC
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05 **FLATE** - Tampa, FL
06 **RCNGM** - Farmington, CT
07 **Weld-Ed** - Elyria, OH

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25 **GeoTech** - Louisville, KY
26 **MCIT** - Omaha, NE
27 **MPICT** - San Francisco, CA

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10 **VESTA** - Springfield, MO

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42 **CWW** - Bellingham, WA

THERE ARE **42 ATE CENTERS** LOCATED AROUND THE UNITED STATES OF AMERICA. FOLD OUT THE BACK COVER TO SEE THEIR LOCATIONS.

AREAS OF STUDY

ADVANCED MANUFACTURING TECHNOLOGIES

AGRICULTURAL & BIO TECHNOLOGIES

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ENGINEERING TECHNOLOGIES

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MICRO & NANO TECHNOLOGIES

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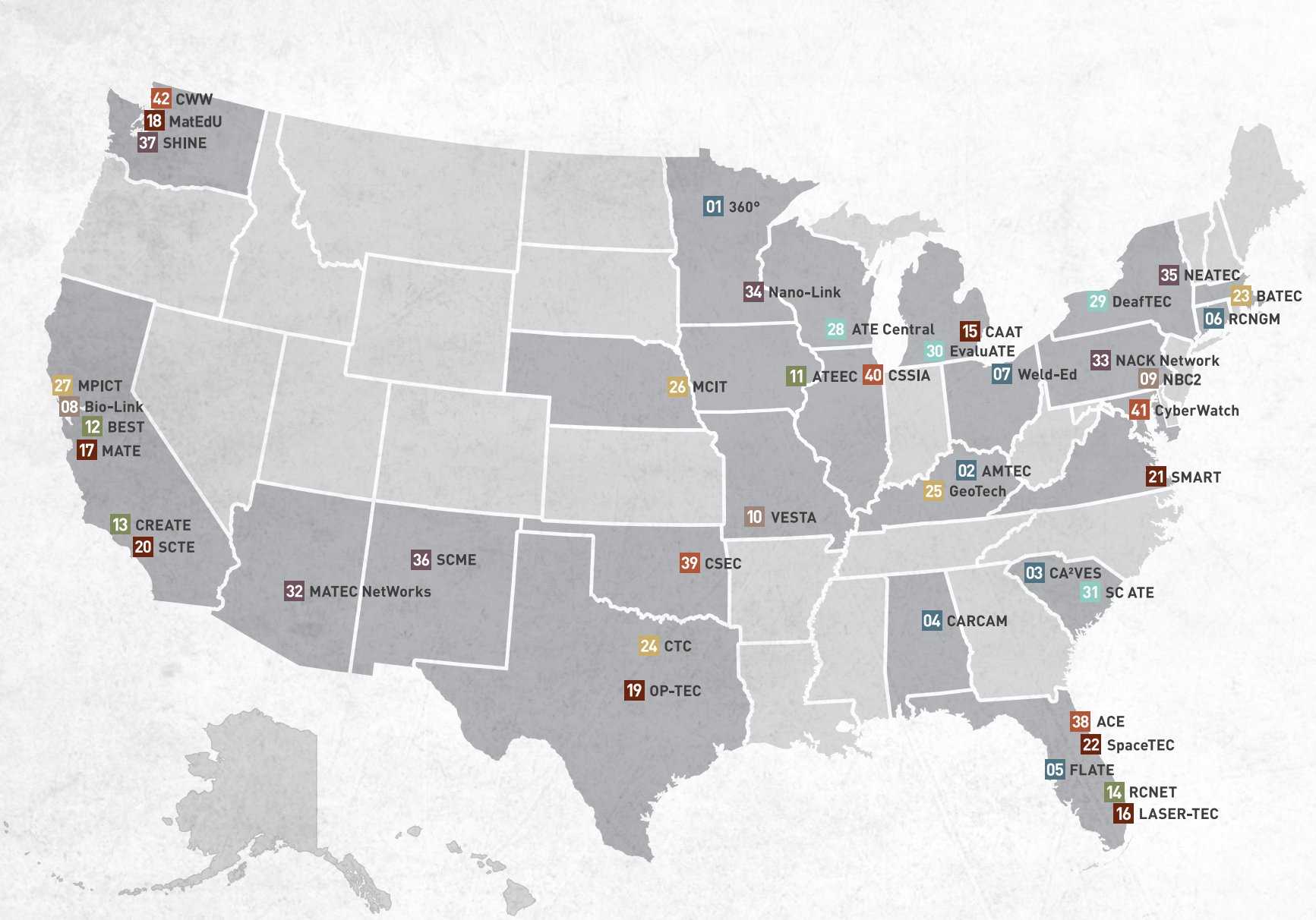
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15 CAAT
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ATE CENTERS

The Advanced Technological Education (ATE) program endeavors to strengthen the skills of technicians, whose work is vitally important to the nation's prosperity and security. In ATE centers and projects, two-year colleges have a leadership role and work in partnership with universities, secondary schools, business and industry, and government agencies to design and carry out model workforce development initiatives.

For more information about the ATE centers visit

WWW.ATECENTERS.ORG/**IMPACT2014**