High Impact Technology Exchange Conference

Educating America’s Technical Workforce

ST LOUIS • JULY 22–25
Hyatt Regency at the Arch

CONFERENCE PROGRAM
It is with great pleasure that we welcome you to the 2019 HI-TEC conference in St. Louis. You will find HI-TEC to be of particular professional interest, since it directly addresses the unique needs of technician educators. During the conference you will discover exciting advances in both technology and teaching that will help prepare your students for America’s future workforce. You will also have a wide variety of opportunities to network during breaks and meals, and while exploring the exhibit hall.

We encourage you to review this HI-TEC program carefully, as there are many offerings from which to choose. Explore the concurrent sessions and consider attending one or more of the Monday and Tuesday preconference workshops. You may also want to join one of the technology site visits unique to St. Louis — Boeing Company or Cortex Innovation Community.

Finally, we hope you have the chance to experience the history and cultural diversity of St. Louis and all it has to offer, including the Arch.

Thank you for attending the 11th annual HI-TEC conference and helping us celebrate HI-TEC’s growth and improvement. Please mark your calendar for HI-TEC 2020 in Portland, Oregon, at the DoubleTree by Hilton Portland, on July 27–30.

Pamela Silvers, 2019 Chair
July 2019 marks the 11th anniversary for HI-TEC. While spearheading this conference, I had the privilege of working with a diverse group of colleagues whose enthusiasm and drive make this event happen. This is an all-volunteer group who share the work and effort with a single goal: to produce an excellent event for technical educators. Working in a variety of committees, we pull all of the elements of a great conference together to create a better event each year.

It is my privilege to acknowledge and thank the committees for their time and effort in making this year’s HI-TEC a success. A list of all the committees and members is on the previous page. In particular, I want to give special recognition to the committee chairs and executive committee members for all their hard work. Greg Kepner did a tremendous job of organizing the program efforts. Jeremy Leffelman is to be commended for the amazing technology site visits. Bob Ehrmann coordinated the preconference workshops. Ann Beheler secured the keynote speakers.

Thomas Stout managed the awards committee, which selected the awardees for each sector. Rachael Bower did a fantastic job leading the marketing committee. Marilyn Barger chaired the fellowship initiative and organized the fishbowl presentation. Gordon Snyder had the task of coordinating the technology needs, while Donna Lange managed accessibility needs. Mike Lesiecki managed many tasks behind the scenes.

Of course, a very special thanks to Sheila Wilson and her team from the Center for Occupational Research and Development (CORD). Once again, they have done an outstanding job in coordinating all of the details that make HI-TEC such a great success.

Finally, as with any large event, financial support is imperative, and I want to gratefully acknowledge the financial support of the National Science Foundation, which funds the Advanced Technological Education program and the community of NSF ATE centers and projects that produce HI-TEC.

Pamela Silvers, 2019 Chair
General Information

CONTENTS
Special Events / Meetings 3
Schedule-at-a-Glance 5
Monday, July 22, Preconference 6
Tuesday, July 23, Preconference 18
Wednesday, July 24, Main Conference 26
  Opening and Keynote Presentation 27
  Awards Luncheon 32
Thursday, July 25, Main Conference 44
  Keynote Luncheon 53
  Exhibit Hall Floor Plan 58
Exhibitors 59
Index of Presenters 62
Meeting Room Floor Plans Inside back cover

Special Events / Meetings

OPCN Meeting
  By invitation only
  Monday and Tuesday
  Grand Ballroom GH (4th floor)

Mentor-Connect
  By invitation only
  Gateway East (18th floor)
  Tuesday, 8:00 a.m.–5:00 p.m.

Preparing Technicians for the Future of Work
  By invitation only
  Grand Ballroom C (4th floor)
  Tuesday, 8:30 a.m.–4:30 p.m.

Engaging New Communities (Achieving the Dream)
  By invitation only
  Grand Ballroom F (4th floor)
  Tuesday, Noon–5:00 p.m.

CTC Meeting
  Grand Ballroom A (4th floor)
  Tuesday, 5:00–6:30 p.m.

NSF ATE Feedback Session
  Regency E (2nd floor)
  Friday, 8:30–11:30 a.m.
  Continental breakfast included

Hotel
Hyatt Regency at the Arch
315 Chestnut Street • St. Louis, MO 63102 • 314-655-1234

Registration

Fourth Floor
SUN 4:00–7:00 p.m.  WED 7:00 a.m.–5:00 p.m.
MON 7:00 a.m.–6:00 p.m.  THUR 7:30 a.m.–1:00 p.m.
TUE 7:00 a.m.–6:00 p.m.

Exhibit Hall

Regency ABC
WED 9:45 a.m.–6:00 p.m.
Posters 3:00–5:30 p.m. • Reception 4:30–5:30 p.m.
THUR 7:30 a.m.–Noon

Get Social on Twitter and Instagram!

Wednesday and Thursday (Regency Foyer, 2nd floor)
Hit up your Instagram and Twitter accounts and post the best of the best of YOU (and others) at HI-TEC. Use the hashtag #highimpact2019 to be eligible for prizes!

A winner will be selected in each of the following categories and will receive a $50 Amazon gift card at the Thursday keynote.
  • Group photo prize
  • Best conference content and description prize
  • Live Instagram/Twitter leaderboard prize (who posts the most QUALITY content)

There will also be a social media scavenger hunt throughout HI-TEC. All hints and prizes will be on Instagram and Twitter.

#highimpact2019 Photo Booth
Join the fun! Take selfies in our super social, interactive photo booth with a high-tech twist. The high-fidelity ring light will capture photos with HI-TEC digital backgrounds you’ll love to share! You’ll receive your shots directly to your phone for easy sharing on Facebook, Twitter, and Instagram. Don’t forget to hashtag #highimpact2019 to be entered into contests and win prizes.
**Keynote Panel**

*Thursday, July 25, 12:30–1:30, Grand Ballroom DE*

**Cultivating and Leading Change in Big Data, Analytics, and Artificial Intelligence: Empowering and Advancing Women and Underrepresented Groups in STEM**

A keynote panel of industry leaders will provide perspectives on emerging trends, future requirements, and workforce characteristics that are necessary to meet global demand and fulfill national security interests. The opportunity for women and underrepresented groups to play an important part in developing and leading these technology initiatives will be explored.

**Moderator**

Ann Beheler  
PI, National Convergence Technology Center (CTC)

**Panelists**

1. **Panelist**
   - Aaron Burciaga  
   - Chief Technology Officer at Analytics2Go

2. **Panelist**
   - JC Caesar  
   - Chief Operations Officer at Addx and retired Rear Admiral US Navy

3. **Panelist**
   - Polly Mitchell-Guthrie  
   - Vice President of Industry Outreach and Thought Leadership at Kinaxis

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**Todd McLees**

Founder, Pendio Group and Rethink Ecosystem Hub

*Wednesday, July 24, 8:30–9:45, Grand Ballroom DE*

**Opportunities for Growth in a Time of Extraordinary Change**

Todd will offer insights on three key areas related to the speed of innovation. He will discuss the current and future rate of change in technological innovation; its impact on Work of the Future and how educators can prepare students for the changing jobs in the new economy; and the need for new levels of collaboration to meet the needs related to reskilling, upskilling, and “newskilling” the workforce of today and tomorrow.
Schedule at a Glance

Registration Hours

**Fourth Floor** (near elevators)
- Sunday: 4:00–7:00 P.M.
- Monday: 7:00 A.M.–6:00 P.M.
- Tuesday: 7:00 A.M.–6:00 P.M.
- Wednesday: 7:00 A.M.–5:00 P.M.
- Thursday: 7:30 A.M.–1:00 P.M.

Exhibit Hall Hours

**Regency ABC**
- **Wednesday**
  - 9:45 A.M.–6:00 P.M.
  - Poster Sessions 3:00–5:30 / Reception 4:30–5:30
- **Thursday**
  - 7:30 A.M.–Noon

Preconference

**Monday**
- 7:30–8:30: Continental Breakfast (for morning workshop attendees only)
- 8:30–Noon: Workshop *(see page 7)*
- 8:30–4:30: Workshop *(see page 7)*
- 10:00–10:30: Refreshment Break
- Noon–1:00: Lunch (for afternoon workshop attendees only)
- 1:00–4:30: Workshops *(see page 8)*
- 2:30–3:00: Refreshment Break

**Tuesday**
- 7:30–8:30: Continental Breakfast (for morning workshop attendees only)
- 8:30–Noon: Workshops *(see page 19)*
- 8:30–4:30: MNT*SIG *(see page 19)*
- 10:00–10:30: Refreshment Break
- Noon–1:00: Lunch on Your Own
- 1:00–5:00: Tours *(see page 20)*

Main Conference

**Wednesday**
- 7:45–8:30: Continental Breakfast
- 8:30–9:45: Opening Session / Keynote *(see page 27)*
- 9:45–10:15: Refreshment Break / View Exhibits
- 9:45–6:00: Exhibit Hall Open
- 10:15–11:00: Concurrent Sessions *(see page 28)*
- 11:15–Noon: Concurrent Sessions *(see page 30)*
- Noon–1:00: Awards Luncheon *(see page 32)*
- 1:15–2:00: Concurrent Sessions *(see page 34)*
- 2:15–3:00: Concurrent Sessions *(see page 36)*
- 3:00–3:45: Refreshment Break / View Exhibits
- 3:00–5:30: View Poster Sessions *(see page 38)*
- 3:45–4:30: Concurrent Sessions *(see page 42)*
- 4:30–5:30: Exhibit Hall Reception
- Poster Sessions Continued

**Thursday**
- 7:30–8:15: Continental Breakfast in Exhibit Hall
- 7:30–Noon: Exhibit Hall Open
- 8:15–9:00: Concurrent Sessions *(see page 45)*
- 9:15–10:00: Concurrent Sessions *(see page 47)*
- 10:00–10:30: Refreshment Break / View Exhibits
- 10:30–11:15: Concurrent Sessions *(see page 49)*
- 11:30–12:15: Concurrent Sessions *(see page 51)*
- 12:30–1:30: Keynote Luncheon *(see page 53)*
- 1:45–2:30: Concurrent Sessions *(see page 54)*
- 2:30–2:45: Refreshment Break
- 2:45–3:30: Concurrent Sessions *(see page 56)*
(must be registered to attend preconference events)

7:00 A.M.–6:00 P.M.

Registration (Grand Registration Desk, 4th floor)

7:30–8:30

Continental Breakfast (for morning workshop attendees; Grand Ballroom D)

8:30–Noon

PRECONFERENCE WORKSHOP

Fiber Optics Technologies for Beginners (Mills 3)

8:30–4:30

PRECONFERENCE WORKSHOP

Missouri Biotech Day (Bus boards at 8:00 A.M. on Fourth Street near elevators.)

Noon–1:00

Preconference Lunch (for afternoon workshop attendees; Grand Ballroom D)

1:00–4:30

PRECONFERENCE WORKSHOPS

Increasing the Enrollment and Retention Rates of Women in Engineering Technology (Mills 6)

Using Arduino Uno and LabView to Learn MEMS Concepts (Grand Ballroom A)

Detecting Stolen Identity Using Advanced Threat Analytics and Delivering Identity to the Cloud (Mills 1)

NSF Proposal Writing and Mock Panel Review (Grand Ballroom C)
Preconference Workshop • 8:30–Noon

Mills 3

Fiber Optics Technologies for Beginners

This workshop is intended for instructors who want to learn more about the practical aspects of fiber optics so they can create and/or enhance courses with the latest technologies impacting the termination, connecting, and testing of fiber optic networks. In addition to learning about the theory of fiber operation, participants will terminate a single-mode fiber with the Corning Unicam system, create and test fusion splices, and use an OTDR for signal tracing and troubleshooting. Fiber to the home, passive optical networks, and distributed antenna systems (DAS) will also be covered.

Chrys Panayiotou, LASER-TEC, Fort Pierce, FL

Refreshment Break 10:00–10:30 • Grand Foyer (4th fl)

Preconference Workshop • 8:30–4:30

Bus boards at 8:00 A.M. on 4th Street near elevators.

Missouri Biotech Day

The day will start with a tour of the Donald Danforth Plant Science Center followed by panel sessions covering best practices in high school education, what two-year alumni are doing in industry, and how education interacts with and supports industry through student internships and contract research work. At the end of the day, there will be three poster sessions. One session will focus on how two-year programs meet emerging industry trends. The other two will focus on research performed by college and high school students. Several of the panel and poster topics will be further explored in main conference sessions. Participants must bring their own laptops.

Linnea Fletcher, AC2 Bio-Link Regional Center, Austin, TX; Richard Norris, Center for Plant and Life Sciences, St. Louis, MO; Elizabeth Boedeker, St. Louis Community College, St. Louis, MO
Mills 6

**Increasing the Enrollment and Retention Rates of Women in Engineering Technology**

This workshop will outline strategies, activities, and practices that have proven successful in increasing enrollment, retention, and graduation rates of women in energy systems engineering technology programs at Idaho State University. During this ATE project, female enrollment has increased almost 400 percent. There will be a discussion on lessons learned throughout the project and observations and reviews from current participants and program graduates who are now in the workforce. Session activities will demonstrate challenges and identify obstacles to recruiting and retaining women in engineering technology.

_Lawrence Beaty, Jodi Johnson_, Idaho State University, Pocatello, ID

Grand Ballroom A

**Using Arduino Uno and LabView to Learn MEMS Concepts**

As the Internet of Things explodes, it is critical that technicians learn how sensors are integrated with electronics. This workshop will demonstrate the use of MEMS kits in tandem with Arduino Uno microcontrollers and LabView software. Participants will learn how pressure sensor devices and cantilever beams are built and used in educational environments. Participants will be provided mini-MEMS kits that will include pressure sensors and cantilevers with attached strain gauges. Both sensors will interface with an Arduino UNO and custom shield. The Arduino will be controlled by a PC running custom LabView data acquisition code. Participants will receive all the material and software used in the workshop. _Participants must bring their own laptops._

_Andrew Bell, Matt Pleil_, Southwest Center for Microsystems Education (SCME), Albuquerque, NM

Mills 1

**Detecting Stolen Identity Using Advanced Threat Analytics and Delivering Identity to the Cloud**

This workshop will use a simulation in which cyber attackers breach a network perimeter. Detection of adversaries before exfiltration of critical information will be the primary objective. Participants will walk through scenarios and apply the following tools to address the attack: (1) architecture of advanced threat analytics and detection, (2) advanced threat analytics as a post-infiltration detection of lateral movement and privilege escalation, and (3) detection and alerting of abnormal user activity from internal reconnaissance user behavioral analytic techniques. _Participants must bring their own laptops._

_Israel Emmanuel_, Century College, White Bear Lake, MN

Grand Ballroom C

**NSF Proposal Writing and Mock Panel Review**

This workshop will present an overview of NSF programs of interest to community and technical colleges and four-year institutions. The NSF merit review process will be presented, and a panel of principal investigators of current award recipients will discuss their experiences. Participants will review and rate a successful proposal and compare their ratings with those of the panelists who formally reviewed the proposal. Participants will leave with the materials used in the workshop.

_V. Celeste Carter_, National Science Foundation, Alexandria, VA
Advanced Technological Education (ATE) centers and projects offer new materials, exemplary methods, professional development, and research leading to enhanced technician education.

Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) supplies scholarships for academically talented, financially needy STEM students.

The Hispanic-Serving Institutions (HSI) program seeks to enhance the quality of undergraduate STEM education and to increase retention and graduation rates of undergraduate students pursuing degrees in STEM at HSIs.

Improving Undergraduate STEM Education (IUSE) supports research and development leading to and propagating interventions that improve both the quality and quantity of STEM graduates.

Louis Stokes Alliances for Minority Participation (LSAMP) The LSAMP program places particular emphasis on transforming undergraduate STEM education through innovative, evidence-based recruitment and retention strategies, and relevant educational experiences in support of racial and ethnic groups historically underrepresented in STEM disciplines.

Robert Noyce Teacher Scholarship Program (Noyce) provides funds to postsecondary institutions to support scholarships, stipends, and academic programs for STEM majors and professionals to become K–12 teachers.

Not a complete list. Please check the NSF website for additional programs.
HI-TEC IS PLEASED TO WELCOME OUR 2019 FELLOWS

The fellowships program is a competitive application open to those faculty who are new to the conference. HI-TEC fellows receive support to attend the conference, make new connections, and participate in the HI-TEC community.

Alex Baldwin
Daytona State College

Erik Christensen
South Florida State College

Don Crall
Tulsa Community College

Thomas Dunbar
Corning Community College

Angelo Esposito
Orange Coast College

Andrew Ippolito
Bucks County Community College

Mahmood Lahroodi
Chippewa Valley Technical College

Jarrod Anthony Tollett
Seminole State College

Sandra Wilson
Central New Mexico Community College

Kristen Wolslegel
City College of San Francisco
Working Connections events, both in-person and on-line, offer cutting-edge, cost-effective professional development that provides IT instructors with the expertise needed to teach the most in-demand technology topics. Limited travel reimbursement help is often available.

Email us at nationalctc@collin.edu.

The robust Convergence College Network (CCN) community of practice connects innovative IT educators from 70 colleges around the nation to share resources, collaborate on curriculum, and discuss best practices to enhance their programs.


Our National Business and Industry Leadership Team (BILT) provides insight on both the current IT job market and emerging technology trends. If your program is not co-led by the businesses that are hiring graduates, consider taking your existing advisory council to the next level by transforming it into a successful BILT.

NACK, MNT educators, industry and government facilitated the creation of nanotechnology workforce education standards as guidance for foundational material for MNT programs. Six standards are published and available via ASTM International (www.astm.org):

- health and safety
- infrastructure
- material properties and effects of size
- characterization
- pattern generation
- materials synthesis and processing

Building College-University Partnerships for Nanotechnology Workforce Development

The Nanotechnology Applications and Career Knowledge (NACK) Support Center has assisted more than 300 post-secondary institutions through guidance in planning and design, instruction at educator workshops, and distribution of adaptable curriculum materials to foster nanotechnology workforce education.

Like our page at facebook.com/nanotechnology.rain

Like our page at facebook.com/nanotechnology.rain

Stackable credentials for the MNT workforce:

- are being facilitated by the NACK Support Center and the MNT community.
- are performance-based assessment tests.
- are industry endorsed.
- are to be administered and awarded by ASTM International.
LASER OPTICS AND PHOTONICS EDUCATION
HARNESSING THE POWER OF LIGHT

CURRICULUM AND TEACHING MATERIALS
Program Planning Guides
Course Textbooks for Students
Teaching Resources for Instructors
Math and Science Student Tutorials
Laboratory and Career Videos

EQUIPMENT KITS AND GUIDELINES
Lab Equipment Kits
Guidelines for Laboratory Design and Safety
High School Laser and Optics Exploration Activities

FACULTY PROFESSIONAL DEVELOPMENT
New Faculty Training in Lasers and Optics
Faculty Professional Development
STEM Teacher Workshops

MONOGRAPHS OF BEST PRACTICES
Student Recruitment Guides and Materials
Student Retention Guide
Job Search and Placement of Graduates Guide

PHOTONICS TECHNICIAN EDUCATION CENTERS
Supported by National Science Foundation Advanced Technological Education Program

3209 Virginia Avenue Fort Pierce, FL 34981
772-462-7179 www.laser-tec.org
Support Center for Microsystems Education

SCME is here to Support you!

Visit scme-support.org to learn more about:

MEMS Certifications
Educational Materials
Hands-on Kits
Online Instructor training
Online Student courses
Cleanroom Workshops
Industry Maps

Participate in our latest set of free online short courses:

MEMS Foundations
The course topics include:
sensors, transducers, actuators,
scale, statistical process control,
problem solving, career pathways
for microtechnology,
& more!

BioMEMS
The course topics include:
BioMEMS & Biomolecular Applications, BioMEMS Therapeutics & Diagnostics, Clinical Lab Techniques, MEMS for Environmental & Bioterrorism, DNA
HISPANIC-SERVING INSTITUTION ATE HUB

GUIDING HSI TWO-YEAR COLLEGE STEM FACULTY TOWARD SUCCESS WITH NSF ATE GRANT FUNDING IN ADVANCED TECHNOLOGICAL EDUCATION

To learn more, visit: https://ate.is/hsiatehub.

HSI ATE HUB

Two-Year College Hispanic-Serving Institutions: Growing and Diversifying America’s Technological Workforce

- Targeted support for two-year HSIs
- Access to HSI-specific resources for strengthening technician related STEM education
- Mentoring and technical assistance for developing competitive NSF ATE grant proposals
- Growing HSI STEM faculty leaders

Questions, contact Elaine Craft at elaine.craft@fdtc.edu or Caroline Van Ingen-Dunn at cvaninge@asu.edu

Funded by the National Science Foundation (NSF) Advanced Technological Education (ATE) Program DUE#1800678 and #1929329.
PATHWAYS TO FUNDING SUCCESS IN ATE

Mentor-Connect guides POTENTIAL GRANTEES through the proposal and funding process

Visit the exciting new Mentor-Connect Website
www.mentor-connect.org

Get a Mentor

Mentoring and technical assistance is available for STEM faculty seeking ATE grants.

Mentor-Connect assists those who are:

* New-to-ATE
* Moving Up to a larger project
* Re-doing/re-submitting a declined proposal

Be a Mentor

Mentors guide potential grantees to ATE funding success.

The Mentor Fellows program prepares experienced ATE grantees to become Mentors.

* Participate with a Mentor-Connect cohort
* Complete Mentor-Connect activities
* Shadow and learn from an experienced Mentor

Seek Technical Assistance

Grant-writing lessons, mentoring, and technical assistance are available for those seeking to become grantees and ATE leaders.

* Mentor-Connect workshops and webinars
* Mentor-Connect online technical assistance and resources
* Mentor-Connect leadership lessons and opportunities

Benefit from and contribute to the ATE program through Mentor-Connect

This material is based on work supported by the National Science Foundation under grant numbers, DUE#1501183 and #1840856. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.
Tuesday, July 23

7:00 A.M.–6:00 P.M.
Registration (Grand Registration Desk, 4th floor)

7:30–8:30
Continental Breakfast (for morning workshop attendees; Grand Ballroom D)

8:30–Noon
PRECONFERENCE WORKSHOPS
New IT/Security Virtual Lab and Internet of Things Showcase (Grand Ballroom A)
Passing the FAA Part 107 Drone Pilot Certification Exam for the Education and Technical Community (Mills 3)
Additive Manufacturing: Providing Participants with Hands-on Experience Building Classroom Trainers (Grand Ballroom G)

8:30–4:30
SPECIAL INTEREST GROUP
Micro Nano Technology Education Special Interest Group (MNTeSIG) 2019 (Park View)

Noon–1:00
Lunch on Your Own

1:00–5:00
PRECONFERENCE TOURS (All tours board on 4th St by elevators. Box lunch is provided.)
Boeing Company – James S. McDonnell Prologue Room and Boeing Manufacturing Facility (1:00–5:00; bus loads at noon)
Cortex Innovation Community (1:00–3:30; bus loads at 12:30)

Refreshment Break
10:00–10:30
Grand Foyer (4th fl)

(must be registered to attend preconference events)
**Preconference Workshops • 8:30–Noon**

**Grand Ballroom A**

**New IT/Security Virtual Lab and Internet of Things Showcase**

This workshop will feature free virtual labs and best practices supported by the National Convergence Technology Center. Attendees will test-drive IT/cyber-security labs and learn how to implement them in their classrooms. The workshop will include a presentation on MSCE-aligned NetLab labs created as part of the InnovateX grant, as well as hands-on practice labs in Microsoft server and security. The workshop will also demonstrate how to set up a home automation microcontroller environment using off-the-shelf and open source products. *Participants must bring their own laptops.*

**Ann Beheler**, National Convergence Technology Center, Frisco, TX; **Ernie Friend**, Florida State College, Jacksonville, FL; **Timothy Pintello**, Daytona State College, Daytona Beach, FL; **Bill Saichek**, Orange Coast College, Costa Mesa, CA

**Mills 3**

**Passing the FAA Part 107 Drone Pilot Certification Exam for the Education and Technical Community**

As applications of unmanned aerial systems increase, so does the need for people who are certified to operate drones. The FAA issued a memo in 2016; Part 107 (released later) is easier and less restrictive to operate under than Section 333. Thus, the technical community and educators will benefit from a Part 107 remote pilot certification. This workshop will detail the federal regulations and how to be successful in taking the examination. The presenter will also provide instruction on key technical aspects and how to begin a career in the drone community.

**Richard Schultz**, National GeoTech Center of Excellence, Arlington Heights, IL

**Grand Ballroom G**

**Additive Manufacturing: Providing Participants with Hands-on Experience Building Classroom Trainers**

The advanced manufacturing program at Moraine Valley Community College enables students to gain up-to-date expertise in additive manufacturing. Device upgrades provide students with deeper understanding of additive manufacturing processes and result in machines that are more reliable and are capable of higher-quality product development. This workshop will include live demonstrations of retrofitting and prototyping low-cost additive manufacturing systems. Participants will be able to replicate the workshop for their students and business communities. *Participants must bring their own laptops.*

**Chuck Bales**, Kristine Christensen, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL

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**Special Interest Group • 8:30–4:30**

**Park View**

**Micro Nano Technology Education Special Interest Group (MNTeSIG) 2019**

The 2019 Micro Nano Technology Education Special Interest Group (MNTeSIG) will build on the success of the 2018 HI-TEC MNT SIG and NACK CIBP Forum as well as ongoing virtual MNTeSIG meetings (www.mntesig.net). This full-day gathering will support MNT workforce improvement by building and fostering micro and nano technology communities across the country. Participants will collaborate in sharing ideas to strengthen and augment workforce development programs through educational partnerships for tomorrow’s micro and nano technology workforce.

**Barbara Lopez, Matt Pleil**, Support Center for Microsystems Education (SCME), Albuquerque, NM; **Michael Lesiecki**, Bob Ehrmann, NACK Support Center, University Park, PA; **The MNTeSIG Community**
Preconference Tours

(All tours will board at 4th St near hotel elevators. Box lunch is provided.)

Boeing Company – James S. McDonnell Prologue Room and Boeing Manufacturing Facility

1:00–5:00

Bus loads at 12:00.

More than a century of the history of the world’s largest aerospace company will be revealed through models, paintings, photos, and dioramas depicting game-changing airplanes and spacecraft, many of which were built in St. Louis. Guests will see full-size Mercury and Gemini spacecraft, a drone ScanEagle, and large-scale models of some of today’s manned and unmanned military aircraft including the Eagle, Hornet, Apache, and Air Force One, as well as varying scale models of rockets, missiles, and commercial jetliners. Attendees will also tour the St. Louis Boeing Manufacturing Facility. The tour will conclude with a stop at St. Louis Community College, where representatives will present on their educational program at Boeing. All attendees on the Boeing tour must be U.S. citizens. A valid state-issued driver’s license or valid U.S. passport must be presented upon arrival at Boeing.

Cortex Innovation Community

1:00–3:30

Bus loads at 12:30.

Attendees will tour CIC – St. Louis (an innovative space for co-working, labs, and private offices), BioGenerator Accelerator Labs (a shared lab space for bioscience companies run by a nonprofit investment organization), the Cortex Commons (a publicly accessible park), and Innovation Hall (a nonprofit event space whose Civic Lounge is dedicated to offering a free drop-in workspace for the community). A 200-acre innovation hub in midtown St. Louis, CIC comprises 390 companies that provide 5,700 jobs. CIC is managed by Cortex, mid-America’s premiere community of bioscience and technology research. Founded by BJC HealthCare, the Missouri Botanical Garden, Saint Louis University, University of Missouri-St. Louis, and Washington University in St. Louis, Cortex catalyzes economic development in the region through the support of entrepreneurship and business acceleration.
Preparing Technicians for the FUTURE OF WORK

A National Science Foundation project enabling the ATE Community to collaborate regionally with industry partners, within and across disciplines, on the transformation of associate degree programs to prepare US technicians for the Future of Work.

Visit our website.
www.preparingtechnicians.org

Subscribe to our podcast series.
JOIN US

Join Achieving the Dream’s growing network of more than 277 community colleges committed to helping students, particularly low-income and students of color, achieve their goals for academic success, personal growth, and economic opportunity. Benefit from the collective learning of the national ATD Network and build key institutional capacities. Address crucial challenges that confront your commitment to better serve students and increase student outcomes. Achieving the Dream has a suite of supports and resources tailored just for you.

WE'RE HERE at HI-TEC!

☑ Attend the Wednesday, 11:15 a.m. concurrent session: Building Capacity for Institutional Transformation with Achieving the Dream and ATE in Grand Ballroom C. Or meet us at the Advanced Technological Education-ATD Special Interest Group of our Network colleges (by invitation).
AC2 Bio-Link Regional Center at Austin Community College focuses on educational solutions that support growth in area biotechnology industries.

PRECONFERENCE: MISSOURI BIOTECH DAY
MONDAY, JULY 22
DANFORTH CENTER AUDITORIUM
Tour the Danforth Center, discover how 2-year programs meet emerging industry trends, and hear about the research performed by college and high school students.

Learn about emerging algae technologies, open educational resources, the undergraduate research experience, immuno-biotechnology, bioinformatics, and more at the main Hi-TEC conference.

MINNESOTA STATE
Advanced Manufacturing Center of Excellence
ATE Regional Center
OUR impact is real!

RECRUITING & EDUCATING MANUFACTURING TALENT

CHANGING PERCEPTIONS
Of youth, parents & teachers through Dream It. Do It. Minnesota resources and events.

DIGITAL BADGE PATHWAY
Allows students to earn digital badges while they learn about manufacturing.

HOSTING TOURS
To showcase modern manufacturing to students and the public through the Statewide Tour of Manufacturing.

UPSKILLING THE MFG WORKFORCE
To train non-traditional students through the 360 eTECH Online & Hands-on Manufacturing Education program

FILLING THE PIPELINE
By starting students on a manufacturing career pathway through the 360 eTECH high school dual credit model.

ENHANCING CURRICULUM
Through the infusion of competency-based education into all existing and new coursework.

AC2 BIOC-LINK REGIONAL CENTER
DUE # 1501207

AC2 Bio-Link Regional Center at Austin Community College focuses on educational solutions that support growth in area biotechnology industries.

PRECONFERENCE: MISSOURI BIOTECH DAY
MONDAY, JULY 22
DANFORTH CENTER AUDITORIUM
Tour the Danforth Center, discover how 2-year programs meet emerging industry trends, and hear about the research performed by college and high school students.

Learn about emerging algae technologies, open educational resources, the undergraduate research experience, immuno-biotechnology, bioinformatics, and more at the main Hi-TEC conference.

MINNESOTA STATE
Advanced Manufacturing Center of Excellence
ATE Regional Center
OUR impact is real!

RECRUITING & EDUCATING MANUFACTURING TALENT

CHANGING PERCEPTIONS
Of youth, parents & teachers through Dream It. Do It. Minnesota resources and events.

DIGITAL BADGE PATHWAY
Allows students to earn digital badges while they learn about manufacturing.

HOSTING TOURS
To showcase modern manufacturing to students and the public through the Statewide Tour of Manufacturing.

UPSKILLING THE MFG WORKFORCE
To train non-traditional students through the 360 eTECH Online & Hands-on Manufacturing Education program

FILLING THE PIPELINE
By starting students on a manufacturing career pathway through the 360 eTECH high school dual credit model.

ENHANCING CURRICULUM
Through the infusion of competency-based education into all existing and new coursework.

mnmfg.org

A member of Minnesota State, Bemidji State University is an affirmative action, equal opportunity educator and employer. The Minnesota State Advanced Manufacturing Center of Excellence | ATE Regional Center is supported by an NSF ATE Program Grant, award number 1600927. Any opinions, findings, and conclusions or recommendations expressed are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. An affirmative action, equal opportunity employer and educator.
Regional Center for Nuclear Education & Training (RCNET)

Mission
The Regional Center for Nuclear Education & Training (RCNET) was established to make sure the demand for skilled nuclear technicians is met in a standardized and systematic way.

41 Thousand Opportunities by 2030

www.gonuke.org

NEATEC is leading the way in developing model programs for serving the workforce development needs of nanotechnology and nanoelectronics businesses in the Northeast.

In partnership with local education institutions and businesses, NEATEC provides community-college and secondary-school students with extraordinary hands-on opportunities to engage in cutting-edge education and training through cooperative learning, internships and outreach programs—efforts that will have a direct and immediate impact on the readiness and capabilities of the nanotechnology workforce in New York and Western New England.

www.neatec.org

Partner-based Experiential Learning
Outreach, Awareness, Recruitment
Attracting students to STEM careers
Integrating More Deaf and Hard-of-Hearing Individuals into the Workplace in STEM Technician Careers

- Online Resources and Curricular Materials
- High School, Community College, and Employer Partnerships in California, Florida, Illinois, and Texas
- Teacher and Employer Professional Development
- National Dual Credit Program in STEM
- Student Veterans with Hearing Loss Project
**JULY 24**

**WEDNESDAY**

**7:00 A.M.–5:00 P.M.**

Registration (Grand Registration Desk, 4th floor)

**7:45–8:30**
Continental Breakfast (Grand Ballroom DE)

**8:30–9:45**
Opening and Keynote Presentation (Grand Ballroom DE)

**9:45–10:15**
Refreshment Break / View Exhibits (Regency ABC, 2nd floor)

**9:45–6:00**
Exhibit Hall Open (Regency ABC, 2nd floor)

**10:15–11:00 • Concurrent Sessions**
Statewide Approach to Workforce Demand (Grand Ballroom A)
Immuno-biotechnology and Bioinformatics (Grand Ballroom B)
Business Engagement: Regional BILT (Grand Ballroom C)
Teaching Student Veterans (Grand Ballroom F)
Detecting Stolen Identity (Grand Ballroom G)
Educational Raman Spectrometer Demo (Grand Ballroom H)
Balancing Technology in 1-to-1 Career-Tech School (Mills 3)
Digital Curricula and Textbook for Nanotechnology (Mills 6)
NSF: How to Develop a Coordination Network (CN) (Park View) (continued at 11:15)

**11:15–Noon • Concurrent Sessions**
Emerging Pathways: Curricula for Robotics (Grand Ballroom A)
Emerging Algae Technologies / ATEC (Grand Ballroom B)
Building Capacity for Inst Transformation (Grand Ballroom C)
Using Developmental Evaluation (Grand Ballroom F)
What Can I Do with a Drone? (Grand Ballroom G)
Leveraging Compression Planning (Grand Ballroom H)
Two-Tier Vacuum Technology Learning System (Mills 3)
New Activities for Cybersecurity Programs (Mills 6)
How to Develop a Coordination Network (CN) (Park View) (continued from 10:15)

**Noon–1:00**
Awards Luncheon (Grand Ballroom DE)

**1:15–2:00 • Concurrent Sessions**
Prove Your Worth: Two-Year Degrees (Grand Ballroom A)
Integrating MEMS / BioMEMS into STEM (Grand Ballroom B)
Energy Security, Multidisciplinary Workforce (Grand Ballroom C)
AWS Academy (Grand Ballroom F)
Virtual Realty in the Classroom (Grand Ballroom G)
Using Research to Increase STEM Success (Grand Ballroom H)
Active Learning Recitation Hours in Engineering (Mills 3)
Enhancing Biotech and Adv Mfg Programs (Mills 6)
Adapting Emerging TechEd to URMs (Park View)

**2:15–3:00 • Concurrent Sessions**
An Out-of-This-World Collaboration (Grand Ballroom A)
Updating National IT Skill Standards (Grand Ballroom B)
Free Tools for Cybersecurity (Grand Ballroom C)
Apprenticeship-Based Pathways for STEM (Grand Ballroom F)
Tools for Nanotechnology Education (Grand Ballroom G)
Using Solidworks to Visualize MEMS (Grand Ballroom H)
Student Engagement Through ALS (Mills 3)
Laser Apps in Science, Entertainment, Military, Info (Mills 6)
Outreach Tips and Tricks for the ATE Community (Park View)

**3:00–3:45**
Refreshment Break / View Exhibits (Regency ABC)

**3:00–5:30**
View Poster Sessions (Regency Foyer)

**3:45–4:30 • Concurrent Sessions**
Looking to the Future: ATE Down on the Farm (Grand Ballroom A)
NBC2 Curriculum Modules: Bioprocessing (Grand Ballroom B)
Community College Cyber Pilot Program (Grand Ballroom C)
Growing Employability Skills in High-Tech (Grand Ballroom F)
Matrix: Rubric for Measuring Partnerships (Grand Ballroom G)
Zero to Sixty in Two Seconds: Electric Vehicle (Grand Ballroom H)
AMTEC: Combating Skilled Labor Shortages (Mills 3)
Teaching the Internet of Things (IoT) (Mills 6)
NSF ATE Mentor-Connect (Park View)

**4:30–5:30**
Exhibit Hall Reception (Regency ABC)
View Exhibits (Regency ABC) / View Posters (Regency Foyer)
Opening Session and Keynote Presentation

Grand Ballroom DE • 8:30–9:45

The National Anthem will be sung by Dawn Levinson, St. Louis Community College.
Welcome: Jeff L. Pittman, Ph.D., Chancellor, St. Louis Community College

Todd McLees
Founder, Pendio Group and Rethink Ecosystem Hub

Opportunities for Growth in a Time of Extraordinary Change

Todd will offer insights on three key areas related to the speed of innovation. He will discuss the current and future rate of change in technological innovation; its impact on Work of the Future and how educators can prepare students for the changing jobs in the new economy; and the need for new levels of collaboration to meet the needs related to reskilling, upskilling, and “newskilling” the workforce of today and tomorrow.

Refreshment Break / View Exhibits
Regency ABC • 9:45–10:15

Get Social on Twitter and Instagram!

*Wednesday and Thursday (Regency Foyer, 2nd floor)*

Hit up your Instagram and Twitter accounts and post the best of the best of YOU (and others) at HI-TEC. Use the hashtag #highimpact2019 to be eligible for prizes!

A winner will be selected in each of the following categories and will receive a $50 Amazon gift card at the Thursday keynote.

- Group photo prize
- Best conference content and description prize
- Live Instagram/Twitter leaderboard prize (who posts the most QUALITY content)

There will also be a social media scavenger hunt throughout HI-TEC. All hints and prizes will be on Instagram and Twitter.

#highimpact2019 Photo Booth

Join the fun! Take selfies in our super social, interactive photo booth with a high-tech twist. The high-fidelity ring light will capture photos with HI-TEC digital backgrounds you’ll love to share! You’ll receive your shots directly to your phone for easy sharing on Facebook, Twitter, and Instagram. Don’t forget to hashtag #highimpact2019 to be entered into contests and win prizes.
Concurrent Sessions • 10:15–11:00

**Grand Ballroom A**

**Building a Statewide Systems Approach to Meeting Industry Workforce Demand**

It takes a village to meet the demands of industry. Yet colleges work independently as pockets of innovation trying to address growing workforce deficiencies. Learn about a different, collaborative approach that Arizona has used. Community colleges in the area had successfully implemented innovative workforce programs. However, the partners recognized that a collaborative effort was needed to meet demand. Join a panel of college leads and state government representatives as they share the steps taken to produce a uniform statewide program. The lessons learned can change the workforce training and education landscape.

Leah Palmer, Mesa Community College, Mesa AZ; Greg Wilson, Pima Community College, Tucson, AZ; Paula Livingston, Estrella Mountain Community College, Avondale, AZ; Julie Leonard, Central Arizona Community College, Coolidge, AZ

**Grand Ballroom B**

**Immuno-biotechnology and Bioinformatics in Community Colleges**

The use of new technologies such as immune-profiling (where large numbers of immune receptors are sequenced en masse) and targeted cancer therapies (where researchers create, engineer, and grow modified T cells to attack tumors) is leading to job growth and a demand for new skills and knowledge in biomanufacturing, quality systems, immuno-bioinformatics, and cancer biology. In response to this new demand, Shoreline Community College (Shoreline, WA) has begun developing an immuno-biotechnology certificate. Part of this certificate includes a five-week course (30-hour hands-on computer lab) on immuno-bioinformatics.

Sandra Porter, Todd Smith, Digital World Biology LLC, Seattle, WA

**Grand Ballroom C**

**Maximizing Business Engagement to Support Your Students: Why a Regional BILT Makes Sense**

The National CTC’s model for actively engaging employers in steering curriculum development and guiding faculty and students keeps programs current with evolving IT technology. This approach ensures that students learn the skills they need to be “workforce ready.” The National CTC is expanding this approach by mentoring seven “regional BILTs” (business and industry leadership team) across the country. Attendees will learn how they can use the National CTC’s BILT model in their own regions to ensure active engagement from employers. This session will provide strategies for using the model, which can work with any technical discipline.

Moderator: Ann Beheler, National Convergence Technology Center (CTC), Frisco, TX.

Panelists: Matt Glover, Le-Vel Brands, LLC, Dallas, TX; Kim Yohannan, Cybersecurity Academy, Santa Clara, CA; Aaron Burciaga, Analytics2Go, Sarasota, FL; Glenn Wintrich, North Central Texas InterLink, Irving, TX; Tu Huynh, Comerica Bank, Dallas, TX

**Grand Ballroom F**

**Best Practices for Teaching Student Veterans**

Military veterans bring experiences that can be valuable assets to classrooms, along with others that can be barriers to success. Hearing loss, a commonly overlooked disability in the veteran population, is often one of these barriers and can have a significant impact on learning. This presentation will share results from student veteran focus groups and surveys that provide insight into the unique educational needs of these students. Attendees will learn about the student veteran's Top Ten List of ways to make classrooms more welcoming and accessible and simple Universal Design practices that benefit student veterans as well as all students in the classroom.

Donna Lange, Hira Paulin, DeafTEC, Rochester, NY; Mike Sauter, Terence Nelson, DeafTEC, Mission Viejo, CA
10:15–11:00 Concurrent Sessions (continued)

**Grand Ballroom G**

**Detecting Stolen Identity Using Advanced Threat Analytics: Delivering Identity to the Cloud**

This presentation will address the challenges of defending and detecting modern cyberattacks such as spear phishing and ransomware. Malware has evolved beyond signature-based antivirus solutions, and network attacks have moved to application and identity levels. This presentation will explore the use of advanced threat analytics to detect abnormal user behavior. Participants will walk through useful techniques and tools.

*Israel Emmanuel*, Century College, White Bear Lake, MN

**Grand Ballroom H**

**Educational Raman Spectrometer Demo by Central Carolina Community College (CCCC); LASER-TEC**

Visible and near-infrared spectroscopy is fast growing in areas such as forestry, medical, agriculture, defense, homeland security, and food safety. Raman spectroscopy applications growth has resulted in increased demand for technical talent. This session will demo an educational Raman spectrometer developed by Wasatch Photonics. CCCC has incorporated the spectrometer in its laser and photonics technology program. Session participants will learn the fundamentals, applications, and job growth of Raman spectroscopy, and witness a demonstration of a Raman spectrometer.

*Gary Beasley*, LASER-TEC, Lillington, NC;  
*Chrys Panayiotou*, LASER-TEC, Fort Pierce, FL

**Mills 6**

**Digital Curricula and Textbook for Online and Hybrid Nanotechnology Courses**

Omni Nano developed the only digital curriculum and e-textbook package for instructing both high school and college nanotechnology courses. Our curricula are aligned with ASTM international standards for nanotechnology workforce education, which aim to prepare future engineers and technicians for employment in high-demand fields such as aerospace, energy, and healthcare. For maximal flexibility, our curricula are modular and support a wide range of learning environments including in-class, online/virtual, blended/hybrid, and flipped classroom models. Compatibility with popular learning management systems like Canvas and Schoology make the adoption and use of our high-quality, NGSS-aligned educational materials simple and straightforward.

*Marco Curreli*, Omni Nano, Los Angeles, CA

**Park View**

**How to Develop a Coordination Network (CN) Concept in Preparation for Submitting a Proposal**

(Continued at 11:15) A CN supports the development of new collaborations to build on existing networks to advance science and technician education through communication and sharing of ideas. The compelling argument for a CN is unique, and the standard project and center proposal claims are neither applicable nor successful for CN proposals. This highly interactive session will provide the foundation for a concept paper on a proposed CN. Topics will include the definition of a CN, how to build on current activities and networks, how to determine the core team for the CN, types of membership structures, and evaluation outcomes for a CN.

*Mel Cossette*, National Resource Center for Materials Technology Education (MatEdU), Lynnwood, WA;  
*V. Celeste Carter*, National Science Foundation (NSF), Arlington, VA;  
*Terryll Bailey*, The Allison Group, Seattle, WA

**Mills 3**

**Balancing Technology in the 1-to-1 Career-Tech School**

What is the appropriate balance between technology and face-to-face and pen-and-paper instruction in the 21st century? What do research, best practices, and experts tell us about the changing face of learning? The presenter has eleven years of CTE experience in a 1-to-1 district using LMS such as Schoology and Blackboard.

*Ryan Gilbert*, Ohio Hi-Point, Bellefontaine, OH
Concurrent Sessions • 11:15–Noon

**Grand Ballroom A**

**Emerging Pathways: Multi-track Experiential Curricula for Robotics in Advanced Manufacturing**

Skills needed in today’s labor market are more diverse and changing more rapidly than ever before. Technology is more integrated, connected, and automated, requiring a nimble workforce. To maximize their opportunities in a time of pervasive technological change, workers must engage in lifelong learning. Recognizing these changes, CUCWD and its partners are developing four-track online curriculum pathways from high school to master’s degree levels with concentrations in robotics for advanced manufacturing applications. The courses will align with industry demand and incorporate experiential labs and virtual and physical work and learning experiences that extend from apprenticeships to capstone projects.

Rebecca Hartley, Eddie Bennett, Center for Aviation and Automotive Technology Education Using E-Schools (CA2VES), Clemson, SC

**Grand Ballroom B**

**Interested in Learning About Emerging Algae Technologies? ATEC Can Help**

The Algae Foundation launched the Algae Technology Educational Consortium (ATEC) project, recognizing that algal production will provide a sustainable source of biomass for bio-based products, feed, fuel, and foods, creating high-quality jobs for an educated workforce. Through algal education, students learn practical applications of farming and biotechnology, developing the skills for the next generation of algal-based jobs. The consortium’s goal is to develop novel educational programs to strengthen industry workforce capabilities by focusing on the skills needed to support the commercialization of algal products. Learn how this technology intersects with ATE technologies and how you can get involved.

Linnea Fletcher, AC2 Bio-Link Regional ATE Center, Austin, TX; Ira Levine, Algae Foundation and Southern Maine University, Lewiston, ME; Stephen Gomez, Santa Fe Community College, Santa Fe, NM; Matt Carr, Principal, Green Capitol, LLC, Washington, DC

**Grand Ballroom C**

**Building Capacity for Institutional Transformation with Achieving the Dream and ATE**

Representatives of Achieving the Dream, ATE Central, and Indian River State College will discuss capacity strategies, coaching, and learning initiative opportunities that come from joint participation in ATD and ATE and the potential for synergies between the two national networks. Participants will come away with examples that will help them better understand institutional transformation through the use of networks and will have completed a visioning exercise about their own institutions.

Ryan Kelsey, Meredith Hatch, Achieving the Dream, Silver Spring, MD; Kevin Cooper, Regional Center for Nuclear Education & Training (RCNET), Fort Pierce State College, Fort Pierce, FL; Rachael Bower, ATE Central, Madison, WI

**Grand Ballroom F**

**Using Developmental Evaluation to Improve Learning and Continuous Improvement**

Del Mar College secured NSF funding to launch its Unmanned Autonomous Systems Education Consortium (UASTEC). The consortium used employer and community partner engagement to build curriculum and program credentials to meet the UAS technician workforce needs in South Texas. To track lessons learned, ensure systematic program implementation evaluation, and leverage results for continuous improvement, UASTEC employed a developmental evaluation approach. This session will examine strategies and activities required to connect developmental evaluation to program and curriculum development and sustainability efforts.

Phillip Davis, John Nelson, Del Mar College, Corpus Christi, TX; John Cosgrove, Maggie Cosgrove, Cosgrove and Associates, LLC, St. Louis, MO
11:15–Noon Concurrent Sessions (continued)

**Grand Ballroom G**

**What Can I Do with a Drone?**

This session will explore the uses of unmanned aerial vehicles (UAV) and the types of sensors that can be attached to these aircraft. Vehicle types, sizes, and uses will be explained for both multi-rotator and fixed-winged. Attached sensors of different wavelengths including visible light, near infrared, thermal infrared, and LiDAR will be discussed to show how they are used for analysis. Physical parameters such as aperture, shutter speed, and resolution will be introduced as well as mission planning.

*Vince DiNoto, Richard Schultz*, GeoTech, Louisville, KY

**Grand Ballroom H**

**Leveraging Compression Planning as a Tool for Proposal Development and Conducting a Job Skills Analysis**

Columbus State integrates compression planning, a collaborative storyboarding process, in concept development, proposal planning, and implementation of grant projects. This tool has helped investigators from multiple disciplines secure funding for eleven NSF ATE projects in the last five years. This session will provide an overview of the compression planning process and demonstrate how this tool has been used in the Logistics Engineering Technology grant projects to conduct a modified DACUM and develop project proposals.

*Shane Kirby, Scott Wegeng*, Columbus State Community College, Columbus, OH; *Bob Sompolski*, Oakton Community College, Des Plaines, IL

**Mills 3**

**Two-Tier Vacuum Technology Learning System for Semiconductor and Nanotech Manufacturing Tech Training**

This session will consist of (1) an overview of the vacuum technology skills required of technicians in the nanotech and semiconductor industries and the resultant design of a two-tier vacuum technology learning system suitable for community colleges and technical high schools as well as for incumbent worker training; (2) an overview (including live demo) of the assembled vacuum trainers and the vacuum technology content and lab activities involved in using our trainers, and (3) a review of the implementation of this system with community college and high school students and incumbent technicians.

*Robert Geer, Abe Michelen, Robert Decker, Stephen Stewart*, Northeast Advanced Technological Education Center (NEATEC), Albany, NY

**Mills 6**

**New Activities for Cybersecurity Programs**

This session will provide information on how to receive a series of new labs and activities to upgrade your existing cybersecurity programs. Over the last 20 years, the cybersecurity industry has matured, resulting in over 52 job roles. Many of these job roles are associated with cybersecurity governance, risk management, and compliance. These materials, jointly developed by CSSIA and CWW and funded by NSF, will enable your program to prepare students for these new job roles. Learn how to download and implement the materials.

*John Sands*, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL; *Corrinne Sande*, CyberWatch West (CWW), Bellingham, WA

**Park View**

**How to Develop a Coordination Network (CN) Concept in Preparation for Submitting a Proposal**

*Continued from 10:15* A CN supports the development of new collaborations to build on existing networks to advance science and technician education through communication and sharing of ideas. The compelling argument for a CN is unique, and the standard project and center proposal claims are neither applicable nor successful for CN proposals. This session will provide the foundation for a concept paper on a proposed CN. Topics will include the definition of a CN, how to build on current activities and networks, how to determine the core team, membership structures, and evaluation.

*Mel Cossette*, National Resources Center for Materials Technology Education (MatEd), Lynnwood, WA; *V. Celeste Carter*, NSF, Arlington, VA; *Terryll Bailey*, The Allison Group, Seattle, WA
Educator of the Year Award

Recipient: John Nelson, Del Mar College, Corpus Christi, Texas

John Nelson has been a member of Del Mar College’s Geographic Information Systems (GIS) program since 1999. He began as a student and has since served as program technician, adjunct faculty, and now full-time associate professor. Between 2008 and 2013 John served as CoPI and GIS SME for the GeoTech Center. During that time, he developed several GIS training modules and provided workshops to students, K–12 teachers, and professionals. John served as GIS SME for the National Information, Security, and Geospatial Technologies Consortium (NISGTC) Center from 2011 to 2014, during which time he participated in producing five new GIS courses using an innovative accelerated eight-week format. The goal of preparing GIS-ready technicians in as little as six months was achieved, and numerous technicians graduated and are now employed. Many of John’s modules now serve as OER resources on the U.S. Department of Labor website. John pioneered the innovative use of continuing education-to-academic-credit workflow, which enables unemployed/underemployed adult learners to accelerate their technology training through intense eight week-long cohorts. Once employed, adult learners are able to convert the CE courses into credit-bearing academic transcript entries and achieve academic degrees at a later date. Since 2016 John has served as CoPI, SME, and instructor for the NSF-funded Unmanned Autonomous Systems Technology Education Consortium (UASTEC) project. He authored two new UAS courses and coauthored a third UAS course with Dr. Michael Starek (TAMUCC). These courses are now used to educate UAS technicians throughout South Texas.

Industry Recognition Award

Recipient: Scot McLemore, Honda North America, Inc., Marysville, Ohio

Scot McLemore has been a tireless advocate of developing early-college pathways and experiential learning programs to promote advanced manufacturing education throughout Ohio. Scot is setting the standard for collaboration between community colleges and K–12 districts in meeting the need for industrial maintenance technicians. Scot was instrumental in the development of Columbus State Community College’s Modern Manufacturing Work Study program. This five-semester program culminates in an AAS in electro-mechanical engineering technology and includes a year-long paid co-op during students’ second year of coursework. Honda’s support, partnership, and forward-looking approach have led to the placement of more than 100 students at over thirty Central Ohio employers. Students graduate from the program with full-time job offers from industry partners and little to no debt. Scot has also ensured the development of a strong manufacturing technician career pathway through the creation of career exploration programs for middle schools, the development of CTE programs at high schools and career centers, the adoption of the Modern Manufacturing Work Study programs across the state, and tuition reimbursement for bachelor’s degree attainment. Scot’s unwavering passion for advanced technician education can be seen in his participation in efforts such as Project Lead the Way, the STEM Industry Council, Men of Color in STEM, and the EPIC Initiative.
Along with CSCC’s President David Harrison, Scot testified before the Joint Economics Committee of the US House of Representatives on innovative strategies for addressing workforce development. Scot is also responsible for Honda’s national workforce strategy for technician roles.

Innovative Program Award

Recipient: Business and Industry Leadership Team (BILT)
Pictured (L to R): Glenn Wintrich, Chairman Emeritus of the BILT; Ann Beheler, PI for CTC and Creator of the BILT Model; Matthew Glover, Current Chairman of the BILT

The Business and Industry Leadership Team (BILT) model—developed and disseminated by the National Convergence Technology Center (CTC) at Collin College in Frisco, Texas—turns the idea of an “advisory council” on its head. The BILT model invites business and industry leaders to take active and engaged roles in co-leading programs so that students learn the skills the job market actually demands. This includes a formal process in which BILT members annually vote on the job skills entry-level workers will need over the coming two years. Ann Beheler is the primary architect of the BILT model. The BILT approach has its roots in familiar processes like the DACUM, but Ann has refined the process and made it her mission to disseminate it far and wide. Since the National CTC was first funded in 2012, Ann and her staff at the CTC have developed toolkits and worksheets, recorded webinars, made presentations, appeared on panels, and hosted role-playing workshops. Looking just at the 31 conferences in fifteen states plus Washington, DC, where the BILT model has been delivered, 1284 people have heard about this approach. If you include attendees of workshops and webinars, the number jumps to over 2500 nonduplicated faculty, administrators, and businesspeople who have been taught why the BILT model works and how programs can transform their advisory committees into BILTs. Many groups have adopted the BILT model as a result of Ann’s intervention. The BILT model has become something of a requirement for ATE grants. NSF program officers have more than once steered to Ann a grant applicant lacking a business engagement plan. It’s a concept that is transforming programs nationwide.

HI-TEC recognizes outstanding educators and industry members who make a significant contribution to the training and education of today’s technology workforce.

The Educator-of-the-Year Award recognizes community college faculty who have had a demonstrated broader impact on technology education on both a local and national level.

The Industry Recognition Award recognizes an industry colleague who has made significant contributions to the education and training of today’s technology workforce.

The Innovative Program Award recognizes a team of advanced technology education professionals that has designed and implemented a significant innovation, which has led to a positive impact on student enrollment, retention, and/or advanced technological education.
Concurrent Sessions • 1:15–2:00

**Grand Ballroom A**

**Prove Your Worth: Demonstrating the Value of Two-Year Degrees to Employers**

This session will explore two of Columbus State’s innovate employer partnership models. In partnership with Honda, the college developed an earn-and-learn program that has been changing the conversation around two-year technical degrees in the Central Ohio region. The program allows manufacturing technology students to work three days a week in mentored, technical roles during the second year of an associate degree. The college has also developed an onsite delivery program with Amazon that encourages the upskilling of incumbent workers through career and technical programs.

*John Sherwood, Michell Ward, Columbus State Community College, Columbus, OH*

**Grand Ballroom B**

**Integrating MEMS and BioMEMS Materials into STEM Curricula**

The presenters will discuss how to integrate MEMS and BioMEMS materials into STEM curricula. The Support Center for Microsystems Education has two sets of free online courses available with the opportunity to obtain certification through the Association of Technology, Management, and Applied Engineering (ATMAE) after completing each set of courses.

*Barbara Lopez, Matt Pleil, Support Center for Microsystems Education (SCME), Albuquerque, NM; Rock Travis, Capital Region BOCES, Schenectady, NY*

**Grand Ballroom C**

**Energy Security Needs a Multidisciplinary Workforce**

The U.S. Departments of Homeland Security and Energy are emphasizing what ATE Centers and industry have recognized: The energy sector is uniquely critical because it provides an enabling function across all essential infrastructure sectors, and resilient energy delivery systems require a multidisciplinary workforce that understands both cyber and physical security. Representatives of ATE Centers in cybersecurity and energy education, along with the world’s largest utility company, will discuss and answer questions on how they’re training a 21st-century workforce that is knowledgeable in cyber and physical security across all functions from design and installation to operation and maintenance.

*Kevin Cooper, Regional Center for Nuclear Education and Training (RCNET), Fort Pierce, FL; John Sands, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL; James Auld, NextEra Energy Resource, Juno Beach, FL; Benjamin Reid; Impact Allies, Inc., Ennis, TX*

**Grand Ballroom F**

**AWS Academy: Quick Launch Cloud Computing Program**

As cloud technologies continue to help organizations transform their businesses at a rapid pace, people with the necessary cloud skills are in high demand. This gap in skills creates an opportunity for educational institutions to create courses and programs in cloud computing. This session will provide information on how the AWS Academy is working to solve this problem. AWS Academy enables diverse education institutions to deliver curriculum and hands-on learning experiences to prepare students for employment in cloud roles.

*Ernie Friend, Florida State College, Jacksonville, FL; Angel Duncan, Amazon, Jacksonville, FL*
1:15–2:00 Concurrent Sessions (continued)

Grand Ballroom G
Cost-Effective Augmented and Virtual Reality in the Classroom: Hands-On with Mobile Devices
Augmented and virtual reality (AVR) helps people learn faster, decide better, and remember longer. However, using this exciting new technology in the classroom has been challenging due to the need for expensive hardware and the cost to create content. ATEEC will present two cost-effective methods that bring AVR to the classroom using mobile devices, and will share content developed for an NSF grant to help students and trainees in the water/wastewater areas. Attendees will experience AVR educational and training modules using mobile devices provided.

Linda Baxley, Josh Webb, Advanced Technology Environmental Education Center (ATEEC), Davenport, IA

Grand Ballroom H
Utilization of Undergraduate Research to Increase Success in STEM Students
Undergraduate research was utilized at Pasadena City College as a method of recruitment and retention of STEM students. The program emphasizes support for students from underrepresented communities. A description of the program will be provided and a student panel will share their undergraduate research experiences.

Jared Ashcroft, Paula Kirya, Zekaria Beshir, Tracee Maxell, Kellie Eugenio, Pasadena City College, Pasadena, CA

Mills 3
Active Learning Recitation Hours in Engineering: Improving Self-Efficacy, Retention, and Success
The presenters will share Year-2 student success results from their NSF-funded work in adding near-peer-led recitation hours in engineering courses at Valencia. Participants will see examples of active learning exercises for engineering coursework and will participate in active learning exercises.

Lisa Macon, Mohua Kar, Valencia College, Orlando, FL

Mills 6
Enhancing Biotech and Advanced Manufacturing Programs by Infusing Cutting-Edge Laser and Optics Curricula
Attend this session to learn how to infuse the latest laser technologies and concepts into your STEM curriculum. The presenters will provide an overview of laser applications in biotech and advanced manufacturing, from detecting and diagnosing disease to fabricating, cutting, welding, drilling, and micro machining. Technicians of all stripes are using lasers and therefore require an understanding of how they work. Participants will be given access to LASER-TEC’s educational materials. The session will include a hands-on demonstration of the Light and Optics Exploration kit and will provide an opportunity to discuss methods for integrating these new technologies into existing programs.

Chrys Panayiotou, LASER-TEC, Fort Pierce, FL; Gary Beasley, LASER-TEC, Lillington, NC

Park View
Adapting Emerging Technology Education to the Needs of Underrepresented Minorities
Reaching out to underrepresented minorities (URM) and developing partnerships with agencies or programs with a URM focus require educators to address the cultural relevance of their curriculum and course materials. Experiences gained through partnering with the Spanish speaking community and the Arizona SciTECH Foundation will highlight the importance and potential of engaging URMs in emerging technology education by addressing language and culture in our design of materials and curriculum. Access to the materials created by Nano-Link as well as templates for customizing curriculum for URMs will be provided and explained.

Billie Copley, Nano-Link Center for Nanotechnology Education (Nano-Link), Rosemount, MN; Kim Grady, BehaveHeuristics, LLC, Apache Junction, AZ
Grand Ballroom A

An Out-of-This-World Collaboration: NASA, the International Space Station, DMACC, and LSCBI

The National Community College Aerospace Scholars (NCAS) program provides educational experiences at NASA centers for community college students majoring in STEM disciplines. In 2016, NASA requested proposals from NCAS students describing potential International Space Station (ISS) experiments. Lyndsay Baker, a DMACC student, proposed to investigate microgravity effects on astaxanthin production by the microalga *Haematococcus pluvialis*. NASA expanded this collaboration when they extended an invitation for the Lone Star College Biotechnology Institute (LSCBI) to participate in “Algae Mission Control” duties. This unique undergraduate research project has generated high-level student engagement at community colleges in Texas and Iowa.

Daniel Kainer, Lone Star College, Conroe, TX; Alicia Baturoni Cortez, NASA Community College Aerospace Scholars Manager, Houston, TX; Lyndsay Baker, Des Moines Area Community College, Des Moines, IA; John Lauber, Boeing, Houston, TX

Grand Ballroom B

How You Can Get Involved in Helping to Update National IT Industry Skill Standards

The “IT Skill Standards 2020 and Beyond” NSF project will create a set of employer-led, future-facing, and verified IT skill standards for 8–10 high-demand job clusters. Educators will use skill standards to create relevant curriculum to prepare students to meet employers’ job requirements. Hundreds of employers and community college educators from across the nation will identify essential skills in top IT job clusters. Learn more about this important project, including how faculty and employers can get involved and stay updated on its progress.

Ann Beheler, National Convergence Technology Center (CTC), Frisco, TX; Teryll Bailey, The Allison Group, Seattle, WA; Pete Maritato, Suffolk County Community College, Selden, NY

Grand Ballroom C

Free Tools for Recruiting, Training, and Retaining the Next Generation of Cybersecurity Professionals

According to (ISC)², 1.8 million cybersecurity jobs will be available by 2022. Filling this gap would require hiring 63 qualified cybersecurity professionals every hour between 2019 and 2022. But how do organizations adequately find and train the next generation of cybersecurity professionals? CISA’s cybersecurity outreach efforts and free resources can help you recruit, educate, and retain qualified professionals. Join this discussion on how CISA is focusing on workforce diversity and best practices for serving underrepresented groups such as women, persons with disabilities, persons of color, and veterans.

Nancy Limauro, Department of Homeland Security, Cybersecurity and Infrastructure Security Agency, Washington, DC

Grand Ballroom F

Apprenticeship-Based Pathways Engage and Equip Underserved Populations for STEM Occupations

According to a 2014 American College Testing report, underserved populations—veterans, women, first-generation college students, people with disabilities, and students of color—have the same level of interest in STEM careers as non-underserved populations yet consistently show lower readiness rates. To increase students’ technical readiness for technician-level STEM careers and credential attainment, educators and employers are turning to apprenticeships. Apprenticeship programs for technician careers provide students with valuable hands-on workplace experience, related technical instruction that can lead to educational and industry credential attainment, and guided mentoring.

Barbara Murray, TransPORTs, Morgan City, LA; Guy St. John, Oceaneering International, Chesapeake, VA; Cynthia Walker, CTE Apprenticeship Director, Eldon, MO; Lauren Slegerman, Chicago Women in Trades, Chicago, IL
2:15–3:00 Concurrent Sessions (continued)

**Grand Ballroom G**

**Web-Based Visualization and Simulation Tools for Nanotechnology Education**

The presenters will discuss web-based visualization and free online simulation tools that can enhance students’ understanding of abstract nanoscience concepts without requiring expensive equipment. These tools include 21 remote access instruments in nanotechnology (RAIN) nodes for accessing visualization instruments. In addition, over 500 simulation tools are available through nanoHUB.

Ahmed S. Khan, Fulbright Specialist Scholar (2017–2020), World Learning, Washington, DC; Salahuddin Qazi, SUNY Polytechnic Institute, Utica, NY

**Grand Ballroom H**

**Using Solidworks to Visualize MEMS Design Concepts**

This presentation will focus on the use of Solidworks in the design and visualization of micro electromechanical systems (MEMS) devices. Attendees will learn about a Solidworks model of the SCME pressure sensor that is derived from the mask used in the construction of the devices. 3D printable unit cell models of the BCC, FCC, and HCC crystalline structures will also be presented with the models made available. These models can be 3D printed and contain additional support between atoms.

Andrew Bell, Ivy Tech Community College, Fort Wayne, IN

**Mills 3**

**Student Engagement Through Active Learning**

Have you heard about active learning? Do you want to know more about strategies that encourage student participation in your classroom? Attend this session to examine the flipped classroom, project-based learning, and other strategies for engaging students. The presenters will provide examples used in their classrooms, show how they were developed, and share successes. Attendees will leave with tips and free resources for implementation of active learning strategies.

Jim Sullivan, Rachael Tipton, Skilled Workers Get Jobs, Asheville, NC

**Mills 6**

**Laser Applications in the Fields of Science, Entertainment, Military, and Information**

This session will focus on current and emerging laser applications in multiple fields. Attendees will explore the use of lasers for fusion at the National Ignition Facility at Lawrence Livermore National Laboratory and for space communications at the National Institute of Information and Communications Technology. Topics will include laser light shows and laser movie magic, JDAMs (joint direct attack munitions) and EXACTO (accuracy tasked ordinance), how fiber optics communications work, and how to store a world of knowledge in a 1 cm cube using optical data storage.

Frank Reed, Midwest Photonics Education Center (MPEC), Ottumwa, IA

**Park View**

**Get the Word Out: Outreach Tips and Tricks from the ATE Community**

Join a group of ATE community experts and learn about tools, resources, pathways, and strategies that will help you share your work, connect with new audiences, and broaden your outreach and impact. Whether you’re a seasoned expert or considering applying for an ATE grant, this session will help you discover new ways to plan for outreach. Panelists from ATE projects and centers that offer resources and support for educators and staff will lead roundtable discussions and share resources and tools for managing, disseminating, and getting the word out about resources and activities. Participants will select three roundtables to join to learn about newsletters, publications, teaching technicians.org, Twitter, Facebook, videos, webinars, outreach planning, and more.

Rachael Bower, ATE Central, Madison, WI; Marilyn Barger, Florida Advanced Technological Education Center (FLATE), Tampa, FL; Mary Slowinski, Working Partners Project, Bellevue, WA; Michael Lesiecki, Luka Partners, Phoenix, AZ; Rick Roberts, South Carolina Advanced Technological Education Center (SC ATE); Florence, SC; Emma Perk, EvaluATE, Kalamazoo, MI
Better the Planet Through Building Energy Efficiency
Learn about how Valencia College has developed Florida’s first Energy Management and Controls Technology AS degree, which prepares students to become highly trained technicians operating and maintaining technologically complex, “high performance” buildings. Degree, lab, and industry partnership development; K–12, female, and veteran student community outreach; and Valencia student learning experiences in our building automation system controls lab and in student industry internships will be covered. With a focus on emerging energy research and innovations related to commercial building energy efficiency training, expect to take home a variety of ideas to implement in your community and learning institution.

Deb Hall, Valencia College, Orlando, FL

Convergence Technology Students Present New Perspectives and Share Projects
Student representatives from schools in the CTC’s nationwide Convergence College Network (CCN) community of practice will provide an overview of recent research, learning projects, and career opportunities in the information communications technology space.

Ean Towne, Collin College, Frisco, TX; Amberly Hoffman, Sinclair Community College, Dayton, OH

Bioscience Technician Expansion Project Year One
The Bioscience Technician Expansion Grant’s design will assist North Central Ohio’s workforce in filling a void in the biotechnology field. This area is seeing an increased demand in technician-level jobs. The grant allows students to be enrolled in evening classes while beginning their employment in the field. The grant has three main components: (1) alteration of course materials to facilitate a “one night for one class” teaching model, (2) a close relationship with our community partners in business and education to assist in identifying prospective adult students, and (3) a look toward the future and sustainability that involves targeting career center and high school student populations. The hybrid course materials, when completed, will be available to other institutions.

Justin Tickhill, Jason Tucker, North Central State College, Mansfield, OH

Results of the Bioscience Industry Fellowship Program – NSF ATE Grant #1304010
The National Center for the Biotechnology Workforce (NCBW) of Forsyth Tech has to date had approximately 55 fellows—community college or HS instructors and several veterans, representing multiple states—come to Winston-Salem, NC, to do a three-week or one-month program. Fellows participated in boot camps at three community colleges with hands-on lab experiences and shadowed workers in multiple departments at a dozen industrial/university hosting facilities with the aim and purpose of visiting many of our key NC bioscience assets and demystifying the bioscience industry. This session reports on our data and conclusions over a six-year period.

Russ Read, Forsyth Tech, Winston-Salem, NC

Creating Technical Scholars (CTS)
Eastern Shore Community College’s Creating Technical Scholars Project brings together local high-tech employers, school districts, and four-year institutions to create flexible career pathways beginning in high school and potentially culminating in a bachelor of applied science degree, with an emphasis on recruiting and retaining underrepresented populations.

Chevelle Mason, Eastern Shore Community College, Melfa, VA
Poster Sessions • 3:00–5:30 (continued)

**BETA Skills: Skills for Biomedical Emerging Technology Applications**

The project (NSF ATE DUE #1800909) represents advanced technological education pertaining to “convergent technology platforms” supporting product research, development, and/or manufacturing at the interface between biomedical devices and tissue engineering. Objectives are to (1) define BETA core skills for national use by educators, researchers, and employers; and (2) connect BETA competencies to the emergence of technician-specialists with a new, higher-level set of specialized core skills. The project is national in scope and involves multiple sites across the country. This session will present an update.

Russ Read, Forsyth Tech, Winston-Salem, NC

**Using Historical Sanborn Maps in GIST**

Discovering the history of cities and towns by using Sanborn Fire Insurance Maps will be visualized. This poster will show historical maps and describe features on the maps (such as building materials and water sources) and how they can be used in urban planning. The process of creating vector surfaces and shapes using open-source geospatial software will be explored.

Vince DiNoto, National Geospatial Technology Center of Excellence, Jefferson Community and Technical College, Louisville, KY

**Assessing Educational Pathways for Manufacturing in NW Florida: Study Progress to Date**

Building on prior research on career pathways in information technologies (IT), this NSF ATE targeted research project investigates the alignment of curriculum, employer needs, and new employee experience in advanced manufacturing (AM) and tests the usefulness of tools and processes developed to assess that alignment in rural institutions. In this session, the presenters will share research results to date, directions for future work, and implications.

Marcia A. Mardis, Florida State University, Tallahassee, FL; David Bouvin, Chipola College, Marianna, FL

**Pathways to “and through” a Vacuum Technician Curriculum**

Vacuum technicians fill the critical role of maintaining complex equipment used in the semiconductor, solar, and defense industries. Normandale provides one of the few vacuum technology education programs in the United States. Pathways to the program have broadened through partnerships with industry and academic institutions. A telepresence delivery model provides a pathway for students and incumbent workers around the country to take classes in real time while practicing hands-on with a Vacuum Equipment Trainer system. The initial Foundations class includes a concept inventory that helps students chart a pathway through the vacuum technology curriculum for rapid entry into the workplace.

Nancy Louwagie, Normandale Community College, Bloomington, MN

**Documenting the Prevalence of Antibiotic Resistance in the Environment**

*Engaging Students from Classrooms and Camps to College and Advanced Technological Careers* is an NSF-funded project designed to increase the STEM interest and skills attainment of underrepresented and socioeconomically disadvantaged high school students. The focus is on engaging middle and high school STEM teachers and their students using innovative activities to introduce students to careers as technicians. One of the innovative activities is the Prevalence of Antibiotic Resistance in the Environment (PARE) project, where community college students worked with regional high school students. The high school students collected soil samples, and the college students served as their laboratory technicians. They processed the samples and photographed the results. The data was analyzed by the high school students and then submitted to Tuft University’s national database.

Ashley Johnson, Amanda Gregg, Northwestern Connecticut Community College, Winsted, CT
Deepen Learning, Maximize Investment, AND Stimulate the Local Economy? A Study of CXO Models and Business Incubators

Contractual relationships between colleges and industry utilize campus facilities and student workers to conduct industry-provided projects. AC2, an NSF ATE regional center, recently surveyed the national biotech education community to better understand how CXO models—CSOs, CROs, and CMOs (contract service, research, and manufacturing organizations) and business incubators—are being implemented and how they can be replicated. Visit our session to learn more about these partnerships.

Carole Twichell, AC2, Collin College, Plano, TX; Abbe Kesterson, Bluegrass Community and Technical College, Lexington, KY; Bridgette Kirkpatrick, Collin College, Plano, TX

Working Partners Research Project: How Do YOU Initiate and Maintain Industry Partnerships?

The Working Partners Research Project collects and examines data on industry partnerships across the NSF ATE community. While investigating the most frequent challenges, implementations, and impacts associated with the eight partnership models commonly used by this group, it became evident that a need existed for information and tools to support the initiation and management of these partnerships. Join us for this poster session to learn more about the suggestions we’ve collected for starting and sustaining these relationships and add your tips and best practices to our collection.

Mary Slowinski, Bellevue College, Bellevue, WA; Rachael Bower, ATE Central, Madison, WI

Incorporating Microscopy and Genomics Into the Histotechnician Curriculum

The Merritt College Histotechnician Program pioneered a new approach to infusing cutting-edge technology into the established curriculum of a regulated field. Integrated curriculum pathways allowed students to receive hands-on training not only in the required histotechnology techniques, but also in the two main growth areas in the field: fluorescence microscopy and genomics. The confluence of two established programs, the Merritt Microscopy Program and the Merritt Genomics Program, with the Merritt Histotechnician Program provided a valuable opportunity to prepare multifaceted, cross-trained technicians who are qualified for a variety of career pathways in the rapidly evolving fields of biomedical research, biotech, and clinical diagnostics. The presenter will share examples of imaging projects that underscore the value of integrating related disciplines.

Candy Mintz, Bio-Link Next Generation National ATE Center for Biotechnology and Life Sciences, Merritt College, Oakland, CA
Providing High School Students with Professional and Technical Skills for Careers in STEM

Industry seeks employees who have not only technology skills but also the professional skills that will make them reliable leaders. The Engineering Technology Challenge (ETC) ATE Project teaches high school students professional skills that put them ahead when they enter college. ETC focuses on the recruitment of underrepresented populations in STEM disciplines and the continuous review and modification of curriculum.

Mehrdad Faezi, Engineering Technology Challenge, Manchester Community College, Manchester, CT; Karen Wosczyna-Birch, Regional Center for Next Generation Manufacturing (RCNGM), Farmington, CT; John Birch, Engineering Technology Challenge, Farmington, CT; Eric Flynn, Gateway Community College, New Haven, CT

Student-Developed Educational Kits for Teaching Advanced DNA Sequencing Concepts

The Support Center for Microsystems Education (SCME) produces educational materials on micro electrical and mechanical systems (MEMS). A collaboration between SCME and Lone Star College (LSC) has focused on BioMEMS and their life science applications. Modern DNA sequencing platforms exemplify the rapidly evolving BioMEMS technology sector. LSC Biotechnology faculty and students are developing an educational kit that simulates first-, second-, and third-generation sequencing technologies. LSC faculty are beta testing curriculum and student research opportunities centered on the Nanopore DNA sequencing platform.

Daniel Kainer, Paola Olivo, SCME/Lone Star College, Conroe, TX

Examining Diffusion of Innovation Through an ATE Project Case Study

As a part of the Robotics Awake ATE project, the evaluation team, working with the project team, is conducting a case study to examine the role that community colleges can play in accelerating the adoption of new technologies (specifically, collaborative robotics).

Evelyn Brown, Robotics Awake (with Wake Technical Community College in Raleigh, NC), NC State University, Industry Expansion Solutions, Raleigh, NC. Coauthors: John Dorris, Industry Expansion Solutions, NC State University, Raleigh, NC; Michael E. Moore, Wake Technical Community College, Cary, NC

Promoting Active-Learning Strategies in Two-Year, Hispanic-Serving Institutions Through Collaborative Professional Development for STEM Faculty and Graduate Students

Active-learning strategies foster increased student success in undergraduate STEM. Propagation of these strategies benefits from sound faculty professional development. In this project, science faculty members from two-year Hispanic-serving institutions (2Y-HSI) and graduate students from a research university participated in joint professional development activities and collaborated in designing, implementing, and assessing elements of active learning in science courses offered at the 2Y-HSIs. This professional development program commenced with a three-day workshop on course transformation via backward design and subsequent establishment of a community of practice.

David R. Brown, Foundation for California Community Colleges, Sacramento, CA; Stacey Brydges, Department of Chemistry and Biochemistry, and Mathematics and Science Education, University of California, San Diego, La Jolla, CA; Stanley M. Lo, Department of Cell and Developmental Biology, and Mathematics and Science Education, University of California, San Diego, La Jolla, CA; Maya E. Denton, Department of Mechanical Engineering, University of Texas at Austin, Austin, TX; Nicole A. Suarez, Song Wang, Joint Program in Mathematics and Science Education, San Diego State University, San Diego, CA, and University of California, San Diego, La Jolla, CA; Maura J. Borrego, Department of Mechanical Engineering and Center for Engineering Education, University of Texas at Austin, Austin, TX
Looking to the Future: What’s ATE Doing Down on the Farm?

Like all business and industry sectors, agriculture is changing rapidly. From the integration of drones and autonomous vehicles to advances in plant and agricultural sciences and advanced automated processing, production, and testing, farms are implementing 21st-century technologies in all phases of food production. Representatives of ATE projects will share the state of agriculture and ag education in a lively panel discussion. You will be excited and surprised to learn what ATE is doing “down on the farm.”

Marilyn Barger, Florida Advanced Technological Education Center (FLATE), Tampa, FL; Amanda Sizemore, St. Charles Community College, St. Charles, MO; Joel Sikkema, Dordt College, Sioux Center, IA; Doug Laven, South Central College, Mankato, MN

NBC2 Curriculum Modules: Open Educational Resources for Current Technologies in Bioprocessing

The Northeast Biomanufacturing Center and Collaborative (NBC2) is committed to developing curriculum and professional development for the education and training of technicians for the biopharmaceutical industry. A series of three-day workshops on current and emerging areas of biomanufacturing provided faculty with the hands-on experience, knowledge, and teaching materials to incorporate the topic into existing courses and programs. These workshops have resulted in seven all-inclusive curriculum modules, available as open educational resources and downloadable from the NBC2 website (biomanufacturing.org). Several modules will be showcased and implementation strategies discussed.

Maggie Bryans, Bill Woodruff, Northeast Biomanufacturing Center and Collaborative (NBC2), Blue Bell, PA

Community College Cyber Pilot Program

This session will provide an overview and first-year results from the institutions participating in the Community College Cyber Pilot (C3P) program, created to prepare students for employment with federal agencies in cybersecurity. Learn about the student benefits, curriculum pathways, and job opportunities available to participants in this program. For the first time, this pilot program enables community colleges to receive direct funding from the National Science Foundation to participate in the CyberCorps scholarship for service program. Panelists will share their curriculum pathways, student activities, and program experiences.

Michael Qaissaunee, John Sands, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL; Kyle Jones, Sinclair Community College, Dayton, OH; Corrine Sande, CyberWatch West (CWW), Bellingham, WA; Kim Muschalek, San Antonio College, San Antonio, TX

Growing Employability Skills in High-Tech Fields

Through a two-year case study and review of research, SRI Education has compiled a collection of practices that high-tech educators can use to develop employability skills such as collaboration, communication, lifelong learning, and reliability. In this session, you will learn about new instructional approaches and deepen your understanding of the role that technical educators play in developing these skills. You will hear cases of how the development of employability skills risks getting sidetracked or stalled through lack of support or persistent life stress. You will review and discuss systematic approaches to developing employability skills from secondary school through adulthood. The goal of this session is to empower high-tech educators to take an intentional approach to helping students acquire employability skills.

Louise Yarnall, SRI Education, Menlo Park, CA; Ann Beheler, National Convergence Technology Center (CTC), Frisco, TX
3:45–4:30 Concurrent Sessions (continued)

**Grand Ballroom G**

**Enter the Matrix: Building a Rubric for Measuring Industry Partnerships and Their Impacts**

Partnerships are key to the success of programs, projects, and centers, yet measuring the impact of partnerships can be challenging. Recognizing that few tools exist to capture relevant data, the NSF ATE Working Partners Research Project and The Rucks Group are jointly developing a partnership rubric for measuring these connections. This session will introduce the rubric and show how to stay involved as the matrix evolves.


**Mills 6**

**Teaching the Internet of Things (IoT): Where Does It Fit?**

This session will discuss the Internet-based application that many believe will be the next significant technology revolution—the Internet of Things (IoT). Applications of IoT combined with machine learning and/or artificial intelligence (AI) have the potential to impact almost every aspect of human endeavor. Because IoT is interdisciplinary, it will necessitate changes in how we educate two-year college students in electronics/computer/networking programs, as well as what should be taught in non-electronics-based technology programs.

**Gary Mullett**, Springfield Technical Community College, Springfield, MA

**Grand Ballroom H**

**Zero to Sixty in Two Seconds: Electric Vehicle Design, Fabrication, and Testing**

Electric vehicles are expanding into the marketplace as never before. The presenter will show how battery and motor technologies are used in alternative energy and electronics engineering technology programs. Facility and tool requirements for both fabrication and testing laboratories will be addressed. Attendees will learn about outcomes such as an electric drag bike capable of accelerating to 60 MPH in just over two seconds.

**Thomas Henderson**, Tulsa Community College, Tulsa, OK

**Mills 3**

**AMTEC: Proven Solutions for Combating Skilled Labor Shortages**

Learn how AMTEC, the Advanced Manufacturing Technical Education Collaboration, can help you produce maintenance technicians who can predict, prevent, troubleshoot, and problem-solve in real time. AMTEC’s employer-driven, multi-state collaboration of 70+ industry and educational partners provides a nationally recognized training solution that reduces cost and improves efficiency and productivity. This session will provide examples of industry-education partnerships that produce workers who can analyze issues, solve difficult or complex problems, and manage output.

**Jason Simon**, Sheri Plain, Advanced Manufacturing Technical Education Collaborative (AMTEC), Owensboro, KY

**Park View**

**NSF ATE Grant Funding: Opportunities Abound, and Mentor-Connect Provides Proposal Development Help**

The NSF-funded Mentor-Connect project is a proven strategy for helping you prepare competitive proposals whether you are seeking a small grant for an institution that is new to ATE, reworking a first or second proposal, or wanting to move up to a larger project proposal. Participants will learn from NSF’s lead ATE Program Officer about available funding and, from Mentor-Connect, will learn about free mentoring and technical assistance. To date, 90 percent of the 143 participating colleges have submitted proposals. The funding rate for proposals from Mentor-Connect colleges is 70 percent.

**Elaine Craft**, SC ATE, Florence, SC; **V. Celeste Carter**, National Science Foundation, Arlington, VA

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Exhibit Hall Reception • 4:30–5:30 Regency ABC
7:30–1:00
Registration (Grand Registration Desk, 4th floor)

7:30–8:15
Continental Breakfast / View Exhibits (Regency ABC)

7:30–Noon
Exhibit Hall Open (Regency ABC)

8:15–9:00 • Concurrent Sessions
- Creating Effective Prof Dev Activities (Grand Ballroom A)
- Inclusion Promotes Innovation (Grand Ballroom B)
- Necessary Skills Now Network (Grand Ballroom C)
- Transitioning Veterans to Engineering (Grand Ballroom F)
- Classroom in the Cloud (Grand Ballroom G)
- Medical Device Networking, Cybersecurity (Grand Ballroom H)
- The Circle of the Center (Mills 6)
- Remote Delivery Using Zoom (Park View)

9:15–10:00 • Concurrent Sessions
- Palo Alto Networks Cybersecurity Academy (Grand Ballroom A)
- Technician Education at Two-Year HSIs (Grand Ballroom B)
- A Leap to the Future: Advanced Mfg (Grand Ballroom C)
- Collaboration Delivers Certification (Grand Ballroom F)
- DevSecOps = DevOps + Secure Coding (Grand Ballroom G)
- Reaching the Most Students with Skills Info (Grand Ballroom H)
- Promoting Broader Impacts in NSF ATE thru ARIS (Mills 3)
- K-12 Teacher Engagement (Park View)

11:30–12:15 • Concurrent Sessions
- Coordination Networks (Grand Ballroom B)
- Cybersecurity Curriculum Development (Grand Ballroom C)
- PathTech LIFE and LISTEN (Grand Ballroom F)
- Increase Your Social Media Presence (Grand Ballroom G)
- Enhancing Workforce Education in Arizona (Grand Ballroom H)
- Aligning Employers and Classrooms (Mills 3)
- Selling Your Ideas (Park View)

12:30–1:30
Keynote Luncheon (Grand Ballroom DE)

1:45–2:30 • Concurrent Sessions
- Working Technicians Tell Their Stories (Grand Ballroom A)
- Building a Technology Education Pipeline (Grand Ballroom B)
- AI in Smart Robots, Drones, and IoT Devices (Grand Ballroom C)
- Classroom-Ready Interactive Content (Grand Ballroom F)
- Teaching IoT with the Raspberry Pi (Grand Ballroom G)
- Implementing a Backward Design Process (Grand Ballroom H)
- Promoting Minority Women in Engineering (Park View)

2:30–2:45
Refreshment Break (Grand Foyer)

2:45–3:30 • Concurrent Sessions
- Soft Skills in Kindergarten (Grand Ballroom B)
- Undergraduate Research at Del Mar College (Grand Ballroom C)
- Career Pathways for Cybersecurity (Grand Ballroom F)
- Providing Industry Consulting Experience (Grand Ballroom G)
- Ed Technologies for Student Success (Grand Ballroom H)
- Short Modules Targeting Job Growth and Demand (Park View)
Grand Ballroom A

Creating Effective Professional Development Activities

Learn successful strategies for creating professional development activities. Consider these questions: Who is your audience? What is the purpose of the activity? How do you inform and recruit participants? What do participants need to know? How do you engage participants? How do you know if the activity was effective?

Greg Kepner, Frank Reed, Midwest Photonics Education Center (MPEC), Ottumwa, IA; Chrys Panayiotou, LASER-TEC, Fort Pierce, FL; Anca Sala, Baker College, Flint, MI

Grand Ballroom B

Inclusion Promotes Innovation: Infusing Accessibility into Next Generation Learning Environments

We know from experience and neuroscience that individuals learn in varied ways. Universal Design for Learning (UDL) provides educators with practical strategies and techniques to ensure that all learners can meet high expectations. In this session, the presenters will explore the foundational concepts of UDL as one component of an inclusive learning environment—the other two being the universal design of the physical space and the accessibility of the learning tools and materials. The discussion will include demonstrations of a number of new tools for making STEM content accessible for a variety of learners.

Luis Perez, National Center on Accessible Educational Materials, St. Petersburg, FL; Rachael Bower, AccessATE, Madison, WI

Grand Ballroom C

The Necessary Skills Now Network: Enhancing Employability Skills Across Disciplines

The Necessary Skills Now Network is dedicated to facilitating collaboration between educators and employers to improve the employability skills of entry-level technicians in STEM fields. Learn more about this ATE Coordination Network and how you can participate and benefit. We’ll share no-cost instructional resources and professional development activities as well as employer perspectives on employability skill deficiencies. Learn about the network’s collaborative strategies for tackling these challenges.

Hope Cotner, Center for Occupational Research and Development (CORD), Waco, TX; Marilyn Barger, Florida Advanced Technological Education Center (FLATE), Tampa, FL; Ann Beheler, National Convergence Technology Center (CTC), Frisco, TX

Grand Ballroom F

Transitioning Veterans to Engineering-Related Careers

The American Society for Engineering Education (ASEE), with support from the National Science Foundation, held a Veterans Summit that resulted in a dozen recommendations on ways to smooth veterans’ transition from military service to careers in engineering and related fields. The role of community colleges emerged as an important potential pathway for enabling veterans to secure credentials as engineering technicians and advance to a bachelor’s-level education. This session will provide a forum for sharing information and engaging community colleges to form a network to offer the model AAS degree engineering technology program recommended at the summit.

Ashok Agrawal, American Society of Engineering Education, Washington, DC
8:15–9:00 Concurrent Sessions (continued)

Grand Ballroom G

Classroom in the Cloud Using Amazon AWS Cloud-Based Services and Virtual Machine (VM) Environment

Suffolk Community College, in collaboration with CDW and Amazon AWS, implements a scalable, cloud hosted, virtual environment where students have 24/7 access to a multiplatform architecture that enables them to design, configure, deploy, install, and run multiple copies or instances of the same or different operating systems and application suites on a single network and virtual environment. The virtual environment is where students and faculty can implement and interconnect a network of virtual machines that is truly independent of the college’s IT network.

Pete Maritato, Steven Clark, Jonathan Sadowski, Suffolk County Community College, Selden, NY

Grand Ballroom H

Pathways into Medical Device Networking and Cybersecurity for Biomedical Engineering Technicians

Participants will receive teaching resources (e.g., questions, videos, and activities) related to medical device networking and cybersecurity, copies of two new course outlines, and documentation for a newly developed certificate in medical device networking and cybersecurity. As healthcare technology shifts, the education and credentialing of medical equipment repair technicians, also known as biomedical equipment technicians, must be evaluated based on updated input and feedback from industry professionals. This presentation will discuss feedback collected from industry on skills and competencies needed in medical device networking and cybersecurity. This feedback was used to develop two courses and a new certificate.

Brian Bell, Laura Malave, St. Petersburg College, Tarpon Springs, FL

Mills 3

The Circle of the Center: Outreach, Programs, and Research Can Strengthen Each Other

At the Center for Plant and Life Sciences Campus of St. Louis Community College, numerous efforts synergistically overlap. These intersections produce highly valuable interactions and experiences that promote the biotechnology industry and career opportunities in the St. Louis region. The center is truly synergistic, with the contract research, outreach, and STLCC programs tightly intertwined. The presenters will share the unique combination of in-depth STEM outreach efforts and high school independent research opportunities onsite at their facility.

Elizabeth Boedeker, Lee Douangkeomany, St. Louis Community College Center for Plant and Life Sciences, St. Louis, MO

Park View

Remote Delivery of Hands-on Networking Courses Using Zoom

North Arkansas College is increasing opportunities for students in rural areas by using Zoom technology and other tools to provide synchronous access to IT/networking classes being taught on the main campus. Additional supports at the remote site include lab assistants, dedicated equipment, and virtual labs. The presenters will share the details of the technology, equipment, costs, what is working, what needs improvement, and future plans for expansion.

Rick Williams, Laura Berry, North Arkansas College, Harrison, AR
Concurrent Sessions • 9:15–10:00

Grand Ballroom A

Development of the Cybersecurity Workforce: The Palo Alto Networks Cybersecurity Academy

Focusing on the unprecedented demand for trained and certified personnel in cybersecurity, this session will provide attendees with information about, and the benefits of, becoming a Palo Alto Networks Cybersecurity Academy. The program provides technology and curriculum (aligned to the U.S. National Initiative for Cybersecurity Education, or NICE, framework and work roles) at no cost to any degree-granting institution of higher education. Come learn about the academy from an industry and faculty perspective.

J.B. Groves III, Wharton County Junior College, Richmond, TX; Kim Yohannan, Palo Alto Networks, Cybersecurity Academy, Cape Cod, MA

Grand Ballroom B

Strategies for Advancing Technician Education at Two-Year College Hispanic Serving Institutions (HSI)

Already serving 56 percent of Latin(x) postsecondary students, and rapidly growing in number, two-year college HSIs can now access help in addressing the opportunities and challenges facing advanced technological education programs. The HSI ATE Hub collaborative has served 48 two-year college HSIs and is now prepared to provide specialized assistance for ATE grant proposal development and support for HSIs as the drivers of their communities’ economic success via technician education. Science-Foundation Arizona’s Kickstarter project and the ATE Program’s Mentor-Connect project, based at Florence-Darlington Technical College, are offering mentoring and curated resources designed to improve the success and increase the capacity of two-year college HSIs.

Elaine Craft, SC ATE, Florence, SC; Anita Grierson, SFAz Center for STEM at ASU, Scottsdale, AZ

Grand Ballroom C

A Leap to the Future: Creating Sustainable Advanced Manufacturing Technician Unified Pathways

NextFlex, in collaboration with Evergreen Valley College and multiple industry partners, has created a comprehensive advanced manufacturing talent framework that links students in middle school and high school with an industry-driven advanced manufacturing technician program composed of stackable certificates. The program supports a broad range of competencies in 21st-century advanced manufacturing.

Brynt Parmeter, Emily McGrath, NextFlex, Manufacturing USA, San Jose, CA

Grand Ballroom F

Collaboration Delivers Third-Party Certification for Entry-Level Electronics/Instrumentation Careers

This session will provide an overview of the joint efforts of Mississippi Gulf Coast Community College (MGCCC) and the Electronics Technicians Association International (ETA) to develop a technical skills assessment (TSA) for the college’s Systems Based Electronics/Instrumentation curriculum standards, which are mandated by the state of Mississippi. The intent is to lay a foundation of the skills (in a wide variety of electronics industries) needed by technical personnel to advance their career competency and efficiency. Interaction with companies demonstrating a demand for certified technical professionals and the elements of ETA credentials that make MGCCC graduates competitive in the marketplace will be discussed.

Michele Lawson, ETA International, Greencastle, IN; Joe Poelma, Aaron Cleveland, Mississippi Gulf Coast Community College, Gautier, MS
Grand Ballroom G

DevSecOps = DevOps + Secure Coding

DevOps is a software development methodology that combines development life cycle with IT operations. The idea is to develop faster and quicker updates using agile and lean approaches in the software development life cycle (SDLC). This process still does not solve the issue of software vulnerabilities. By integrating a security development mindset from the beginning of the SDLC, DevSecOps seeks to develop secure system design and reduce the risk of software vulnerabilities. How do we incorporate such tools in the classroom?

This presentation is based on best practices on how basic secure coding concepts and agile software development are included in the curriculum.

Rajiv Malkan, Bruce Caraway, Lone Star College, Conroe, TX

Grand Ballroom H

Reaching the Most Students with Skills Information

Creating materials that enable students to learn concepts is a time-consuming (but important) process. Concepts are the foundation of learning and can be used as an introduction to new material and a review of technical knowledge. The GeoTech Center model uses short video discussions, which are placed in an online video service and closed-captioned. While voice recognition software has improved, it still requires manual editing of the text to ensure accuracy. The topics of the GeoTech Center concept modules were selected based on a personal assessment instrument. This presentation will explore the methods used to construct and disseminate the information.

Ann Johnson, Vince DiNoto, National Geospatial Technology Center of Excellence (GeoTech), Louisville, KY

Mills 3

Integrated Efforts for Promoting Broader Impacts in the NSF ATE Community Through ARIS

The NSF Center for Advancing Research Impact in Society (ARIS) will advance the rigor, relevance, and practice of broader impacts (BI) by (a) cultivating and strengthening the existing and emerging BI expert community; (b) building the capacity of researchers and educators to enhance and articulate the BI of their work; and (c) creating a socio-technical infrastructure that is adaptable to stakeholder needs. ARIS will provide opportunities to integrate BI efforts into NSF ATE projects to increase public understanding and meet the demand for innovative BI training. The center emphasizes support for serving historically underserved populations while providing inclusive public engagement to ensure a diverse STEM workforce.

Thomas Tubon, Madison Area Technical College, Madison, WI

Park View

K-12 Teacher Engagement: Successful Outreach Approaches

One focus of NEATEC is to increase student interest in pursuing educational pathways leading to careers in nanotechnology. At the K-12 level, NEATEC tries to make connections with educators that will encourage them to introduce their students to this exciting field. In this session, the presenters will cover several types of outreach that have been successful, including activities that can take place at ATE centers or off-site at the home districts of the educators.

Mary Ann Nickloy, Kelly Fahrenkopf, Elaine Garrett, Northeast Advanced Technological Education Center (NEATEC), Albany, NY
Concurrent Sessions • 10:30–11:15

Grand Ballroom A

Addressing the Need for Manufacturing Technology Instructors

With an estimated need for 35,000 new skilled workers in Connecticut over the next two decades, there is a high demand not only for students but also for instructors in manufacturing technology programs. To address this growing need, a coalition of educators, employers, and industry associations came together to conduct a survey of retired manufacturing employees regarding their interest in becoming instructors. The survey resulted in recommendations that will be shared during this session along with the results of instructor recruitment and professional development for higher education initiatives that have been developed and implemented.

Karen Wosczyna-Birch, Wendy Robicheau, Regional Center for Next Generation Manufacturing (RCNGM), Farmington, CT; John Birch, Engineering Technology Challenge, Farmington, CT; Eric Flynn, Gateway Community College, New Haven, CT; Mehrdad Faezi, Manchester Community College, Manchester, CT

Grand Ballroom C

Industry Talks: The Future of Work and Its Impact on the Technician Workforce

This panel will engage community college, university, and high school educators and administrators in a discussion of the Future of Work at the Human Technology Interface. Panelists from multiple business sectors will present what new technologies their companies are implementing (or planning to implement) to address the impact of these changes on technician education.

Facilitator: Marilyn Barger, Florida Advanced Technological Education Center (FLATE), Tampa, FL. Panelists: Barbara Biller, President, Intellitech, St. Petersburg, FL; Scot McLemore, Talent Acquisition and Deployment, HR, Honda North America, Inc.

Grand Ballroom B

Prioritizing Diversity and Inclusion: Building a Bridge to STEM Education and Employment

Now in its tenth year, the Merritt College Bioscience program has established itself as a Bay Area leader in diversity and inclusion in STEM education and career training by creating a departmental culture that supports both men and women students from all races, ages, and stages in their education and careers. This interactive session will include lessons learned and practical tools that have brought us continued success in the areas of diversity and inclusion.

Feather Ives, Gisele Giorgi, Merritt College, Oakland, CA

Grand Ballroom F

Developing New Industry Standards Starting from Scratch

Northwest Engineering and Vehicle Technology Exchange (NEVTEX) (NSF ATE award #1700708) proposes to take a 140-year-old automotive industry with proven technology and technician standards and start all over again. The presenters propose the development of Advanced Vehicle Training Standards for technicians working with high-voltage and high-pressure systems. Topics will include the process of creating a template for vehicle electrification systems standards, categories for vehicle electrification systems, category sub-systems for vehicle electrification systems, and application and practical test lab examples. Many HI-TEC attendees are considering new technologies at their institutions. This is a great time to discuss the standards setting process for a new technology.

Ken Mays, Central Oregon Community College, Bend, OR; John Frala, Rio Hondo, Whittier, CA
10:30–11:15 Concurrent Sessions (continued)

Grand Ballroom G

Recruiting and Retaining Students: How Flexible Scheduling Meets Student Needs

Curious about innovative ways to help students complete coursework while maintaining their outside commitments? Discover the institutional and student benefits of flexible scheduling. A professor from BridgeValley Community and Technical College will discuss a pilot program at her college that is designed to recruit and retain students enrolled in technology majors who have time constraints that make attending college in the traditional fashion difficult. Learn how the program came to be, how flexible scheduling is laid out and can be recreated at any institution, and lessons learned while developing the program.

Christie Linger-Hunt, BridgeValley Community and Technical College, South Charleston, WV

Grand Ballroom H

The Role of National and International Frameworks in Building Effective Cybersecurity Programs

The cybersecurity industry has matured significantly over the last ten years. Several national and international frameworks are available for those building or updating their cybersecurity degrees and certificates. Over the last decade, organizations have established comprehensive frameworks for studying workforce and academic standards. The presenters will review each of these frameworks and discuss their purposes and applications. The session will also focus on how these frameworks should be used in developing structural materials, program outcomes, courses, and student credentials.

Chuck Bales, John Sands, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL

Park View

Evaluation: The Secret Sauce in Your ATE Proposal

Planning to submit a proposal to the ATE program? Then don’t miss this session! The presenters will cover the essential elements of an effective evaluation plan and show you how to integrate them into an ATE proposal. The session will also provide guidance on how to budget for an evaluation, locate a qualified evaluator, and use evaluative evidence to describe the results from prior NSF funding. To help integrate evaluation into their ATE proposals, participants will receive the Evaluation Planning Checklist for ATE Proposals and other resources.

Emma Perk, Lyssa Wilson Becho, EvaluATE, Kalamazoo, MI
Concurrent Sessions • 11:30–12:15

**Grand Ballroom B**

Coordination Networks: Perspectives and Practices for Workforce Development Through Public-Private Partnerships

This session will provide strategies for engaging community members, government agencies, academic leaders, and industry partners in cooperative efforts to build a talent pipeline from community to careers in STEM. Topics will include the development of an NSF-funded Coordination Network and the framework supporting a comprehensive approach to addressing gaps in workforce readiness for emerging technology sectors. Attendees will participate in a facilitated discussion to identify core principles that can be applied across STEM disciplines. Strategies presented will include increasing participation in underserved and underrepresented communities and engaging stakeholders by creating a value proposition.

Thomas Tubon, Madison Area Technical College, Madison, WI

**Grand Ballroom C**

Cybersecurity Curriculum Development: Integrating Hands-on Experience and Industry Certifications

This session will focus on Miami Dade College’s NSF ATE proposal titled Cybersecurity Opportunities and Methods that Promote Access to Student Success (COMPASS), which proposes to create an associate in science and a college credit certificate in cybersecurity. Topics will include mapping KUs (knowledge units) for CAE (Center for Academic Excellence) designation, mapping to industry certifications, input from industry, and the state framework already in place. As part of the program, an integration with the Cyber-Range training platform capabilities and tools allows trainees to experience and respond to cyberattacks in real-time.

Diego Tibaquira, Miami Dade College, Miami, FL

**Grand Ballroom F**

PathTech LIFE and LISTEN: Annual Report of Research on Technician Education Students

This session will present new findings from analyses of the PathTech LIFE survey of 3,216 students from 96 community colleges from around the county. These analyses examine student program satisfaction, campus resource knowledge and utilization, motivation to enroll, career and educational aspirations, and school-work-life balance issues among a diverse population of students. This session will also include information about PathTech LISTEN, a recently funded longitudinal investigation of students in technician education that will include two follow-up interviews with 150–200 PathTech LIFE survey participants. Attendees will develop strategies for applying research findings to impact student recruitment, retention, and completion.

Will Tyson, Lakshmi Jayaram, University of South Florida, Tampa, FL

**Grand Ballroom G**

Increase Your Social Media Presence to Improve Recruitment and Retention

Recruitment and retention of students is becoming increasingly reliant on building a strong social media presence. Learn about how social media platforms differ in their audiences and how to spread the word about your program on Facebook, Twitter, and Instagram. You will also learn to make your own social media graphics using free web tools.

Misty Wehling, Susanne Helms, Tracy Niday, Southeast Community College, Lincoln, NE
Grand Ballroom H
Enhancing Workforce Education in Arizona: A Model Internship Program
The Science Foundation Arizona Center for STEM developed an internship model that is helping Arizona’s community colleges and high school technical districts prepare students in both urban and rural areas to enter the middle skills workforce. Twelve college and high school internship programs serving 347 students at 102 industry partners have been funded across five middle skills industry growth sectors. Nine programs have proven self-sustaining. Session participants will discuss common challenges and potential solutions to implementing and sustaining internship programs, while learning to adapt and implement the SFAz model to bridge the skills gap.

Anita Grierson, Anna Tanguma-Gallegos, SFAz Center for STEM at ASU, Scottsdale, AZ

Mills 3
Aligning Employers and Classrooms: Using a Body of Knowledge to Analyze AM Program Syllabi
In this session, the presenters will share their advanced manufacturing (AM) body of knowledge (BOK), developed with employers’ perceptions of required worker competencies. The session will include results of research in which the presenters have used the BOK to assess syllabi from several AM technician preparation programs in the rural Florida panhandle. The presenters will discuss their process for refining and updating the BOK as well as providing recommendations to AM program leaders. The presenters will engage session participants in discussion of the BOK content and how the BOK can be applied to their own programs.

Marcia A. Mardis, Florida State University, Tallahassee, FL; David Bouvin, Chipola College, Marianna, FL

Park View
Selling Your Ideas
Getting buy-in from your department and college can be daunting and often the first hurdle to clear when you are ready to embrace a new project or plan. Join us to review the basics of pitching ideas, practice your pitching skills in small groups, and take away insights on how to approach and sell ideas to your administration. Regardless of discipline area or industry sector, come away with tools and tips for advancing your projects.

Abbe Kesterson, Bluegrass Community and Technical College, Lexington, KY; Mary Slowinski, Bellevue College, Bellevue, WA; Bridgette Kirkpatrick, Carole Twichell, Collin College, Plano, TX
Keynote Luncheon
12:30–1:30 • Grand Ballroom DE

Panel
Cultivating and Leading Change in Big Data, Analytics, and Artificial Intelligence:
Empowering and Advancing Women and Underrepresented Groups in STEM

A keynote panel of industry leaders will provide perspectives on emerging trends, future requirements, and workforce characteristics that are necessary to meet global demand and fulfill national security interests. The opportunity for women and underrepresented groups to play an important part in developing and leading these technology initiatives will be explored.

Moderator
Ann Beheler
PI, National Convergence Technology Center (CTC)

Panelist
Aaron Burciaga
Chief Technology Officer at Analytics2Go

Panelist
JC Caesar
Chief Operations Officer at Addx and retired Rear Admiral US Navy

Panelist
Polly Mitchell-Guthrie
Vice President of Industry Outreach and Thought Leadership at Kinaxis
Concurrent Sessions • 1:45–2:30

**Grand Ballroom A**

**Working Technicians Tell Their Stories**

This session will provide an opportunity for working technicians to share their experiences about attending community and technical college programs that prepare them for their positions. Technicians will speak from a “fishbowl” setting with the audience observing. Members of the audience will be invited to ask questions and will learn the “fishbowl technique,” which is frequently used in industry.

*Facilitator: Terryll Bailey, The Allison Group, Seattle, WA*

**Grand Ballroom B**

**Building a Technology Education Pipeline**

Northwestern Connecticut Community College is working with the Torrington School District and area manufacturers to build a technology education pipeline from middle school to high school and on to the community college and careers. This collaborative effort involves coordinating activities with industry, providing math tutoring for students, and providing industry-related professional development activities for teachers. The presenters will share how they structured their program and how they formed industry partnerships. Participants will be invited to share their own experiences and will outline plans to bridge the gap between their local school districts, colleges, and industries. Supported by NSF ATE grant #1801062.

*Sharon Gusky, Doug Mooney, Amanda Gregg, Ashley Johnson, Northwestern Connecticut Community College, Winsted, CT*

**Grand Ballroom C**

**Embedded AI in Smart Robots, Drones, and IoT Devices: Teaching Emerging Technologies in the Classroom**

This session will focus on the current effort to distill the essence of the growth of artificial intelligence and machine learning and their implications to cybersecurity. As the processing power of specialized hardware increases, artificial intelligence and machine learning capabilities can be embedded in portable and mobile devices such as drones, robots, and other IoT devices. There is a need for consumers to understand the basic underlying technology behind these embedded devices and underlying privacy and security risks and concerns. The presenters will provide a broad overview of the topic and the benefits/risks involved, and will describe how these topics are integrated into classroom curriculum in standard CS courses found in many universities.

*Debasis Bhattacharya, University of Hawaii Maui College, Kahului, HI; Rajiv Malkan, LoneStar College Montgomery, Conroe, TX*

**Grand Ballroom F**

**Classroom-Ready Interactive Content**

This session will provide a hands-on demonstration of classroom-ready interactive content developed to support courses in networking, cybersecurity, electronics, chemistry, environmental science, and physics. The project to be discussed is the result of collaboration between internal subject matter experts (SME) at Brookdale Community College, external SMEs from around the country, and instructional designers. Content was developed using HTML5 and is therefore accessible on any device running a modern web browser. Participants can take content with them to host online, in a learning management system (LMS), and even offline without an Internet connection.

*Michael Qaissaunee, Brookdale Community College, Lincroft, NJ; John Sands, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL*
1:45–2:30 Concurrent Sessions (continued)

Mills 3  
STEM Learning Using Electric Guitars, CNC, and Now Acoustic Guitars
The STEM guitar project helps connect educators to STEM learning opportunities surrounding the guitar. Launched in 2008 and covering 48 states, the project now has over 800 trained faculty. The Electric Guitar Kit and curriculum was first; now CNC training focuses on manufacturing skills. The Acoustic Guitar Kit is new this year for the STEM learning areas of vibration, structural analysis, and non-amplified sound. Our presentation will cover how to get started, costs, hurdles and barriers to implementation, summer training opportunities, and a fun activity.

Thomas Singer, Sinclair Community College (The STEM Guitar Project), Dayton, OH; Debbie French, Wilkes University, Wilkes-Barre, PA

Grand Ballroom G  
Teaching IoT Concepts with the Raspberry Pi
In 2017 the presenters demonstrated how Internet of Things devices could be incorporated into curriculum using cost-effective technologies. In this session they will demonstrate how to do it with a Raspberry Pi. The flexibility of the Raspberry Pi makes it an ideal controller for the classroom lab environment. Attendees will learn how to use the device as an automation controller, a VPN appliance, a RADIUS server, and a media client using readily available open source software. Topics will include peripheral devices and lessons learned in applying the concepts in a classroom lab.

Brian Nelson, Lansing Community College, Lansing, MI; Bill Saichek, Orange Coast College, Costa Mesa, CA

Grand Ballroom H  
Implementing a Backward Design Process to Invigorate Your Project Curriculum and Delivery
Have you ever been tasked with developing curriculum from scratch? Does your curriculum need to meet the needs of multiple audiences? If so, where did you start? Building curriculum is never easy and can be very time-consuming. This session will explore the benefits of using a backward design approach and aligning curriculum with external standards. Learn more about the tools, techniques, and lessons learned through implementation of the NEXUS NSF project.

Karen Wegner, Michael Guericke, Lyndsie Gibbs, Metropolitan Community College, Omaha, NE

Park View  
Personalized Approach to Promoting Minority Women in Engineering
The presenter will share a personalized approach to the promotion of minority women in engineering. The session will include individual case studies and their results, along with reflections on ways to help minority women thrive in engineering careers and expand engineering communities on campuses and beyond. Attendees will learn novel techniques for reaching out to targeted populations to stimulate interest in engineering careers. The presenter will explain a customized approach to addressing the academic needs of underrepresented minority women in engineering. The session will highlight career decisions that have significantly improved the lives of students and communities.

Ramona Anand, Weld-Ed, Lorain County Community College, Elyria, OH

Refreshment Break • 2:30–2:45 Grand Foyer
Grand Ballroom B

Soft Skills: What Should Have Been Learned in Kindergarten

The top complaint by employers nationwide is the lack of soft skills in job applicants. The lack of soft skills can force college graduates to take jobs well below their education and technical (hard skills) knowledge. This session will explore WHAT soft skills are, WHY they are important, and HOW to develop and integrate soft skills into your curriculum. Join this session for an interactive discussion focused on designing activities that promote the development and assessment of soft skills to unleash the full potential of graduates by bridging the gap between job applicant behavior and employer expectations.

Erik Christensen, South Florida State College, Avon Park, FL

Grand Ballroom C

A Summer Undergraduate Research Experience to Connect Course-Based Research Experiences at Del Mar College

Del Mar College (DMC) has been revising science education with authentic discovery-based research courses. During the last three summers, a new Summer Undergraduate Research Experience (SURE) was developed based on our experience working with both PARE and SEA-PHAGES. During the SURE, students who completed the PARE course can use their newly discovered antibiotic-resistant bacterial strain for further study including 16s rRNA colony PCR. The student researchers have also been isolating a novel bacteriophage that infects their antibiotic-resistant bacteria. The SURE assessment data was collected by online CURE assessment surveys.

Daisy Zhang, J. Robert Hatherill, Del Mar College, Corpus Christi, TX

Grand Ballroom F

Developing Effective Career Pathways Ecosystem for Cybersecurity Programs

This session will present the results and impact of a grant partnership funded to explore career pathways ecosystems for cybersecurity programs in a seven-state region. The presenters will share research data, including successful career pathways programs in Illinois, Ohio, and Michigan. The session will also identify innovative programs in the elements that make up a successful pathway for students in cybersecurity from K-12 courses to college certificates and degrees. These programs also include internship and apprenticeship opportunities and supplemental student activities such as cybersecurity competitions and hackathons.

John Sands, Center for Systems Security and Information Assurance (CSSIA), Palos Hills, IL; Kyle Jones, Sinclair Community College; Dayton, OH; Stanley Kostka, Moraine Valley Community College, Palos Hills, IL

Grand Ballroom G

Building Partnerships with Industry: Providing Students with Industry Consulting Experience

The presenter will report a case study of a successful partnership between Lund Boats and Bemidji State University. Topics will include strategies for establishing positive relationships between industry and academic programs and how to leverage these relationships to provide real-world consulting experiences for students.

Michael Lund, Bemidji State University, Bemidji, MN
2:45–3:30 Concurrent Sessions (continued)

Grand Ballroom H

**Educational Technologies for Student Success**

Educational technologies are very effective in helping students understand their learning styles and bridge the gap from struggle to success. They assist students battling with learning issues, poor memory, hearing loss, and physical disabilities. Come learn how you can partner with your student disability services office to increase your students’ success by connecting them with educational technologies and valuable support services that will increase their learning potential. This presentation will also include a demonstration of the newest educational technologies used to address multiple learning styles, poor attention and memory, difficulty in reading textbooks, and hearing loss.

*Mike Sauter*, Saddleback Community College, Mission Viejo, CA

Park View

**Short Modules Targeting Job Growth and Demand**

Technical workforce education today has one main focus: Prepare students for “available” careers. Technical career disciplines have numerous career paths, requiring unique training for each. This makes it difficult to prepare students for “niche” areas. So, technical programs are forced to give students a general education in a particular technical discipline, with students learning career path specifics on the job. This session will share an approach to solving this problem: “short modules” introducing students to job-specific education in areas hiring.

*Gary Beasley*, LASER-TEC, Lillington, NC; *Chrys Panayiotou*, LASER-TEC, Fort Pierce, FL

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**FRIDAY**

**NSF ATE Feedback Session**

*Regency E • 8:30–11:30*

Continental breakfast included
Exhibits are located in Regency ABC. HOURS: Wed 9:45–6:00 (reception 4:30–5:30) and Thur 7:30–noon.

305
AC2 Bio-Link Regional ATE Center (AC2)
3401 Webberville Road
Austin, TX 78702
www.ac2.bio-link.org
AC2 Bio-Link Regional Center is a four-year NSF-funded ATE center, focused on educational and industry-based solutions using Communities of Practice.

405
Advanced Technology Environmental Education Center (ATEEC)
201 N. Harrison St, Suite 101
Davenport, IA 52801
www.ateec.org
Advanced Technology Environmental Education Center (ATEEC) is part of the NSF Advanced Technology Education (ATE) program. We create augmented reality modules for training water technicians.

111
Amatrol, Inc.
2400 Centennial Boulevard
Jefferson, IN 47130
www.amatrol.com
Amatrol is a market leader in technical education, emphasizing hands-on skills via both virtual and equipment labs. Amatrol’s learning systems in pre-engineering, project-based learning, advanced manufacturing, and technology programs include courseware for self-directed, distance, and lecture/lab programs, equipment, computerized troubleshooting, and authentic assessment.

212
Amazon Web Services (AWS) Academy
2111 7th Avenue
Seattle, WA 98121
www.aws.amazon.com/training/awsacademy
Amazon Web Services Academy addresses the question, where will the next generation of cloud computing professionals come from? The AWS Academy provides educational institutions with courseware and hands-on learning resources to prepare students for employment in cloud roles.

404
ATE Central
1210 W. Dayton Street
Madison, WI 53706
www.atecentral.net
ATE Central is a free online portal and collection of materials and services dedicated to highlighting the work of the NSF Advanced Technological Education community.

106
Center for Aviation and Automotive Technological Education Using Virtual E-Schools (CA2VES)
216 S. Palmetto Boulevard
Clemson, SC 29634
www.cecas.clemson.edu/cucwd/ca2ves/
CA2VES provides research-centered resources and evidence-based leadership for community colleges and the broader ATE community by designing and developing state-of-the-art virtual reality-based modules that support automotive and aviation technician education.

408
Center for Nanotechnology Education (Nano-Link)
1300 145th Street E.
Rosemount, MN 55068
www.nano-link.org
Nano-Link Center for Nanotechnology Education promotes nanotechnology education at multiple grade levels with comprehensive resources, products, and services for students, educators, and community and industry partners. Nano-Link teams with industry, programs, and schools across the United States to ensure the need for a skilled nano workforce is met.

407
Center for Renewable Energy Advanced Technological Education (CREATE)
1701 Wright Street
Madison, WI 53704
www.createEnergy.org
The goal of CREATE is to advance the field of renewable energy and strengthen two-year college renewable energy programs by supporting faculty, industry, and pedagogical practices.

403
Columbus State Community College
550 E. Spring Street
Columbus, OH 43215
www.csc.edu/community/grants/
Columbus State currently leads eight NSF ATE projects that seek to elevate technician education in automotive technology, data analytics, logistics, manufacturing, and mobile development.

412
CyberWatch West
237 W. Kellogg Road
Bellingham, WA 98226
www.cyberwatchwest.org
CyberwatchWest links higher education and industry to strengthen our nation’s cyber security workforce. Funded by an NSF grant, CWW is administered by Whatcom Community College.

313
Digilent Inc., A National Instruments Company
1008 Western Avenue Suite 405
Seattle, WA 98104
www.digilent.com
Digilent Inc., a National Instruments company, is a leading electrical engineering products manufacturer serving academia and professional engineers worldwide.

303
Emona TIMS
78 Parramatta Road
NSW 2050, Camper Down, Australia
www.QPSK.com
Visit Emona for (i) telecom’s experiments and (ii) unique single-unit multi-user, electronics experiments—all hands-on hardware for students to learn by seeing and doing.

311
ETA International
5 Depot Street
Greencastle, IN 46135
www.eta-i.org
ETA® International represents electronics professionals with over 80 industry-recognized certifications. ETA accredited certifications, developed by industry experts, align with international standards and confirm both technical knowledge and hands-on skills.
Technician workforce. Manufacturers have an innovative and best-in-class manufacturing ecosystem and ensures that members to engage around issues related to evaluation in the pursuit of excellence in technical education.

Festool Didactic is the leading provider of technical electrical, and automation technologies. Automation Studio™ is a unique software solution that offers intuitive design, simulation, and system analysis features for teaching hydraulics, pneumatics, and automation technologies.

MakerTEC is a Coordination Network focused on providing resources and connections to align education with industry to help fill the workforce shortage in advanced manufacturing. MakerTEC.org

The Manufacturing Skill Standards Council (MSSC) is the nation’s leading industry-led training, assessment, and certification organization focused on the core technical competencies needed by the nation’s frontline production and material handling technicians.

Mentor-Connect is the evaluation support center for the National Science Foundation’s Advanced Technological Education program. We provide webinars, resource materials, newsletters, workshops, and opportunities for ATE community members to engage around issues related to evaluation in the pursuit of excellence in technical education.

Festool Didactic is the leading provider of technical equipment and training. Festo’s educational solutions evolved from its world-class automation and engineering division and integrates the latest trends in each learning system it offers.

Goodheart-Willcox delivers authoritative content for teaching and learning success. Learn more about new digital learning solutions, textbooks, and instructor resources at our booth or visit www.g-w.com. Together, we build careers!

MakerTEC provides skills training solutions in Industry 4.0, Internet of Things, CNC, robotics, and mechatronics hardware, software, and e-learning. Ask us about sensor trainers.

Mentor-Connect: South Carolina ATE Center of Excellence provides leadership development and outreach for ATE designed to broaden the impact of the NSF ATE program through mentoring and knowledge transfer for technician education advancement among the nation’s two-year colleges.

Middle Georgia State University offers fully online bachelor’s and master’s degrees in information technology. Students can enjoy the quality, affordability, flexibility, and convenience of attending MGA’s programs.

The Minnesota State Advanced Manufacturing Center of Excellence is an innovative, collaborative effort between education and industry to recruit, educate, and train workers for dynamic careers in advanced manufacturing.

MTAB provides skills training solutions in Industry 4.0, Internet of Things, CNC, robotics, and mechatronics hardware, software, and e-learning. Ask us about sensor trainers.

The NACK National Support Center for Nanotechnology Workforce Development has a mission to provide assistance to existing or developing micro-nanotechnology workforce education programs at postsecondary institutions across the United States.
Addressing an immediate and growing national demand, the National Center for Supply Chain Automation advances industry-education partnerships in the development of programs that advance supply chain automation technician education and training.

The National Geospatial Technology Center of Excellence (GEO) (GEO) 1000 Community College Drive Louisville, KY 40272 www.geotechcenter.org The GeoTech Center will be showing the latest development in geospatial technology, including the use of UAV and specialized sensors.

In partnership with local education institutions and businesses, NEATEC provides community-college and secondary-school students with extraordinary hands-on opportunities to engage in cutting-edge education and training.

In close collaboration with industry partners, NBC2 creates curricular materials to educate and train technicians in the development, production, and analysis of biopharmaceuticals and other bioproducts.

The NSF/ATE Photonics Centers work with secondary, postsecondary, and industry partners to increase and sustain our nation’s capacity to produce laser, optics, and photonics technicians.

Simtronics Corporation provides operator training simulators (OTS) for the process industries and the educational institutions that train operators and technicians.

Engage and learn from the Support Center for Microsystems Education team so that you can better prepare your students for the future in micro-nano technologies.

A National Center of Excellence that serves as a resource for educators and employers with the goal of increasing the number of deaf and hard-of-hearing STEM technicians.

Teach emerging technology skills in cloud computing and virtualization to build a better workforce! Visit us for an overview of the VMware IT Academy academic courses, a customized webstore, and vouchers. With the right skills, success is virtually guaranteed.
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Meeting Areas

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Portland, Oregon

JULY 27–30 • 2020

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