Preparing Technicians for the FUTURE OF WORK

Marilyn Barger, Ph.D., P.E.
Executive Director & P.I.
FLATE (Florida Advanced Technological Education Center of Excellence)
barger@fl-ate.org – www.fl-ate.org – www.madeinflorida.org
Project Team

- Ann-Claire Anderson, Principal Investigator
- Hope Cotner, Co-Principal Investigator
- Mike Lesiecki, Co-Principal Investigator
- Richard Gilbert, Co-Principal Investigator
- Marilyn Barger, Special Advisor
Nature of work changing at unprecedented speeds

Technology advancements in machine learning, AI, IoT, and robotics eliminating some jobs, creating others

Technicians sit at the center of much of this disruption

Education must keep up

Our students’ career paths will evolve erratically and fast
Industry 4.0 Technologies

- The Internet of Things
- Automation
- Augmented Reality/Simulation
- Simulation
- Supply Chain/Customization
- System Integration
- Cybersecurity
- Big Data
- Additive Manufacturing
- Cloud Computing
Our Job?

Predict the Future

- Graphic: Aethon
Project Phases

- 2019: Discover
- 2020: Specify
- 2021: Develop
- 2022: Sustain
The National Science Foundation’s 10 Big Ideas Include a New Research Agenda

- “The Future of Work at the Human-Technology Frontier”
  - Study the intersection of future workers, future work, and future technology
  - Enable creation of technologies that can collaborate with humans to enrich lives and workplaces
The Elephant in the Room: Fear of Job Loss

- Technology eliminates job categories, not **work**
- Technology is transformational
- One size does not fit all
Technology Transforms:
Powered Exoskeletons for Industrial Applications
Technology Transforms: Medical Diagnostics & Treatment
Technology Transforms: Material Handling
One Size Does Not Fit All

Adoption among companies by 2022

- Humanoid Robots: 23%
- Stationary Robots: 37%
- Aerial and Underwater Robots: 19%
- Non-humanoid Land Robots: 33%

First movers

- (35%) Financial Services and Investors
- (53%) Automotive, Aerospace, Supply Chain
- (52%) Oil and Gas
- (42%) Automotive, Aerospace, Supply Chain

On the card, please write

ONE word about the Future of Work

Future?
Smart machines are getting smarter and production, assembly, monitoring, and maintenance in a wide variety of industrial settings is becoming more efficient.

What does this mean for role of the technician?

Are there new foundational skills for future STEM technicians?
Enable the NSF-ATE community (2-year colleges) 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.

This material is based upon work supported by the National Science Foundation under NSF DUE #1839567. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Gathering Information from Many Sources

- Industry Advisors
- NSF Advanced Technological Education Leadership Caucus
- Industry/education focus groups
- Recent business news and research on the Future of Work
- Existing competency models
- Industry site visits
- Interviews of working technicians and supervisors
1. More robots and cobots with more functionality—which means they're more complicated and more connected—are being installed everywhere.

2. Most technicians need to know something about digital communication protocols between equipment.

3. More connected and automated robots and machines mean more challenging troubleshooting situations.
4. Across all the operators and technicians, strong fundamentals in math, science and technology are key to understanding the new equipment and processes.

5. Employability skills (or the human skills) are still extremely important—maybe even more so today than they have been in the past.
New Foundational, Cross-cutting Knowledge and Skills
What we hear about the Future of Work

Specific knowledge and skill areas that will help “future proof” STEM Technicians

- Skill Area 1: Data Knowledge and Analysis
- Skill Area 2: Advanced Digital Literacy
- Skill Area 3: Business Knowledge and Processes
Foundational Skills for STEM Technicians

- Business Knowledge & Processes
- Advanced Digital Literacy
- Data Knowledge & Analysis
Skill Area 1: Data Knowledge and Analysis

Manipulate, interpret, compare, contrast, merge, and “operate” on data to resolve issues/problems and use Excel and other common software proficiently to accomplish tasks.
“Increasingly complex data science algorithms will continue to be subsumed in packages and technologies that make them orders of magnitude easier to deploy…

Much of the work that data scientists are doing today will ultimately be transferred to less highly trained workers who have sufficient coding and statistics exposure to effectively use robust packages and technologies and build machine learning models.”

- Wulin, Forbes, May 21, 2019
Skill Area 2: Advanced Digital Literacy

Understand and use at a higher than introductory:

• Digital communications / interfaces
• Networking
• Cloud interface
• Cybersecurity
• Machine learning
• Smart sensors
• Human-machine interfaces
Skill Area 3: Business Knowledge and Processes

Understand:
• Processes of an enterprise
• Value chain
• Business practices
• Work performance skills
• Ethics surrounding use of new technologies
• OEE
Continuing Activities

- Industry site visits
- Interviews (technicians, technician supervisors, middle management, executives and HR staff)
- Special interest groups
- Dissemination activities

New Activities

- Subject matter expert review of priority topics
- Regional convenings / networks (industry, ATE, other committed parties)
- Identification of curriculum modifications
- Professional development
Where are you with I4.0?
Exploring the Human-Technology Frontier

Leadership 4.0: People Development in the Fourth Industrial Revolution
Thomas Lichtenberger, President and CEO, Festo Didactic
May 21, 2019

When thinking about manufacturing in America, what comes to mind? Big data processing, cloud-based systems, advanced robotics, and artificial intelligence? If not, they should. The significance of these technologies cannot be overstated. Take AI for example. When used for predictive maintenance AI’s greatest value to manufacturing comes from predictive maintenance, yielding $0.5 trillion to $0.7 trillion across the world’s businesses. So this Fourth Industrial Revolution, also known as Industry 4.0, has ushered in an unprecedented technological revolution, and with it, paradigm shifts that affect us all. The complexities and infinite possibilities of Industry 4.0 can be wondrous, and overwhelming. For many automation companies, it’s presenting a management challenge in terms of ensuring individuals, teams, and the organizational structure as a whole can adjust accordingly when new technology and software is introduced.

More
Imagine the Possibilities

Regional Convenings

Regional Networks
A Regional Network

- Is a partner of the Preparing Technicians for the Future of Work national project
- Collaborates regionally with industry partners, within and across disciplines
- Benefits regional industry, college programs, and students
Regional Network Vision

- Grows from this regional convening
- Brings multi-disciplinary, multi-sector stakeholders together
- Supports the skilled technical workforce within regional economies
- Expands and accelerates effective practices
Potential Regional Network Activities

- Surveying regional industries
- Building/expanding partnerships
- Creating cross disciplinary competency frameworks
- Developing, adopting, refining, and implementing regional recommendations
- Coaching National Science Foundation ATE grant applicants
Benefits of Participation

- Project resources and tools
- Education programs that anticipate future technology and industry needs
- Access to cross-sector collaborations and collaborators
Thank You

www.preparingtechnicians.org

Marilyn Barger, Ph.D., P.E.
Executive Director & P.I.
FLATE (Florida Advanced Technological Education Center of Excellence)
 barger@fl-ate.org – www.fl-ate.org – www.madeinflorida.org