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Multi-State Consortium Redesigns Advanced Manufacturing Training Curricula

- Working with industry partners to identify employer objectives
- Aligning college curricula with industry needs
- Developing a competency-based education approach to meet the requirements of business, instructors, and students

Introduction

When it comes to occupations in advanced manufacturing, college faculty, students and employers articulate a common message: Improve the alignment of education and industry so that instructors know what they need to teach, students can get jobs, and employers can meet their recruitment needs.

In response to this challenge, the Multi-State Advanced Manufacturing Consortium (M-SAMC), a Trade Adjustment Assistance and Community College and Career Training (TAACCCT) grantee, is working with 13 colleges in ten states to transform manufacturing education in their institutions. One of the key strategies to accomplish this goal is the use of Performance-Based Objectives (PBOs) to develop new and modified industry-driven manufacturing curricula and credentials.

The Workforce Need

There were 361,000 job openings in manufacturing in June 2016, according to the U.S. Bureau of Labor Statistics (BLS).[1] Although BLS projects employment to decline in most manufacturing industries between 2014 and 2024, future job openings are expected to result from the need to replace workers who are retiring. Industry experts say there's a need for workers with the right skills in manufacturing.[2]

In the past, many manufacturing jobs were considered low skill and had fewer educational requirements than other types of jobs. Over the last few decades, manufacturing plants have become more automated, thus requiring skills that are more technical. For example, computer programmers and coders are needed by manufacturers, as are people to design and operate the machines. These jobs require different skills from previous jobs in manufacturing and usually require more mathematics or a higher level of education. The jobs in manufacturing tend to be computer-based rather than assembly-line based.[3]

According to the Manufacturing Skills Institute, innovation and technological advances are rapidly transforming U.S. manufacturing. Production is being streamlined and processes automated. The

[1] U.S. Bureau of Labor Statistics, Job Openings and Labor Turnover Survey, http://www.bls.gov/news.release/archives/jolts_09072016.htm
[2] U.S. Bureau of Labor Statistics, Employment Projections, http://www.bls.gov/emp/ep_table_201.htm
[3] U.S. Bureau of Labor Statistics, Monthly Labor Review, http://www.bls.gov/opub/mlr/2015/article/industry-employment-and-output-projections-to-2024.htm

skills required of advanced manufacturing workers have likewise evolved. Worker skills have not always kept pace with the needs of the integrated factory.

Approach

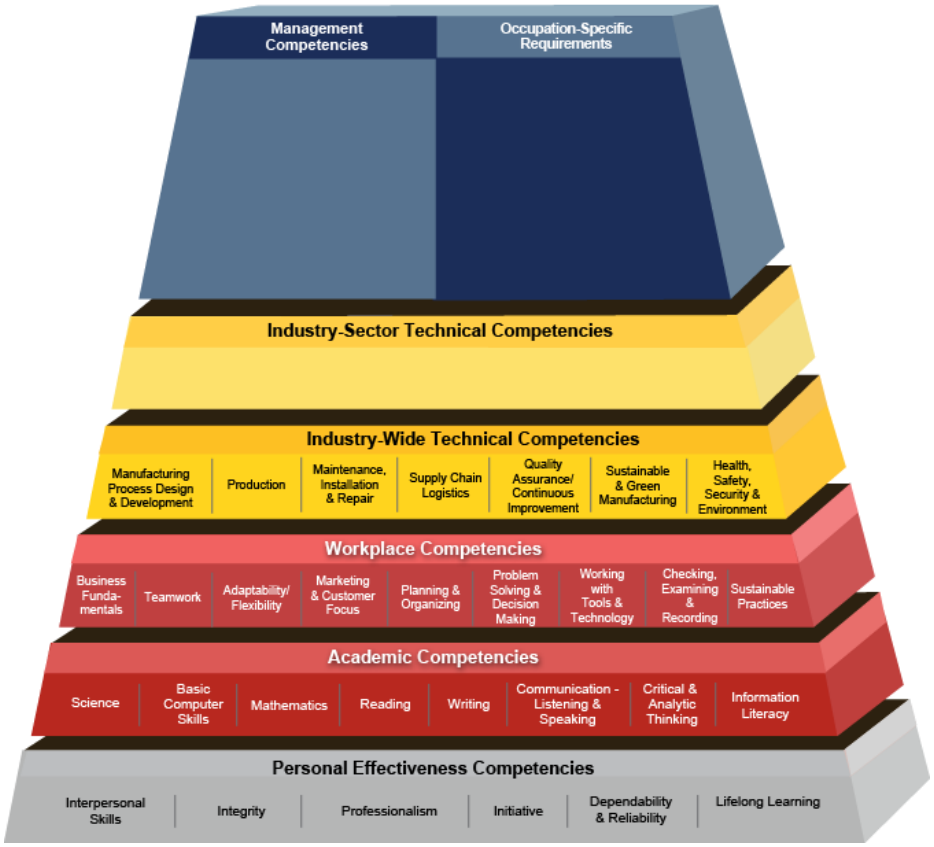
"Prior to receiving the TAACCCT grant from the U.S. Department of Labor, we were already working with the Automotive Manufacturing Technical Education Collaborative on a competency-based education approach," says Scott Jedele, M-SAMC Program Manager, at Henry Ford College in Dearborn, Michigan. "As a member of the Collaborative, we did a DACUM analysis to define exactly what has to be taught for students to be successful on the job in the automotive manufacturing sector. The TAACCCT grant enabled us to expand and further innovate."

The M-SAMC consortium members worked with a number of employer partners including Fiat, Chrysler, Ford, General Motors, Toyota, Nissan, Honda, and BMW, representing the "footprint" of North American auto manufacturers. Although the initial grant focus was on automotive manufacturing, the initiative has now extended into precision machining, aerospace and process technology with employer partners from Kelly Aviation and Boeing.

"We started with a review of the curriculum for launch training for new vehicles, which required refreshed tooling in all the automotive plants," says Mr. Jedele. "This generated the development of the first set of PBOs, specifically the right competencies needed for the new equipment associated with the new vehicles. These PBOs focused on three key components: 1) the objective for learning to take place; 2) the goal for assessment of competencies; and 3) the ability of the student to perform the tasks specified by the objective. We used the PBOs to develop customized competency-based training for specific partners."

"The expansion of the competency approach is 'disruptive innovation,'" says Mr. Jedele. "It's positive but it's not always easy for schools to do that. It's not just about repairing a motor. The system has all kinds of technology in it. The technician needs to be able to understand the entire system, not just the component. The highest need is integrated system instruction using project-based learning. For example, safety is now an essential competency for students. In the past, it was the employer's responsibility. We used to put low voltage equipment in the classroom. Now we provide a real world environment with appropriate personal protective equipment required by OSHA."

The consortium's PBO development process reflects many of the competencies in the U.S. Department of Labor, Employment and Training Administration's Advanced Manufacturing Competency Model.



"For our purposes, we've moved some of the higher-tier competencies to the bottom of the pyramid," says Mr. Jedele. "In our curricula, we've dragged the top tiers down to the bottom, starting with those at the beginning of our programs. In the first six weeks of the program, students have been able to diagnose 80% of the highest frequency manufacturing faults in integrated manufacturing systems."

Next Steps

"We've had unparalleled success in providing students with the skills they need to gain in the education process," says Callan Eschenburg, Assistant Program Manager, Henry Ford College. "They have the right skills for the current manufacturing process. We have received positive feedback from industry that confirms this observation as demonstrated by this attestation example from Darin Griffy, Master Trainer, Nissan North America, Inc. "We completed the training yesterday and I was impressed with the materials developed for the classes. The training is very relevant to real world troubleshooting on the shop floor."

"Based on our success with the TAACCCT grant, we received an American Apprenticeship initiative grant in 2015," says Mr. Eschenburg. "We work with five community colleges in Michigan on an initiative based on PBOs, working with Workforce Development Boards (WDBs) with a focus on apprenticeship. State and local WDBs and the National Association of Workforce Boards are also very interested in the PBO approach because it enables industry to communicate their needs and helps instructors understand what they need to teach."

Related Links

M-SAMC Performance-Based Objectives Website
http://datatools.msamc.org/pbo

M-SAMC Steps to Troubleshooting
http://www.msamc.org/imst_level1/troubleshooting/steps_troubleshooting.html

M-SAMC Project-Based Learning
http://www.msamc.org/pbl_mechapracticums.html

ARC Flash Overview (Electrical Safety)
http://msamc.org/arcflash/index.html

M-SAMC Integrated Manufacturing Systems Troubleshooting
http://www.msamc.org/imst_level1/index.html