



What Does Manufacturing Look Like Today? And How Should CTE Programs Adapt as a Result?

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Jobs in manufacturing look much different than they did a generation ago. Today's manufacturing facilities are modern workplaces that use advanced technologies to streamline processes, enhance production, and improve the safety of employees.

In light of this transformation, the skills needed for manufacturing jobs are changing rapidly—and career and technical education (CTE) programs must adapt in turn to prepare students effectively for manufacturing careers.

Revolutionary technologies

Manufacturers have made significant progress in automating key processes as the world has become increasingly digital. The COVID-19 pandemic has only accelerated these initiatives.

According to a 2022 report from the Manufacturing Institute (MI) and Rockwell Automation, 77% of manufacturers say they've made technological investments to achieve cost efficiencies in the production process, and 73% say they've done so to improve operational performance. These shifts have changed the nature of manufacturing work, including the skills that are required of employees.

This Forbes article describes some of the recent trends in the sector as manufacturers are leveraging technologies such as AI, data analytics, and real-world modeling to develop globally connected and

highly intelligent production systems.

For instance, sensors embedded within factory machines collect data that enable manufacturers to understand how these machines are performing. This helps manufacturers optimize maintenance, reduce downtime, and even predict when things will go wrong, so they can take preventative action and maintain equipment more effectively.

Automated robots are being used to enhance the work of humans, and "digital twins" are being used to simulate physical processes or objects—so manufacturers can build "what-if" scenarios and test key processes before rolling them out for real. A digital twin could be used to simulate a new product on the production line, for example, or to create a virtual replica of the machinery on the factory floor to see how well it operates using different production parameters.

New skills required

As the robotics used in manufacturing become increasingly advanced, companies will need employees who know how to maintain, operate, and troubleshoot these machines. As more and more data is collected in real-time, manufacturers will need employees who can analyze digital information and use it to streamline production, predict behavior, and solve problems.

"Companies are finding greater need for individuals



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with data analysis skills,” the MI report says. “Critical thinking, problem solving, and an agile mindset are skill sets that manufacturers will need more and more in the future.”

The report quotes a number of manufacturing executives who describe the types of skills their employees will require now and in the future. For instance:

- “You need skills that marry the physical and digital worlds, [such as] the ability to understand applications and interactions between mechanical and automation systems.” —Tom O’Reilly, vice president of sustainability for Rockwell Automation
- “While we get a lot of data from tools and sensors, we need people with advanced troubleshooting skills to process the data and take the best action.” —Tim Kinnard, vice president of water fab manufacturing for Texas Instruments
- “Ultimately, our employees need to be data-savvy enough that, when we equip them with an app or a report, they can read it and make more informed and strategic decisions.” —Athina Kanioura, chief strategy and transformation officer, PepsiCo

Implications for CTE programs

The executives interviewed for the MI report also described how training and CTE programs should adapt to these changes to teach the skills required for success in manufacturing careers. Based on their responses, here are three key recommendations for education leaders:

1. Use authentic data and scenarios.

The executives interviewed for the MI report recommended that schools offer training focused on “real” or applied data analytics, with “opportunities to work with actual information—rather than estimates or made-up numbers—and to troubleshoot varied issues with data from

start to finish.”

This type of training not only prepares students more effectively for the data-rich environments they’ll encounter

in manufacturing jobs, it report says—but it also results in deeper student engagement.



2. Focus on problem solving.

“Employers would love to see curricula in high schools and colleges provide more opportunities for young people to build the ‘muscles’ of critical thinking and problem-solving,” the report says. CTE programs can do this by implementing a problem-based approach to manufacturing instruction.

3. Build versatility by emphasizing cross-functional training.

“In the experience of some employers, new workers may be highly educated on how to operate different software or comply with different industry standards but still need practice recognizing the comprehensive ways their work touches other parts of the same company,” the report says. “As a result, multiple manufacturers value applicants who have backgrounds working across functions or with multiple types of stakeholders.”

Time to adapt

The transformation that manufacturing has undergone in the last few years has created a huge need for more highly skilled employees. CTE program leaders must take note of these changes and transform their programs in response.

Academic Representative



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