

April 2019

OHIO MANUFACTURING FOUNDATIONS



PROJECT BRIEF



OhioTechNet

OhioHigherEd
Department of Higher Education

INTRODUCTION

The digitization of production is transforming the way goods are produced. Today's modern facilities are interspersed with smart machines and robots all linked by sophisticated internet technologies known as the Internet of Things (IoT). Companies are puzzling through how best to bring new technologies into their environments in order to compete, and finding or training workers that can thrive in this new environment is a piece of the puzzle. Ohio Manufacturing Foundations Certificate provides students with the technical and analytical skills needed to be successful in this ever-evolving environment.

Manufacturing is thriving in Ohio, but the workforce has not fully caught up with the modern demands of the industry. Manufacturing is Ohio's largest sector, accounting for 17 percent of the state's output and providing approximately 700,000 jobs.¹ **In 2017, the average annual compensation for an Ohio manufacturing worker was \$72,654, which was \$26,000 higher than the average for all workers.** Yet, despite the excellent compensation, manufacturers are having trouble filling positions with qualified workers. For example, research in Northeast Ohio found that about 14,000 manufacturing jobs are unfilled because of a skills gap, with employers reporting that many applicants do not have the foundational employability or technical skills needed to be successful in jobs.

Companies are hard-pressed to solve the skills gap challenge on their own, so partnering with the education and training community is crucial. A survey by the Society of Manufacturing Engineers found that 76 percent of manufacturers do not have a strategy for talent development for production employees.²

To address this need, Ohio TechNet, a consortium of Ohio higher education institutions focused on developing innovative manufacturing education and training strategies led by Lorain County Community College (LCCC), is shepherding the creation of the Ohio Manufacturing Foundations Certificate to create a clear foundational training pathway to provide workers for the new industrial environment. This project launched in collaboration with education and industry partners and financial support from Lightweight Innovations for Tomorrow (LIFT).

Developed with the needs of manufacturers at the forefront, the Ohio Manufacturing Foundations Certificate provides a standardized curriculum of foundational coursework which prepares graduates for entry level manufacturing positions in today's modern industrial environment. The goal is to establish a curriculum that can be delivered at high schools and institutions of higher education statewide. This paper details the development of the Ohio Manufacturing Foundations Certificate and explores the potential for statewide adoption.

¹ <https://development.ohio.gov/files/research/E1001.pdf>

² https://ppc.toolingu.com/pulse-survey-2018/?utm_campaign=CORP.Digital.Email.PulseSurvey2018

DESIGNING AN ADAPTABLE PROGRAM

Lightweight Innovations for Tomorrow (LIFT), a public-private partnership leading the world in lightweight materials manufacturing, has long recognized the pressing need to develop manufacturing workers for today's technologies. Seeking scalable solutions to address this need, LIFT partnered with Ohio TechNet to develop education and training pathways to high-demand manufacturing occupations in Ohio. "LIFT and Ohio TechNet have the common goal of helping youth and adults prepare for high quality, in-demand jobs that are critical to the vitality of the state's emergent manufacturing industry," said Emily DeRocco, Education & Workforce Director, LIFT.

Rob Speckert, Emeritus Professor of Engineering Technology at Miami University led this project on behalf of Ohio TechNet. Rob worked closely with industry partners and college deans via the Ohio Engineering Technology Educators Association (OETEA) to design a foundational curriculum to fill industry's need for entry-level workers. The Ohio Manufacturing Foundations curriculum is designed to help college-ready high school students or career-changing adults develop entry-level skills, become excited about career paths in manufacturing, enter the workforce and/or build toward additional certificates or degrees.

In December 2018, staff from Ohio Department of Higher Education, Ohio Department of Education, several community colleges, and Northwest Ohio industry partners met at Owens Community College to discuss state agency recognition of the Ohio Manufacturing Foundations Certificate. Industry partners supported the model and felt that in addition to technical skills, students who have this certificate will be recognized for their willingness to learn and problem-solve, both key attributes for succession planning within a manufacturing facility.

Fahlgren Mortine, a Columbus, OH-based integrated marketing and communications agency created marketing materials that high schools, colleges, and community organizations can utilize to create interest in Ohio's Manufacturing Foundations Certificate program. The target audience is high school students and their parents, and adults looking to change careers.

The message is simple: **Start Building the Future of Your Dreams.** *Manufacturing today offers a variety of exciting career options with good pay, benefits and work-life balance. Through Manufacturing Foundations, you will lay the groundwork for a rewarding long-term career. Whether you are a high school student, a recent graduate or an adult seeking new opportunities, Manufacturing Foundations provides a fast, affordable start to a successful future.*

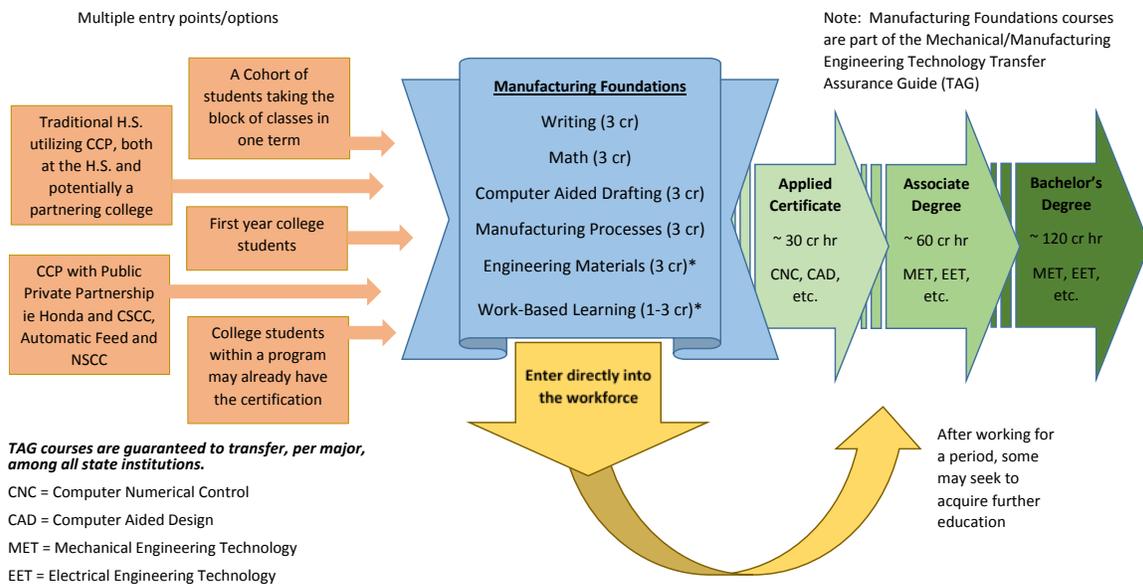
The marketing materials include templates for print pieces, a social media plan with impactful messaging, a Manufacturing Foundations landing page on OhioTechNet.org, and suggestions for ad placements/other marketing tips.

PROGRAM GOALS

- **Serving industry:** The Ohio Manufacturing Foundations curriculum was developed with industry input and support.
- **Connecting with existing initiatives to ensure multiple entry points:** Engaging high school students via College Credit Plus (CCP) and engaging adults via Manufacturing Readiness, a program that introduces participants to manufacturing's exciting career opportunities.
- **Providing connectivity to manufacturing education and training pathways:** Ohio's Manufacturing Foundations Certificate was designed to align with Ohio's Career-Technical Assurance Guide (CTAG) and/or Transfer Assurance Guide (TAG), allowing students to transfer credits between programs and institutions.
- **Informing students of multiple options:** Students who earn the Ohio Manufacturing Foundations Certificate can either enter directly into the workforce or advance along a manufacturing educational pathway.
- **Remaining sustainable:** The program needs to be affordable to institutions and students within existing funding systems. To accomplish this, the certificate includes courses already offered at institutions statewide.
- **Having potential for scalability:** Ohio Manufacturing Foundations Certificate is designed to be flexible enough to be delivered in a variety of local contexts. Guidelines are developed for program implementation within different geographies serving different subset populations of students (high school, incumbent, adult learner, etc.) and manufacturing sub-sectors (aerospace, flexible hybrid electronics, bio-engineering, traditional, etc.).

Manufacturing Foundations (certification)

Pathways



³ MSCC Certified Production Technician Certificate may be earned concurrently with the OMF Certificate

PROGRAM DETAILS

The Manufacturing Foundations curriculum is tied to the needs of industry. Engaging manufacturing partners ensures the content is coordinated with employer pain points and aligns to existing training programs at companies. While the work-based learning component is optional for implementation, apprenticeship, co-op, work study, and similar initiatives should all be considered if possible. **When presented with the proposed curriculum, an HR representative from a Northwest Ohio manufacturing company said, “We look for a potential hire’s ability to analyze and think through a process. These courses would help a student do just that and show they have future vision and commitment to manufacturing.”**

The curriculum is designed to provide students with foundational skills in reading and math, basic technical competencies, and an introduction to manufacturing environments. In total, the curriculum is 16-18 credits and is recommended to be paired with a work-experience or co-op. The courses selected are already offered at nearly all of Ohio’s two-year colleges and many four-year universities.

Manufacturing Foundations Curriculum

16-18 total credit hours

Non-Technical Courses: 6 credit hours

- Writing (Technical Writing OR English*)
- Math (Technical Math OR Quantitative Reasoning* OR College Algebra*)

*Course offered through Ohio Transfer Module

Technical Courses: 10-12 credit hours

- Computer Aided Drafting/Design*
- Manufacturing Processes*
- Engineering Materials+ (OR Technical Elective)
- Work-based learning OR Technical Elective

* Course offered through Transfer Assurance Guide (TAG) or Career-Technical Assurance Guide (CTAG)

+ Course offered through Transfer Assurance Guide only

Upon completion of the certificate students are able to:

- Use CAD systems to create engineering drawings including: dimensions and tolerances; multiple views and projections; assemblies and bill of materials; and 3D models.
- Demonstrate an understanding of manufacturing processes, fabrication processes, production efficiencies, safety procedures, and use precision measuring devices.
- Demonstrate knowledge of engineering materials and why they are used in particular applications including material composition, processes for manufacturing of steels and alloying, cold and hot working processes, material hardness, elasticity, tensile strength, yield strength, and shear strength.

- Work as a member of a team to communicate effectively, solve problems, and improve productivity.

ACHIEVING BROAD SCALE ADOPTION

The curriculum is designed to promote broad scale adoption throughout Ohio. Building on this strength, OETEA is exploring recognition of the Ohio Manufacturing Foundations Certificate through the Ohio Department of Education (ODE) and the Ohio Department of Higher Education (ODHE). **When presented to officials from ODE and ODHE, ODE’s Linda O’Connor noted, “Every parent wants their child to go to college. From what I’ve seen, this certificate could give students a head start into both college and a career.”**

Working closely with OETEA, Ohio TechNet has taken a central role in the effort to expand the number of institutions offering the Ohio Manufacturing Foundations Certificate as a recognized credential statewide. Ohio TechNet contributes dedicated project leadership and a robust statewide learning community of higher education and industry partners to promote and vet the Manufacturing Foundations program. From the outset, it was Ohio TechNet’s capacity to communicate with a statewide network that prompted LIFT to select Ohio TechNet as a partner in developing the Manufacturing Foundations program. To build awareness, the Manufacturing Foundations program was presented to the Ohio TechNet consortium on a weekly learning community teleconference attended by colleges and universities throughout the state.

Thirty of the state’s 38 public institutions of higher education offer courses aligned to the Ohio Manufacturing Foundations Certificate, with 19 offering all of the required technical courses. As of December 19, 2018, fifteen institutions of higher education from around the state (eleven community colleges and four universities) explored offering the Manufacturing Foundations curriculum as a certificate.

Schools Exploring Implementation of Manufacturing Foundations Certificate (as of 12/19/2018)

Cincinnati State Technical and Community College	Northwest State Community College
Clark State Community College	Owens Community College
Columbus State Community College	Rhodes State Community College
Edison State Community College	Shawnee State University
Kent State University	Southern State Community College
Lorain County Community College	Terra State Community College
Miami University	University of Cincinnati
North Central State College	

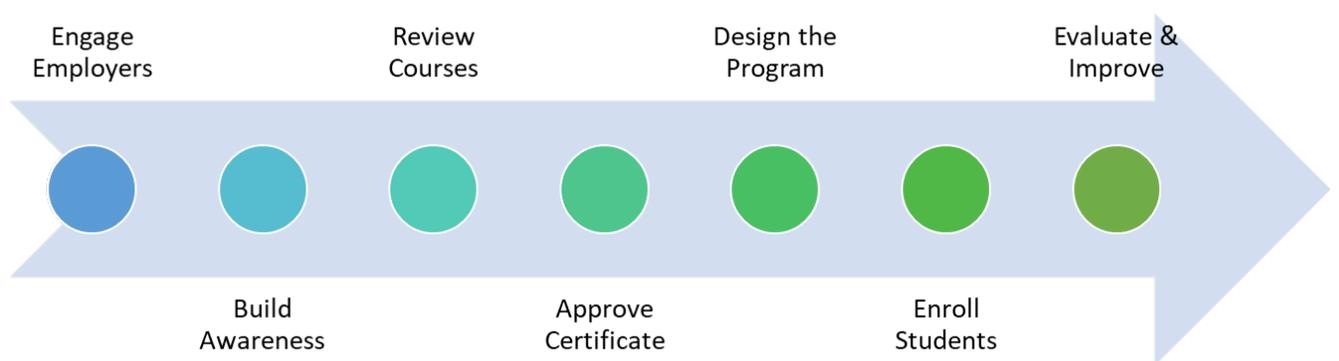
Northwest State Community College (NSCC) and Owens Community College (OCC) received technical and financial support from LIFT to pilot the Ohio Manufacturing Foundations Certificate. Since then each has attained institutional approval with plans to pilot the program certificate Spring semester of 2019. Northwest State Community College’s Dean of STEM, Dan Burklo, Ph.D., is an active member of OETEA and was involved with the creation of the Ohio Manufacturing Foundations curriculum. NSCC will initially offer the program to high school

students through the College Credit Plus program. The students will take classes on campus at NSCC and obtain work experience with local manufacturers.

Owens Community College staff and administration had learned about the Manufacturing Foundations initiative through Ohio TechNet, and leveraged funding from LIFT to help get the curriculum and certificate approved. Enrollment is underway, and the program will pilot Spring semester of 2019. Fifteen students are currently enrolled in courses aligned with the certificate. OCC staff are focused on building awareness among additional students and manufacturers.

IMPLEMENTATION TIPS

For institutions interested in launching the Manufacturing Foundations curriculum, the developers of the program recommend a uniform process leading to adoption.



1. **Engage employers:** Manufacturers are critical partners in the delivery of the Ohio Manufacturing Foundations Certificate. Starting engagement efforts with advisory committees and work-based learning host sites can help build the momentum and create success stories which will attract additional industry partners and additional students.
2. **Build awareness:** Ohio TechNet and OETEA have developed a set of promotional materials and tools to help administrators, staff, and faculty become familiar with the contents and delivery methods of the program.
3. **Review Courses:** Institutions should review their current course catalogue to validate that Manufacturing Foundations courses align with existing offerings and that CTAGs or TAGs are applicable. Once aligned courses are identified, ensure they are part of an advanced manufacturing pathway. The Ohio Manufacturing Foundations certificate is intended to be a short-term credential, so it is important to review course schedules to ensure they can be offered in a short time frame.
4. **Approve Certificate:** Each institution has their own process for vetting and approving new certificates. OETEA can provide a template for seeking certificate approval at the institutional level. For reference, the entire review and approval process has taken less than three months for the pilot programs.
5. **Design the program:**

- a. To ensure that students complete the certificate in one semester, a cohort model is recommended.
 - b. Identify an advisor to help students schedule classes and navigate the educational pathway to pursue follow-on certificates or degrees.
 - c. Identify local industry mentors to help familiarize students with occupational options in manufacturing and help them navigate the working environment.
6. **Enroll students:** While the certificate is working its way through approval, program staff can begin to build the enrollment pipeline. The program staff should work to identify who the program will best serve within their local context, whether it is high school students, existing students, transitioning adults, or some other locally defined population. To help support outreach efforts, Manufacturing Foundations branded materials are available to educate and engage potential students and manufacturers.
7. **Evaluate and improve:** The Manufacturing Foundations pilots are just a starting point. As more sites come online and the pilots mature, the initiative will undergo continuous review, evaluation, and improvement. Pilot institutions are using outcomes such as enrollment, completion, employment and advancement, and future educational attainment as measures of success.

Several lessons are offered from postsecondary institutions that are piloting the program.

Start small: Northwest State Community College and Owens Community College both set achievable enrollment goals for the pilot that built on programs they already had. Sarah Stubblefield, Project Manager for Northwest State Community College suggested, “Look at the classes you are already offering and build from there to get early enrollments.”

Focus on pathway alignment: Manufacturing Foundations requires careful scheduling and alignment with existing programs. The team at Owens Community College took great care to make sure classes were offered so that students could take them all in one semester and that the certificate was aligned with existing pathways to certificates and degrees.

Use available resources and utilize advice from peers at other institutions: Many partners have contributed to this project. Ohio TechNet provides a platform to connect with others offering the certificate.

As schools identify students for the Ohio Manufacturing Foundations Certificate program, colleges are encouraged to work with local high schools to explore the IGNITE program as a way to engage 9th and 10th grade students. Developed through a partnership with America Makes, LIFT, and the Digital Manufacturing and Design Innovation Institute, IGNITE is a high school curriculum that equips students with the mastery of manufacturing technologies, processes and systems to prepare them for careers in the 21st century production environment

or continue their education. Initially piloted in Michigan, an IGNITE program will be piloted in Ohio in 2019 creating expanded entry points into manufacturing pathways for students. IGNITE completers would be on a fast track to obtaining the Ohio Manufacturing Foundations Certificate and could enroll in this program in grades 11 or 12.

To learn more about the Ohio Manufacturing Foundations Certificate, contact:

- **Bernie Gosky, Lorain County Community College, Ohio TechNet Project Manager - bgosky@lorainccc.edu**
- **Rob Speckert, Miami University, Professor Emeritus - speckere@miamioh.edu**
- **Or, visit <https://ohiotech.net.org/manufacturing-careers/ohio-manufacturing-foundations/>**