

Jobs where
you can be
creative and
innovative

Jobs with
competitive
salaries and
great benefits

MAKE YOUR FUTURE: Ohio's Manufacturing Industry

A practical guide for students and their families

Ohio

Jobs where
you can make
a difference
in the world



NAPE
National Alliance for
Partnerships in Equity
Education Foundation

Over the next decade, the United States will need to fill nearly 3.5 million manufacturing jobs, but 2 million jobs may go unfilled because we do not currently have enough people trained to do them.¹

Opportunities!

➔ Manufacturing is an exciting, creative, and high-tech field. You can use advanced manufacturing technologies to help the US remain a world leader in innovation. It will also keep our economy strong and continue to provide a lot of jobs.

Ohio's manufacturing facilities lead the nation in the production of plastics and rubber, fabricated metals, electrical equipment, and appliances. Ohio is also a leading producer of steel, autos, and trucks.

Every day, manufacturers use new processes and materials to make futuristic products. A few years ago, the technologies to make programmable artificial limbs²

or 3-D printed athletic shoes³ didn't even exist. We can now manufacture products on-demand to reduce waste, which is better for the environment.

This workbook is designed to help students and their families to understand the many opportunities for careers in manufacturing right here in Ohio. Look for the success stories of students like you!


"Manufacturing today is much more about brains than brawn. And along with being high-tech, most manufacturing jobs are high-paying."

ALLISON GREALIS

Director of Women in Manufacturing⁴

➔ Meet Sabrina.

After deciding cosmetology wasn't the career for her, Sabrina Smith selected the career of welding because she wanted a hands-on job. She learned a lot in just 2 years thanks to hard work and the inspiration of her instructor, Phil Moore. She was the only female in her class and was the first person to receive her OSHA (Occupational Safety and Health Administration) certificate and two welding certifications. Sabrina furthered her education by going to Hobart Institute of Welding Technology, with the help of scholarships from the Troy Foundation. **"Being the only female in a man's working environment has made me stronger and more confident about my work."** Sabrina also creates pieces of art with her welding skills! Sabrina is passing her passion for welding on to the next generation by working with Girl Scouts to inspire girls to consider a career in the manufacturing industry.



Sabrina

UNITED STATES

12.3 million

work in manufacturing jobs¹

OHIO

1 in 8 jobs

are in manufacturing making
Ohio 3rd in nation⁵

WOMEN IN MANUFACTURING

29%

of manufacturing workers
are women⁶

Dream It!

What kinds of students might like a future in manufacturing?



STUDENTS WHO ENJOY
turning ideas into reality



STUDENTS WHO WANT TO
make life easier for others



STUDENTS WHO ENJOY
problem-solving with a team



STUDENTS WHO ENJOY
working with advanced technologies

Ever had an idea and wondered how you could make it a reality? **Manufacturing is your answer.** People in manufacturing work together to transform ideas into products, and today's entrepreneurs and dreamers are using unique methods and new technologies to produce their products.

Manufacturing companies need people from diverse backgrounds with a wide variety of experiences, knowledge, and training to do a lot of different jobs from planning and design to production, distribution, and sales. People with a wide range of educational experiences, skills, and passions can enjoy high-paying jobs with opportunities for advancement.

Educational requirements vary significantly based on the job. Generally, entry- to middle-level positions provide on-the-job training, require certification in a technical area, or require a 2-year degree in a relevant field. People who go into manufacturing major in many fields, including engineering (mechanical, electrical, industrial, chemical, or process engineering), robotics, food science, clothing and textiles, computer systems, life science, physical science, physics, information technology, and business studies. Teams of people with various skills and education work together to plan, produce, and distribute manufactured products.

Explore It!

- ➔ Look at the many teams in this manufacturing operation and how they all work together to make sure we have access to safe, useful, and high-quality products.



GREAT IDEA



Product Design Team

What are we going to create that makes life easier, better, or safer for people?



Process Design Team

What technology and processes should we use to create the product?



Production Team

How do we use technology efficiently and safely to produce the product?

Each team member's expertise and technical skills contributes to turning an idea into a product. Below, check out some of the jobs these team members do. The icons show how various team members are involved throughout the manufacturing process.

High School Diploma

Apprenticeship, Certification or Associate Degree

Production Associate



Work on the plant floor. Can be assembly team workers, upholsterers, food processing workers, or work in shipping and receiving.

Operator



Set up and operate machines such as semi-conductor fabrication equipment, Computer Numerical Control (CNC) Equipment, lathes, cutters, borers, mills, grinders, drills, forklifts, as well as other process control equipment.

Machinist



Use knowledge, skill and machine tools such as lathes, milling machines, shapers, or grinders to make precision parts.

Computer Numerical Control Technician



Program, set up and operate machines that convert designs produced by Computer Aided Design (CAD) into finished parts.

Production or Maintenance Technician



Ensure machines, robotics, automation, and equipment are running efficiently and safely.

Welder



Use welding equipment to assist in manufacturing assembly and production.

UNITED STATES

75%

of manufacturers are small: < 20 employees¹

UNITED STATES

30 million jobs

with a median salary of \$55,000 that don't require a bachelor's degree⁷

OHIO

\$72,534

average manufacturing income/year⁸



USEFUL PRODUCT



Quality Assurance Team

How will we know the product is safe, strong, and reliable?



Distribution/Inventory Management Team

How do we secure parts for production, manage inventory, and distribute the final product?



Customer Support and Sales Team

How will we sell the product and its value, so people will want to buy it and will be happy they have it?

Associate Degree or Bachelor's Degree

Advanced Degree

Marketing/Sales



Understand customer requirements, promote the sale of company products, and provide sales support.

Supply Chain/Logistics



Oversee the manufacturing flow from supplier of raw materials to finished product delivered to the customer.

IT professional



Design and maintain computer systems that support the manufacturing operations. Can also help with data analysis from marketing and sales. Can support logistics for organizational communication.

Engineers

(Electrical, Mechanical, Industrial)



Design products or processes for making products and use CAD and Computer Aided Manufacturing (CAM) for modeling products and production processes.

Quality Control



Manage the safe and efficient production of products. Use measurements, charts, statistics, and math to ensure the products are safe, reliable, and accurate.

Industry and/or materials experts



Develop new uses for materials in products, ensure safety, provide expert guidance in a type of manufacturing or material, (e.g. metal and alloys, ceramics and glass, plastics and polymers).

Plan It!

➔ Individuals working in the manufacturing industry often have an entrepreneurial spirit, strong creative thinking and problem-solving skills, and science, technology, engineering, and math (STEM) skills.

In manufacturing, you have many choices about pathways to take, with a variety of jobs for people with diverse interests and talents. While some people want to get to work right away through an apprenticeship or internship, others plan to attend a two or four-year college.

The Ohio Department of Education has mapped out pathways to help you pursue careers in manufacturing. Depending on your interest and training, you can enter the pathway at any level or work your way up throughout your career by earning more credentials, certificates, or degrees. Ohio's manufacturing pathways start as early as middle school, and the Ohio Department of Education

has identified the education and experience you need for careers in aerospace, industrial engineering, industrial technology, materials, manufacturing safety, and manufacturing systems.

High school pathways also help you fulfill graduation requirements and can lead to industry-recognized credentials and possible college credit. For more information about the opportunities at your school or local career center, talk with your school counselor or a recruiter from your local career center, or visit education.ohio.gov, and do a keyword search for "career pathways."

Apprenticeships

Ohio boasts one of the largest registered apprenticeship systems in the United States with nearly 20,000 Ohioans participating. Apprentice programs teach students in a practical way through a structured, systematic program of on-the-job supervised training with a mentor, and technical instruction delivered in a classroom or online.

Ohio recognizes over 1,300 occupations as apprentice occupations, and many can lead you to a career in manufacturing. Employers and industry associations sponsor and operate apprenticeship programs, and students participate so they can learn job skills and earn industry credentials or certificates while making an income. In many apprenticeship programs, the coursework can also lead to a college degree, so students have an opportunity to earn both academic and occupational credentials at the same time.

➔ Meet Dylan.

Dylan Rayo's strong work ethic and outstanding academic performance is helping him succeed in the Advanced Manufacturing Program at Columbus Downtown High School. Dylan wants to become an engineer. The knowledge he is gaining through the manufacturing program will help him secure an internship where he will apply what he is learning and develop key relationships to guide him along his career pathway. The high school program has introduced him to industry software programs and state-of-the-art Computer-Aided Design (CAD) equipment. This program has not only helped him get a jump start on his career, but it has also helped him gain confidence in speaking and presenting at various events. **"My instructors have real-world experience, and they have helped me better understand what is expected of me if I want to succeed as an engineer in manufacturing. This program gave me a distinct advantage to help me prepare for a strong college engineering program."**



Dylan

"Manufacturing is about incredible new technologies: 3-D printing, nanoscale chemistry, energy efficiency, satellite technology, medicines that are saving lives and changing the world. Manufacturing is as much about tomorrow as yesterday—with endless opportunities for everyone."

JAY TIMMONS

CEO of the National Association of Manufacturers (NAM)⁹

Do It!

➞ Ohio has many organizations to help students find their way to a career in manufacturing.

 **DreamItDoltOhio.org**

This resource introduces the world of today's advanced manufacturing and offers resources to engage students, parents, educators, and manufacturers. Click on the Ohio map to find programming and key organizations near you that can connect to courses, educational programs, camps, apprenticeships, and more!

 **OhioMeansJobs.com**

Plan your future with a guided tour and online backpack which holds a career interest survey, career searches, and cost of living budget. Enter search term "manufacturing" to learn more about this career pathway.



 **Education.Ohio.gov and Apprentices.Ohio.gov**

Listing middle and high school courses and more than 900 registered apprenticeship programs. Enter search term "manufacturing."

 **High School courses**

- Ask your school counselor about programs available in your area
- Enroll in a career and technical educational (CTE) program
- See if your district offers courses in engineering

Manufacturing jobs in Ohio hold great promise for all Ohioans!

Start now! NAPE designed this workbook to be a useful tool for students and their families to explore resources and opportunities available in Ohio. We wish you the very best in your future educational and career pursuits, and we look forward to seeing you in the manufacturing industry in Ohio!

➞ Imagine yourself in a summer co-op program where your starting wage is \$18/hour.

That is just what Tri-Rivers RAMTEC graduates will be doing as part of the Whirlpool Marion's Summer Apprenticeship program. Once they complete this summer program, they can apply for the Whirlpool Maintenance Apprenticeship and earn \$26/hour while they earn industry credentials!





➔ Meet Tanya.

"I love seeing machines make things...from a manufacturing print on a piece of paper to 'making a machine sing' to producing a detailed, intricate part from a solid piece of material," says Tanya DiSalvo, President of Criterion. Her company produces parts for the "no failure" industries—medical devices, aerospace, nuclear, laser and photonics—so the work they do really makes a difference in people's lives. Tanya's grandfather started Criterion in 1953. **"When I started, I had to overcome stereotypes and show I was more than the girl who served coffee. I had to prove I was capable, work my way up through shipping & receiving, business development, and operations."** Tanya works hard to create pathways for students and adults from diverse racial and ethnic backgrounds.

NAPE is the nation's leading professional alliance for access, equity, and diversity in education, training, and careers.

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¹ Top 20 Facts About Manufacturing. National Association of Manufacturers. Retrieved from <http://www.nam.org/Newsroom/Top-20-Facts-About-Manufacturing/>

² (2014, October 29). Through 3D-printed prosthetic, Illinois students lending a hand in Ecuador. Provided by: University of Illinois at Urbana-Champaign. Retrieved from <https://phys.org/news/2014-10-3d-printed-prosthetic-illinois-students-ecuador.html>

³ Yurieff, K. (2017, April 7). Adidas unveils new 3D printed shoe. Retrieved from <http://money.cnn.com/2017/04/07/technology/adidas-3d-printed-shoe/index.html>

⁴ Mann Jackson, N. (2013, October 8). Why We Switched to Manufacturing Careers. Retrieved from <https://www.dailyworth.com/posts/2168-why-we-switched-to-manufacturing-careers>

⁵ Shields, M. (2017, January 19). Manufacturing plays crucial role in Ohio economy. Retrieved from <https://www.policymattersohio.org/press-room/2017/01/19/manufacturing-plays-crucial-role-in-ohio-economy>

⁶ Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity; Labor force statistics from the Current Population Survey. Bureau of Labor Statistics. Retrieved from <https://www.bls.gov/cps/cpsaat18.htm>

⁷ Carnevale, A., Strohl, J., Cheah, B. & Ridley, N. (2017). Good Jobs That Pay without a BA. Retrieved from <https://goodjobsdata.org/wp-content/uploads/Good-Jobs-wo-BA.pdf>

⁸ (2017, March). Center for Manufacturing Research. Retrieved from <http://www.nam.org/Data-and-Reports/State-Manufacturing-Data/State-Manufacturing-Data/April-2017/Manufacturing-Facts---Ohio/>

⁹ Timmons, J. (2015, March 25). Timmons' Remarks at the Women in Manufacturing STEP Awards Program (Washington, D.C.). National Association of Manufacturers. Retrieved from <http://www.nam.org/Newsroom/Speeches-Presentations/2015/Timmons--Remarks-at-the-Women-in-Manufacturing-STEP-Awards-%28Washington--DC%29/>